

**S20**

**GIS OPERATION MANUAL**

*“Disasters are not born, they are done,  
do not expose your close ones”*

*José Fra Rey*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S20

GIS OPERATION MANUAL

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## S20 GIS OPERATION MANUAL

### CHAPTER 1. GIS OPERATION MANUAL

#### 1.1 Introduction

This manual describes the architecture, characteristics and considerations taking into account the design and latter implementation of the Geographical Information System (GIS) and the data base. It is developed to understand the project “Study on Basic Plan for Prevention of Disaster in the Metropolitan area of Caracas”. There are nine (9) sub components in this manual which will help the users to have the comprehensive view. It describes the development of the system as a whole: the files that are used, application developed for better visualization and consulting and other developments realized.

The followings are the components of this manual.

1. Installations of GIS, CAD and database system
2. File Naming Conventions and Organization
3. User and System Manual on the Development of the Application in ArcView 3.2
4. Transfer of Views and Layouts in ArcView 8.2
5. Description of Physical Database Model
6. Transfer of GIS in HTML Format
7. Transfer of Layouts in PDF Format
8. Metadata Development
9. Visualization of Metadata with ArcCatalog

#### 1.2 Installations of GIS, CAD System and Database System

Based on the initial observation of GIS and CAD system prevalent in the different counterpart institutions, the study team has purchased and installed the following software.

<b>GIS System</b>		
<b>GIS Package</b>	<b>Vendor</b>	<b>Operating System</b>
ArcGIS 8.3	ESRI	Windows XP
Spatial Analyst Extension	ESRI	Windows XP

## CAD System

AutoCad map 2004 was purchased and installed in one of the GIS server. AutoCAD map requires the software key to be present (which is installed) and if for any reason, the hardware needs maintenance, the vendor should be contacted for the another copy of software key license.

For the migration of license from one computer to another, the user may use license migration tools supplied with the software.

CAD Package	Vendor	Operating System
AutoCAD	AutoDesk	Windows XP
AutoDesk Map	AutoDesk	Windows XP

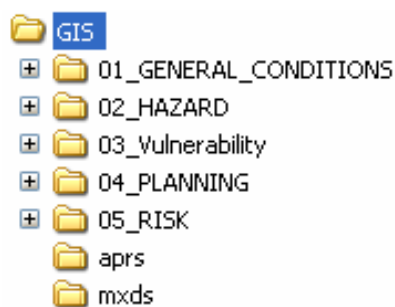
For database system Oracle 8i personal edition was installed for processing large census data. The license of Oracle 8i, however, is not transferred. Microsoft access was installed for other smaller database, the license of which is being transferred to counterparts.

### 1.3 File Naming Conventions and Organization

An uniform file naming convention was used for naming and storing of the files. The standard method for naming the files is outlined below.

An uniform directory and file storage system has been developed so as all the application is run and accessed in the same way. The directory structure (figure shown below) as well as all the other naming conventions has been made in English.

#### Directory Structure



## Naming Conventions

Due to the limitation of Arc/Info for the file name size (16 letters in total, 13 alphabets for name and three alphabets for extension), the file name has been limited to 16 characters in total. The file name is developed in such a way that it will convey information about the geographic extent of the data set, the accuracy of the data, the projection type, scale and the thematic content. This structure is the simple structure which will be useful when adding new files in the directory. This type of structure also improves the implementation of automated processes.

The proposed format of the geodata set name is as follows. This structure was presented to the counterpart for their approval.

Filename = XXXPASSTTTTTT

Where            XXX            is the Extent Code (to insert an underscore if  
the

Extent Code is  $\leq$  3 characters)

P            is the Projection Code (1 numeric character)

A            is the Accuracy Code (1 alphabetic character)

SS            is the scale of the map (2 numerical  
characters)

TTTTTT            is the Thematic Content Code (6 characters)

### **1.4 User and System Manual Development of Application in ArcView 3.2**

#### **1.4.1. Introduccion**

The application development system manual in ArcView is composed of two sections; the first one is composed by the Requirements and Installation. The second section includes a description of the GIS, the application, its considerations and forms of maintainance.

The first section presents the basic requirements in the ambit of software and hardware necessary for working with ArcView 3.2a. The section of the GIS is divided in four (4) parts. In the first one, a description of the GIS (characteristics and design considerations) is given. In the second one, the architecture developed during the implementation is presented. The third one includes a description

of the objects that integrate the GIS: Views, Tables, Charts, Layouts, Scripts y Dialogs. Finally, the mechanisms of security incorporated to the data base system are explained.

## **(1) Requirements and Installation**

This Chapter outlines the requirements at the level of software and hardware, which are needed for working with ArcView. Besides, it is indicated the application installation form.

### **BASIC REQUIREMENTS**

In order to use ArcView 3.2a, it will be needed the following minimum requirements:

- 1) Software
  - Microsoft Windows 98, 2000, XP
  - Arc/View 3.2a License
- 2) Hardware
  - Pentium Computer or superior, with at least 64 MB RAM memories and hard disc with 60 GB of minimum store space.
  - 17" SVGA Color Monitor. The configuration of the monitor should be of 1024\*768 pixels, preferably.

### **INSTALLATION**

The GIS of the project of JICA is submitted with a user manual as a rapid reference guide.

Suggestion: Before installing the application and data, it is convinient to make a security copy of the original data of the program. If you do not know the procedure to be followed for that, you may consult Windows documentation.

Steps for installing the developed application:

- Start Windows in the usual form.
- Insert the CD(s) of the project of JICA in the disc unit (if you have more than one unit, you must use the one that responds to the CD format.
- In the Explorer of Windows and in disc "D, creat a folder with the following structure: D:\Caracas. If you do not have the hard disc unit D, you may continue this procedure in the drive C (or other drive)

- In the above folder, copy all the files contained in the project JICA.
- Go again to the folder D:\Caracas and deactivate the attribute of *Read Only*, which is activated by default when copying the CD.
- In order to create a direct access to the application, go to file D:\caracas\Aprs\gis\_a3.apr, and then follow Windows standard procedure for creating direct accesses.

## (2) **The Application**

### **CHARACTERISTICS**

Under the ArcView 3.2a development environment, an application was developed that would allow:

- The rapid, efficient and secure management of information.
- The consultation and classification of the information in diverse thematic levels (general conditions, hazard, risk, planning) or spatial levels (municipality, parroquia, segment, microzone, manzana, plots, sub catchments, and special units created for making thematic simulation).
- Simple search, consulting and analysis.
- Simple update and under strict security mechanism.
- Possibility of growth and reuse in similar works.
- Use by diverse users.
- Easy handling, since it presents a graphic interface totally user friendly.

### **ARCHITECTURE**

The architecture of the GIS is based on five (5) thematic classes:

- General Conditions
- Hazards
- Vulnerability
- Risks



- Planning

## **HOW TO OPEN THE PROJECT THAT VISUALIZES THE GIS OF THE PROJECT JICA?**

### **First Option**

In the *Start* button select *Programas*, within the programs select *ESRI*, then select *ArcView Gis Version 3.2*.

When ArcView starts, the logo of ArcView appears and the blue-progress-bar shows the advance in the percentage of start up process made. One window of project named *Untitled* is open within the window of the application. The name of the window *Untitled* is *Project Window*.

From the File Menu select *Open Project*.

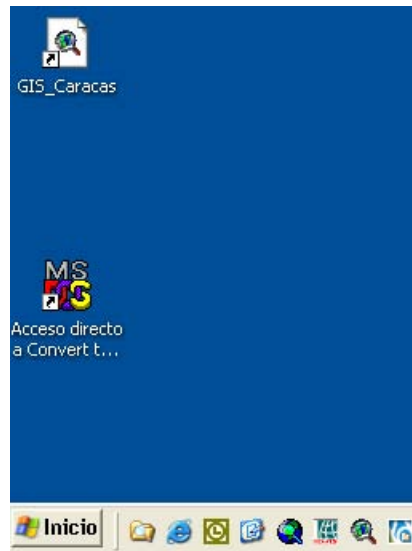
The search box to open projects appears, to navigate in the structure or directories and search for the files of the projects. The directories are listed in the right side and the files of the projects are listed in the left side.

Search for the file locate in *d:\caracas \Aprs\gis\_a3.apr* and double Click to execute it. When the project is executed, the project presentation dialog is opened, from which it is possible to begin navigating on the application.

### **Second Option**

*a. Start up of application:*

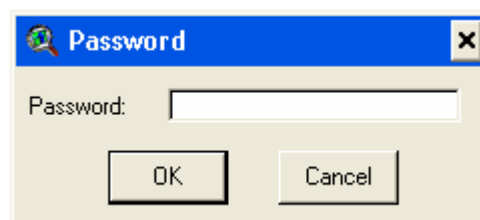
The user should double click on the icon *GIS\_Caracas* as shown in the figure below.



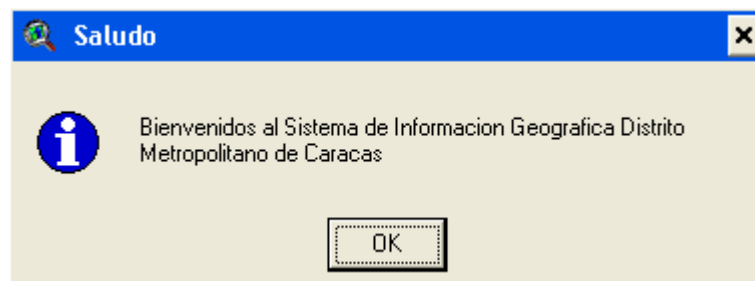
## NAVEGATING IN THE APPLICATION

### Password

After clicking the next windows will be as shown below. The user should type the correct password in order to enter the project and click on the OK button. The initial password is set to 123.



Next the user will get a welcome dialog window as is shown below. Click OK button.

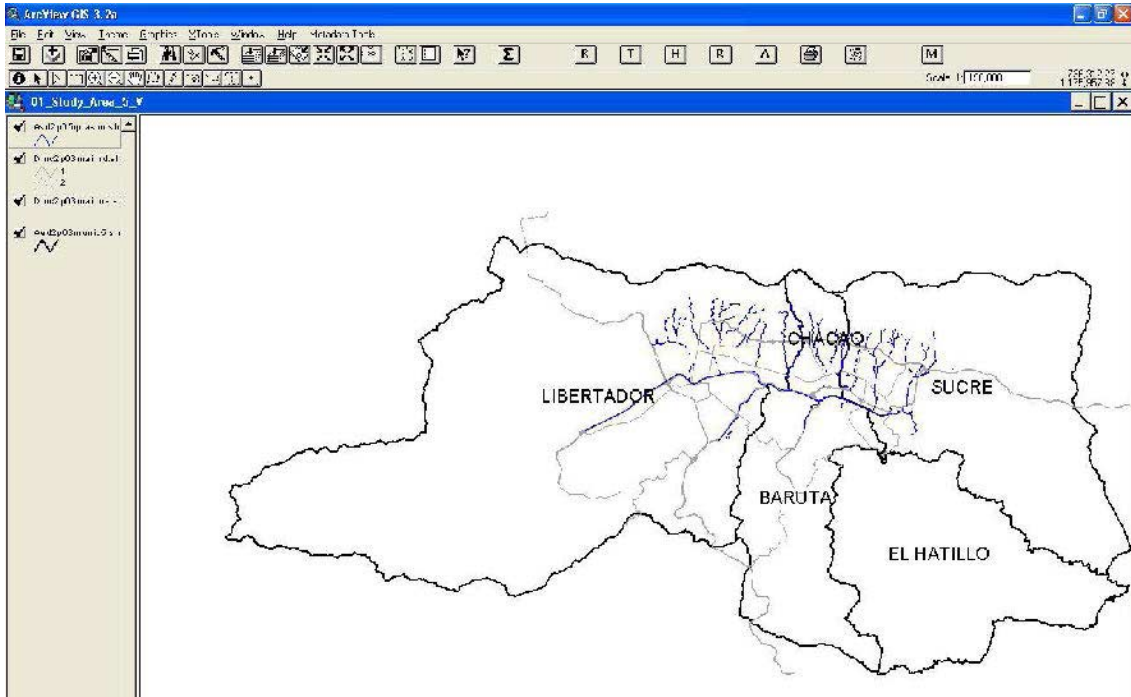


b. The project is opened, you can see the Main menu, the button bar of an ArcView software as well as the View window called *01\_Study\_Area\_5\_V* (figure shown below).

All Views were design at

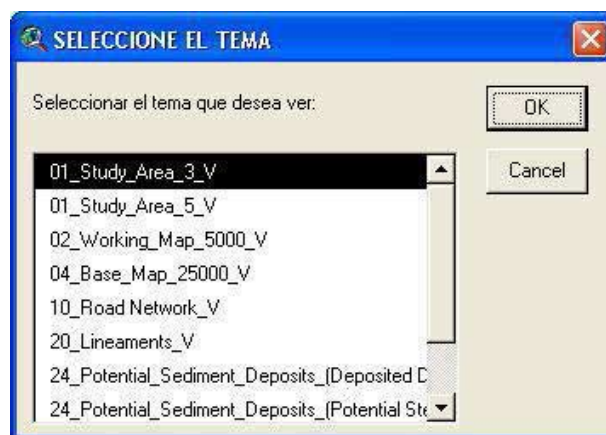
Scale 1:190,000

In the right side of the button bar, you can observe the group of buttons (described bellow) in order to manipulate all the maps that have been created in the project, print layouts and PDF files as well as a Metadata files.



### Base Maps

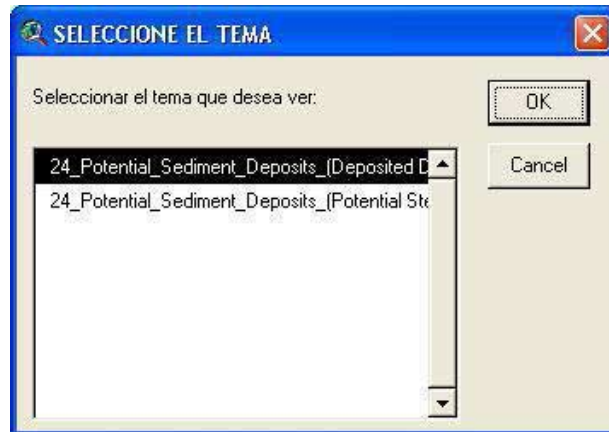
Click this button open the window shown below which contain a list of Base Maps and you can select one View at a time in this list box and click OK button in order to display the selected base map.





## Thematic Maps

Click this button open the window shown below which contain a list of Thematic Maps created during the project, you can select one View at a time in this list box and click OK button in order to display the selected thematic map.



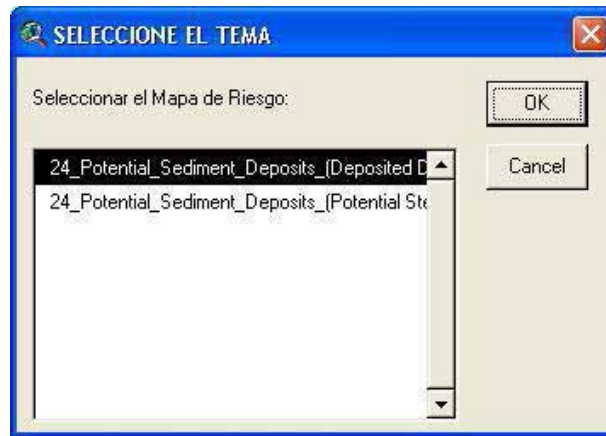
## Hazard Maps

Click this button open the window shown below which contain a list of the Hazard Maps created during the project, you can select one View at a time in this list box and click OK button in order to display the selected hazard map.



## Risk Maps

Click this button open the window shown below which contain a list of Risk Maps created during the project, you can select one View at a time in this list box and click OK button in order to display the selected risk map.



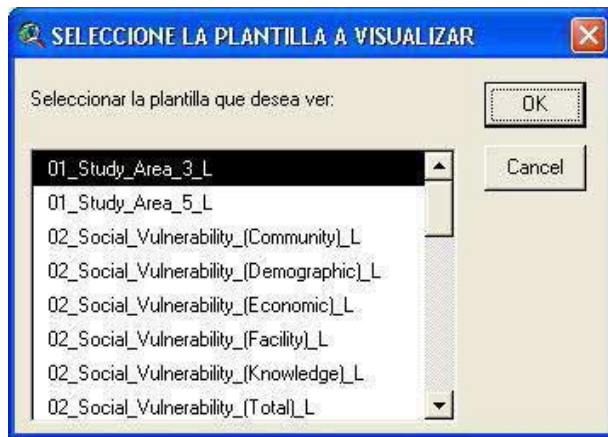
### All Views

Click this button open the window shown below which contain a list of Views created during the project, you can select one View at a time in this list box and click OK button in order to display the selected View.



### Print Layouts

Click this button open the window shown below which contain a list of Map Layouts created during the project, you can select one Layout a time in this list box and click OK button in order to print the selected Layout.



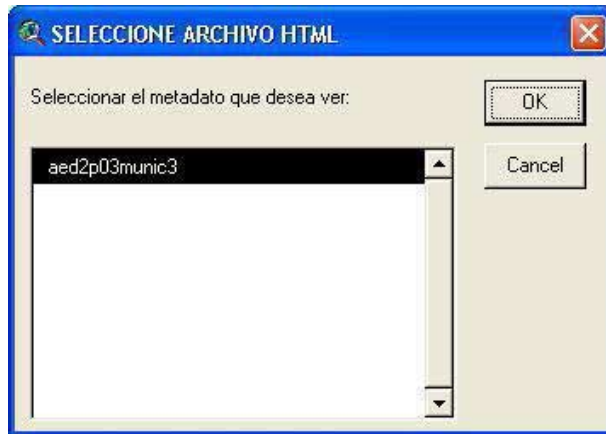
### Print PDF Files

Click this button open the window shown below which contain a list of PDF documents ready to be printed, you can select one Document at a time in this list box and click OK button in order to print the selected PDF file.

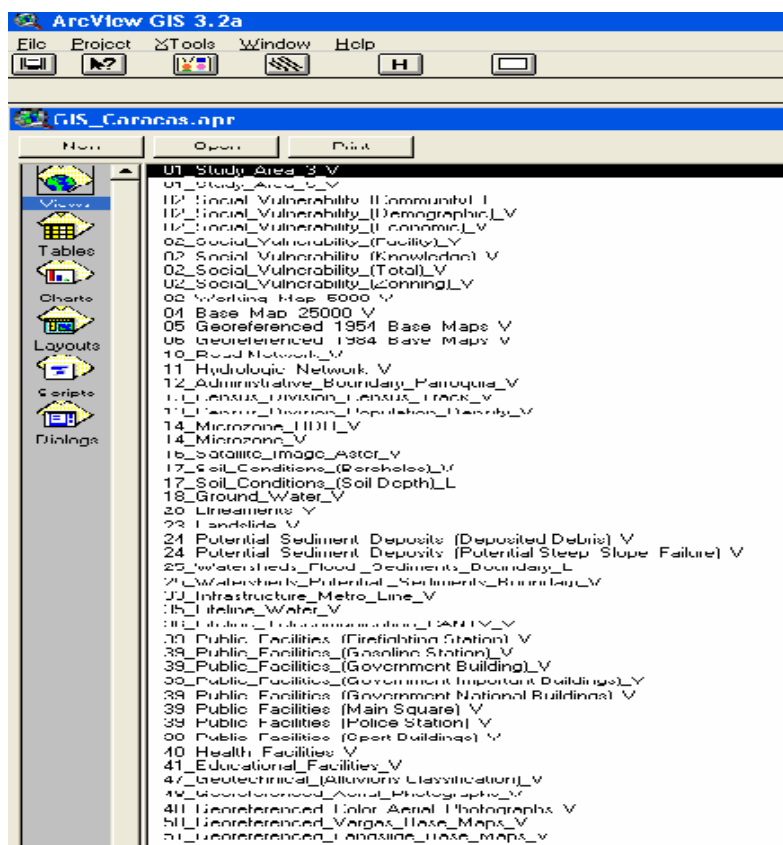


### Display Metadata

Click this button open the window shown below which contain a list of Metadata created during the project, you can select one HTML document at a time in this list box and click OK button in order to display the selected Metadata.



If you close a displayed View you will get the *Project* window as shown below called *GIS\_Caracas.apr*. You can see a Main Menu of the ArcView user interface and a Group of 6 buttons in the button bar.



**Description of the Button Bar**



*Save the current project*



*Get help about the next button, tool or menu choice you click*



*Copy the current view with a new name*

Click on this button opens the View drop-down list. You can select an existing view. In the example below the chosen view is *01\_Study\_Area\_3\_V*. Click OK.



The dialog box called New View Name opens. Type the new name for the view. Click OK button in order to display a new view with the same contents than the source view. The new view is added to the View list in the project window.



*Copy a Layout with a new name*



Click on this button open the Layout from the drop-down list. You can select an existing Layout. In the example below the chosen view is *01\_Study\_Area\_5\_L*. Click OK.

The dialog box called New Layout Name opens. Type the new name for the layout. Click OK button in order to display a new layout with the same contents than the source view. The new layout is added to the Layout list in the project window.





Hide the current project window

Restore the current hidden project

### **Security of Data Application**

The developed GIS are protected by two mechanism of security. In the first level, the application restricted by password required to open up the Project. In the second level, when the users try to save the files, it prompts user for another password.

#### **1.5 Transfers of Views and Layouts in ArcView 8.2**

All the views and layouts developed in Arcview 3.2a were automatically transferred to the new map documents of ArcView 8.2. This helps to migrate from the application developed in version 3.2a when the counterpart teams have their own ArcGIS 8.X system.

#### **1.6 Description of Physical Database Model**

The physical database model for each of the file system is outlined below.

#### **1.7 Transfer of GIS in HTML format**

Many of the layers of GIS are converted to HTML format and are being delivered as a standalone web product of the GIS.

#### **1.8 Transfer of Layouts in PDF format**

The completed maps are converted to Adobe PDF formats. They are located in \caracas\PDFs. These PDF files can be assessed through the application developed in ArcView 3.2a or directly opening through Acrobat Reader.

## **1.9 Metadata Content**

Metadata were developed utilizing FGDC (US Federal Geodata Comitte) standard. This is the commonly used standard and being used in IGVS. An application extension in ArcView 3.2a was also installed to collect, view and export metadata content. The metadata content is also exported in HTML format for easy viewing. Due to large number of pages in metadata (more than 300 pages), it will be provided only in digital format.

## **1.10 Visualization of Metadata with ArcCatalog**

The developed metadata can also be visualized through ArcCatalog embedded in ArcGIS. The user can open the ArcGIS and import/browse through the interface of ArcCatalog the complete description of metadata.

## DESCRIPTION OF ARCVIEW 3.2A

### *References*

The following books and electronic addresses are sources of consultation, whenever you are looking for a very deep and extensive information on how to work with ArcView.

- ESRI (1997): ArcView GIS. The Geographic Information System for all the world. ArcView 3.2. Redlands, CA, USA.
- ESRI (1991): Understanding of GIS. Redlands, CA, USA.
- International Geoinformation (1996): learning on ArcView. New York, USA.
- Hutchinson, S.; Daniel, L. (1995): Dentro de ArcView. Onword Press, Santa Fe, USA.
- ESRI Web Page USA <http://www.esri.com/>
- ESRI Online Discussion Forum [nt1.esri.com/community](http://nt1.esri.com/community)
- ESRI Server List [arcview-l-request@esri.com](mailto:arcview-l-request@esri.com)
- ESRI More Frequent Questions [www.esri.com/support/faq](http://www.esri.com/support/faq)
- ESRI Chat [www.esri.com/chat](http://www.esri.com/chat)
- Avenue Scripts & Extensiones <http://andes.esri.com/arcscripsts/scripts.cfm>
- *Free* Software <http://www.esri.com/base/common/free.html>

### **Introduction.**

ArcView 3.2 is a tool that shows geographic information on the Desktop (PC). It offers functions for:

- editing,
- representing,
- modifying,
- consulting,
- analysis and
- results of the data spatially referenced (geodata).

The main functions of ArcView include:

**Representation of the spatially** It is very easy to produce maps based on existing geodata

referenced data.

<b>Representation of tabular data in one view</b>	It can import tabular data and link them to a view. This will let representing the data spacially.
<b>Consulting of the data base with SQL and representing data in one view.</b>	It can download tabular data from an external data base in order to execute tasks spacially referred with such information.
<b>Codified geodata from tables that contain addresses of information and that represent such information in one view</b>	Tabular data with addresses - for example: users, distributors, competitors, selling or production locations— can be represented in one view as points of location. Geo ArcView codifies this information in order to add it to a view.
<b>Creation and processing of geodata</b>	It can create its own spacially referenced information for the representation of geo-objects and then use ArcView for analysing and exhibiting them in one view.
<b>Consulting the atributes of the geo-objects</b>	You can click on the objects in a view in order to see their atributes.
<b>Creation of thematic maps</b>	Can classify the geodata with base in the value of its atributes and representing them by using a variety of symbols and colors (graphic variables).
<b>Selection of objects based on values of particular atributes</b>	Can define thematically consultations oriented specifically to a subject in order to find certain objects of some theme.
<b>Creation of planes for the representation of the atributes of the objects</b>	Can visualize standard/tabular data with the aid of planes and therefore of complementary maps.
<b>Summary of the geo-objects and their atributes</b>	For example, can add data of cities using a statistical field for a regional or state level. When making this, you can create statistics for each atribute
<b>Accomplishment of analysis of spatial data</b>	By using this type of analysis method is possible to select objects with base in its proximities to other objects, or inclusively to generate environmental zones.
<b>Execution of the cover analysis</b>	For example, it is possible to find the locations in where groups of several objects can be presented/displayed.
<b>Creation and impression of layout of a map</b>	Layouts can be used to create archives of maps ready to be printed from the views or other elements.
<b>Export of layout to be used in another application</b>	Layouts of maps can be exported to other numerous data formats.
<b>Personalización de ArcView for your own projects</b>	You can fit the user interphase of ArcView in a simple way and to remove or to change the functionality of the navigation elements. Additionally, you can write Scripts de Avenue to add your own elements of navigation.
<b>Creation of applications of ArcView for</b>	Avenue offers a complete surrounding of development for

**other users**

the progress of applications based on ArcView.

## **User Interface**

The following types of windows exist in ArcView

*View - Table - Chart - Layout - Script Dialog*

### **ArcView 3.2a Objects**

#### *Project Window*

The project window provides a list of all the components of projects. When making this, it provides certain functions of maintenance for the components. The title bar exposes the name of the project.

#### *Views, Tables, Graphs, Layouts and Scripts Window*

When you open any component of project, this component will be exposed in its own screen. In ArcView, you can have the wished amount of open windows at any given time; **nevertheless, only one window remains active**. This window is in which you are working at the moment.

#### *Quick Reference:*

<b>Menu Bar</b>	Contains the pull-down menus for ArcView 3.2a
<b>Bar of Botoms</b>	Contains icons by means of which the most important functions of ArcView can be acceded.
<b>Tools Bar</b>	Visualizes the advance of the operations and provides to simple functions of help and reports on the advance of the functions that are at the moment in execution.

The menu bars, bottoms and of tools are dynamic elements of the interphase of users of ArcView, and these change according to the type of document that is activated at the moment.

#### *Functions of Help in ArcView*

ArcView offers a variety of help options that go from a brief explanation and suggestions located in the state bar to provide a detailed help of the library of Windows, which includes investigation capacities:

- To the help system can be entered through the **Help Menu** of ArcView or pressing **F1** in keyboard. The system of help of ArcView is **of sensible context**; what means that the text

of help applicable to the active window or to the commando is immediately indicated and indicates the explanation of its meaning. In addition, the help of ArcView is a series of **hypertext documents**, which allows it to go from visualized texts or key words to other topics.

- When doing click in the **button of help** and next in a commando, button, tool or document, you will receive specific help related to that option in particular.
- When positioning the cursor on the buttons and the tools, it will appear a brief description (well-known like **help bubble**).
- A brief description of all the icons can be obtained when placing the cursor on the object or the element of the menu of interest and reading the commentaries of the **state bar**, which is located in the low part of the window of ArcView.

### **Initiating the Program**

Initiate ArcView with the key of beginning in Windows or with the icon of the program of ArcView.

ArcView automatically creates a new project called "untitled", which you can rename and complete with your information.

A theme can only consist of objects of a same class.

The information that describes the objects (attributes or thematic data) is assigned to points, arcs and polygons using an object ID (key of the object) unequivocal (unique). This information is stored in the format of tables, to which the name of **tables of characteristics of attributes (feature attribute tables, FAT)** is assigned. The user can enter directly to the data in the FATs by means of the tables of functions of ArcView, or through a variety of systems of handling of data (DBMS), such as, dBase. In ArcView, the FATs also are known as tables of themes.

### **Shape Files of ArcView**

The shape files are opened-non-topologic data formats. These files contain geometric and thematic information that can be created or be modified with ArcView. These files can be compound of five (5) different classes of files:

- **.shp** contains **geometries of objects**
- **.shx** **index** of geometries of objects
- **.dbf files** that contain **information of attributes** on objects

Additionally, the following classes of files can be created by means of a special procedure of ArcView:

- **.sbn** Stores the **topographic index** from objects
- **.sbx spacial analysis** has been made.
- **.ain** Stores the **index** of attributes (**index of tables**), and
- **.aih Tables of logical connection**

### **CAD Data**

It is possible to load files of AutoCAD in ArcView or in DWG internal formats by using the extension of the "Reader of CAD files", or in the DXF formats (format of CAD interchange). The themes created in CAD systems work in the same way that the themes of ArcView. All the works of process of themes work with this information.

### **Images**

The themes of ArcView can be created from a variety of images

### **Themes events**

The events are standard data that can be incorporated to views like themes. In the events, geometries of the objects are stored in the same table like attributes.

### **Types of Events:**

- Events XY
- Events of points
- Linear Events
- Continuous Events
- Events of Direction

The tables of events XY contain the exact positions of the objects defined by their latitudes and lengths (or other types of systems of Coordinates). For example, the positional description can be registered with the help of a GPS reciver (global system of positions). When registering these values of latitude and length (like coordinates x, y), exactly the locations of spacial objects can be described. The coordinates can be derived from registry methods, primary (methods of geodesic measurement) and secondary (reading of coordinates or digitalization of maps).

The other classes of events talk about routing systems which can be generated when using ARC/INFO or the Network Analyst of ArcView.

### **To add a theme/ theme to a View**

- To activate the View within the new theme to add.
- To click in the button "to add theme", or to select the function from the menu of View
- To find the source of data with the file of examining.
- To choose the type of presentation (only with the covers of ARC/ INFO and CAD data), click on the name of the file of the following folder. Then, the list of the types of geometries within CAD file will appear.

The source of data will be added like a theme when it makes a doubleclick in the exact name of a file or in a type of presentation.

### **Browse and Approach**

ArcView offers functions to change the size of unfolding and the extension of the map as in the bar of buttons as in the one of tools. The browse function allows to make changes in the extension of the map without changing the size of unfolding. The approach function expands or reduces the size of unfolding and, of course, the scale of the map

### **Properties of View**

In the View menu, an option called "properties" exists. This option allows the entrance of certain basic information that describes the View (name of the View, date of creation). If the data have geographical coordinates, it is possible to project all the View in another system of geodesic reference.

### **Properties of Themes/ Themes**

The properties of themes control different values by defect as well as the presentation of the theme and its definition. To the window of "theme properties" it is possible to enter through the menu of Theme or by means of its corresponding button in the bar of buttons.

The icon of "definition" - the first area in the theme characteristics - allows to make the following basic functions:

- To change the name of the theme (from a brief file name to one more a detailed description).
- To register the source of data or its location (with the appropriate route).



- To define the geo-objects of a sub-set of themes, based on particular thematic characteristics; then, the theme will be only made up of objects selected (within the predefined system, all the objects of the theme will be visualized).

Legend editor/ editor

The legend editor/ editor can make the following changes:

- classifications,
- symbols and
- legend texts

In order to enter the legend editor a double click is made in the theme that is in the content table or clicking in the button of the legend editor.

<b>Type of Legend</b>	<b>Description</b>
<b>Symbol</b>	<b>Simple</b> Uniform format and color
<b>Color</b>	<b>Graduated</b> Uniform format and graduated colors
<b>Symbol</b> <i>(for points and lines)</i>	<b>Graduated</b> Uniform format with symbols of graduated sizes
<b>Unique value</b>	Uniform symbols for values of equal attributes
<b>Points</b> <i>(for areas)</i>	Proportional Density of points
<b>Graphicals</b>	Graphs of columns and cake type

#### **Automatic Creation of Classes.**

<b>Method</b>	<b>Description</b>
<b>Equal area</b>	In themes of polygons, the class limits are chosen in such a way that the total area of polygons in each class is approximately equal.
<b>Equal interval</b>	This method divides the total rank of values of attributes in a specific number of classes in where each one has same wide (1-10, 11-20, 21-30). In this method, some classes can contain more elements than others.

- Natural cuts** This method chooses class limits in such a way that each one is diminished. The base of this is a complex statistical analysis (Jenks Optimization), which translates great jumps in values of attributes in class limits.
- Quantil** With the quantil method, the class limits settle down so that each one of them contains an equal number of elements (objects). The number of objects is more important than its value of attributes.
- Standard deviation** With the base in the calculation of arithmetic average terms of ArcView, the classes that contain elements with intervals between  $\frac{1}{4}$ ,  $\frac{1}{2}$  or 1 of standard deviation from the average are created until all the registries of information are assigned to a class. Those registries that are to more than 3 standard deviations of the average are grouped in a class ( $< 3$  std. dev and  $> 3$  std. dev). The visualization is given typically using a dichromatic scale of colors in which the class around the average is of white color.

### **Advanced Editor of Legend Functions**

#### **Scale of Points and Symbols of Line**

Excepting the legend of types of graphs, the size of lines and symbols of point can be defined with reference in the maps scale. When doing click in the button, and then in the *Scale of Symbols*, the representations of dependent scale are activated. If it is not entered explicitly, the present scale of the View will be used like reference scale (scale in which the symbols will be visualized like they have been defined in the legend editor).

#### **Rotation of the Symbols of Point**

The point symbols can be rotated when entering the angle of wished rotation in a special field of attribute. Then, the function begins when choosing the field that contains these angles of rotation after summoning the menu of Advanced Options with the button.

#### ***Displacement of Symbols of Line***

For the line symbols, a displacement can be created when defining a linear separation (in points) for the visualization. This function uses the parallel visualization of two identical linear geometries to allow the reader to see the value of attributes of two themes.

#### **Text Labels**

Using the labels and tools of text, you can place text in views or in geo-objects. An object text can be created using attributes of the tables of themes, either selectively or through the complete table. Also an user-defined text can be assigned to the objects. Each text object is an independent element and with scales of graphs, whose position, size and source can be modified individually.

### **Insertion of User-defined Text**

Making use of the text tools, you can insert text objects in the amount of positions that you please.

The text tools can be activated when doing a click in the button; from there on, you can simply place a text object in any point within a View when doing a click in the place wished with the mouse.

In order to change the size of the text, color or source, select the text that wishes to modify with a click of mouse. The selected text will be denoted by four small rectangles.

### **Automatic Labeling**

You also can label views using the Function Automatic of Labeling. The options that define the characteristics of the automatic labeling can be found in the window of dialog which is opened when this option is chosen:

***Field of Labeling:*** Option of the attribute that will be used for the labels.

***Position:*** Election between the use of the *Property of Positioning of Text Labels* of the theme or finding of the best positioning of labels.

***Overlap of Labels:*** Election between allowing the overlap of labels (the overlap of the sameones is emphasized with the green color) or not to allow this situation (using this option, some labels would not be visualized).

***Removal of Duplicates:*** The duplicated labels are prohibited in linear themes - only a label will be visualized for the characteristics of contiguous lines which have fields of values of identical labels.

***Labels of Line:*** Definition of the vertical direction of the text labels for linear characteristics.

***Labels on Scale:*** Labels on scale are based on the View scale.

***Restriction of Labels in the Extension of Views:*** When choosing the option of *Label Only*, only the visible elements in the present View are labeled.

In order to carry out this, activate a theme/ theme of the table of content of View. You will know that this function has been activated when the cursor appears in cross form with the information icon, click

with mouse to select a geo-object. This object will be outlined briefly. You will receive a list of data of attributes associated with this object in a separated window. Other objects will be able to be chosen, and these will be registered along with the corresponding information of attributes.

If several themes are active in a View, the information will be provided for all the active themes (assuming that there are objects in the active themes in the coordinate already selected!)

### **Interactive Spatial Selection**

The selection of tool is used for the interactive spatial selection of geo-objects. Individual geo-objects are selected with a mouse-click.

When you make use of the selection of tools to draw a rectangle, all the objects grouped within the rectangle or are in contact with the limits of the same one will be selected. This selection can be restricted; also can be expanded with a click of mouse while it presses the SHIFT key.

### **Thematic Selection**

The **Administrator of Consultation** is used to select geo-objects based on their values of attributes. Within the consultation administrator, you have access to all the attributes (fields) of the active theme as well as to the values of present attributes. Also it is possible to restrict a selection defined previously.

Two conditions of consultation can be combined using the logic operator OR.

*(The same result can be obtained with one second action of selection, when this one is restricted to a predefined already selected with the first action of selection.)*

### **Graphical Selection**

A combination of drawing tools (line editors and polygons), and the button To select to Characteristics Using Form allows to select to geo - objects him with the criteria search graphical.

The first step to follow in order to make a graphical selection includes the election of a drawing tool of the bar of tools and to draw a graphical object in the View that contains the geo-object of interest. Then, select the button for Selecting Characteristics Using Form to choose all the geo-objects that are in contact with the with the graphical element. As well, this button can expand this selection at the same time using and pressing the SHIFT key.

### **Examples**

*...with polygons:* First, in the View a circle like graphical element is drawn. Then, the graphical

selection is activated.

Like result, all the objects within the activated theme that have contact with in any point with the circle will be selected.

...with arcs: Another possibility is to use the arc like selection criterion. All the objects intercepted by the arcs will be selected.

### **More Properties of Themes**

Additionally, in this section, other properties of themes (which also can be defined using the window of theme properties) will be directed.

### **Scala-Dependent Visualization**

An extensive default, very effective and modifiable for the theme of the View is the definition of the scale of the rank within which a theme can be visualized.

Within the header of the menu of *Theme*, under the option of *Properties* an area of Visualization exists. After selecting this icon, a window of dialogue for the definition of the minimum scale and maximum allowed of the active theme will appear.

### **Suggestions**

- *The visualization of the theme to dependent scale is helpful for working with areas in which the level of detail for geometric data and attributes is variable enough. Then, you can define visualizations so that with a future approach themes with a density of increasing information can be used.*
- *The representation of the scale-dependent also is appropriate for themes of vectors such as forms!*
- *This technique must be always applied if the final result is an interactive presentation in computer instead of a map in paper.*
- *For an inconsutil transition between two themes, it is possible to specify the same value for the minimum scale of the first theme and the maximum scale for the Second theme (previous example 1:5000). When this "jump of scale" is visualized, the theme of smaller scale will be visualized!*

### **Connections/ Links**

Using connections/ links, it is possible to combine with a View, and of a practical way any type of information (photos, texts, videos, sounds, etc.). Therefore, with the links you can create connections

for other views, tables, graphs and layouts within your project, or inclusive for a new one. For example, you could

- Open a photo of a survey site,
- Open a textual description of an area in an atlas,
- Visualize a detailed map of great scale for an area of natural protection,
- Represent a video of an occurrence of certain species,
- Open a View with information very detailed of some state, or
- Open a new project for a geo-object.

When you click on an object with the tool of connection, this one will be activated. This means that either the document or the application that is connected with this object will be opened or initiated.

### ***Construction of a Link***

A new field must be added to the table of attributes of the theme. An entrance in this new field of attribute must be made for the column corresponding to the object with which it will be connected. Usually, this entrance takes the name of the document of ArcView either the routing of a file or script.

The type of wished link and the name of the field in the table of attribute of the theme must be defined in the window of properties of the theme.

### **Securing of Themes**

You can prevent the user from acceding the properties that have been established to a theme/ theme and therefore to protect your specifications of possible alterations. If the user picks in a box of verification of a theme assured or in the option of Properties menu, a box of dialogue soliciting the entrance of the password will appear.

### **Locating Directions**

Locating directions allows to the geo-code of geo-objects using values of fields in the tables of attributes of the objects. With its help, the geo-objects can indeed be geo-referenced fast and effectively. Nevertheless, only the formats of directions of the States are well sustained.

In order to reach this level of abstraction, several data models available for our use exist. They are based on different sets of modeling rules that are used in the development of data bases. The more important data models are:

- the hierarchic data model
- the data model in network
- the relational data model
- the data model of direction of objects

**The relational data model is important for the work with ArcView.**

It must have at least an attribute or a combination of several attributes whose values allow the unequivocal identification of the registry of data. This attribute or these attributes are called **primary keys**.

--Tables are defined so that the same information does not need to be stored in many locations (redundantly).

**Basic Functions of Tables**

Each theme (excepting the sources of image data) has assigned a table (Table of Characteristics of Attributes), to which access in the View de Documento can be had using the icon of Table.

***Tip:** This also is certain here. Only table(s) of attributes of the active themes will open!*

Tables do not have to be opened from the window View; they can also be opened directly from the project window. Also it is possible to generate new tables or to import tables from external data bases in the project window. These imported tables are like separated entrances in the list of tables administered by the project.

Tables of attributes that are created in the table document are kept in the file with format dBase by defect. Additionally, the existing tables in the dBase format or in other formats can be loaded in a project.

**Hidding and Renaming Files**

Also there is a menu of option of Properties for the document of Table. Along with the ability to specify a title (the title by defect for theme is "Attributes of <theme>". Likewise, the name of the creator of the table and commentaries can be introduced. The date of creation of the table is registered automatically by ArcView.

In the inferior part of the window, two options exist in addition to already mentioned ones, which are part of the description of the properties of View of the document, that they are specific of the type of document of Table:

The table fields can be hidden. This is useful to remove fields (like those that contain numbers of identification of objects) that can be irrelevant for the particular task at hand, when there are a great number of fields in the table. In addition, a pseudonym ("alias" name) for each attribute can be assigned. It allows the use of "sensible" descriptors for all the saved characteristics. In order to rename a table field, choose the option *Properties* of the menu Table and enter the new the descriptor in the appropriate field of pseudonym (alias).

### **Creating a New Table**

Select the icon Table of the project window and it clicks in the button of "New". Next, enter the name of the file under which you wish to save the new table; choose the appropriate folder of file from the looked for file.

This process will create a new table in dBase format.

(... which is, obviously, still empty; it does not contain any column (field) or row (registries of data))

*Tip: The tables will be automatically in the "Beginning Edition" Mode ("Start Editing").*

### **Adding Fields to a Table**

The table fields (attributes) can be added to a table choosing the option *Add Field* of the *Edit* menu. The name of the field, the type of field, wide and decimal positions are characteristics that must be defined. Before creating tables and new fields, you must have in which form is going to take the scheme from the data base. That is to say, you need to decide what information is necessary and how it must be modeled using the relational data modeling

*Tip: Once you have created a field, no longer it can consult to find the field definition nor to change those characteristics.*

It is possible to erase fields selecting them first in the table with the mouse, and then choosing the option *Delete Field* in the menu *Edit*.

### **Adding and Editing Registries of Data**

Soon as the fields have been extracted and the structure of data has been defined, the registries of data must be entered in the table. In order to do this, choose the option *Add Record* of the *Edit* menu. A



new empty registry of data will appear. By defect, all the numeric fields will contain initially a value of 0 and all the character fields will contain an empty spacial.

In order to fill an empty field with a value, the icon *Edit* of the bar of tools must be selected. Then the fields of the new registry of data that still remain empty can be filled with values whose form corresponds to the field definition that was specified when this one was created.

The registries of data can be selected using the tool (when the table is in edit mode). This usually is useful when the same value is assigned to several registries

**Tip:** *An existing table must first be converted to the edit mode before being able to make changes in it or before more data are entered to it. In order to do this, select the option Start Editing of the menu Table.*

### **Erasing a Registry of Data**

In order to erase one or several data of registry, first they must be selected with the cursor. (The registry of data selected will be emphasized with the selection of color defined in the window of properties of the project). Choosing next the option *Delete Data Record* from the *Edition* menu, the registries of selected data will be erased.

### **Stopping the Edition and Saving**

After finalizing the edition of a table, when choosing the option *End Editing* the table will be turned to a mode of only reading and will be saved. In order to save the table before finalizing the edition session, choose the *Save* option of the *File*. A backup can be done of the table choosing the option *Save As* of the *File* menu and specifying a new file name.

### **Extended Functions**

#### **Calculation of Values**

Instead of introducing values manually, some values of attributes can be calculated. In order to do this, first you need to do click in the field which the calculated values must be placed. Then select "the calculator" tool of the bar of buttons (like alternative, choose the *Calculate* option of the *Field* menu). This will allow you to determine the calculation. Besides to make simple arithmetical expressions (p.e. conversion of units), also it is possible to establish calculations and more complex transformations. There are operators for types of numbers, links and data that will help you to define those calculations.

**Suggestion:** *The circumference of a polygon, like the length of linear objects, can be*

*calculated with [Form].Longitudinal Return.*

### **Statistical Tables**

ArcView offers two options to calculate statistical tables:

Calculation of a general **statistical report** for an active numerical attribute: if a selected group of registries of data exists, this report will be calculated only for those registries.

Derivation of a **statistical field**: after a table field is activated like "classification of attribute", select the option *Statistics*. A dialogue will appear after you have chosen this option. Its content will be the name of the file that will be generated and the expression of calculation that was used to generate these statistics. The calculation expression is composed by the name of the field and an operator.

*The function will create a new table that contains the statistics wished for each one of the values that are within the sort field already selected for the analysis.*

### **Combination of Tables**

In most of the cases, multiple tables required for any class of geo-object (places of contamination by oil, rise sites) exist, which store different classes of thematic information on geo-objects. Therefore, ArcView 3.a provides capacities to combine tables. One of the most important examples of tables that need to be combined is the fusion of several tables of data of attributes along with geo-objects. This always happens within the table of the theme. Of this same way, any wished information on attributes (that can be originated of external data bases) could be connected with the geo-objects, and then analyzed and evaluated.

ArcView provides two different methods to combine tables: the function of Join, which combines tables, and the function of Link which simply makes that combination.

The tables of functions of ArcView 3.a allow to combine to each other, tables that have the following types of relations:

- 1: 1 relation
- 1: n relation
- n: 1 relation

### **Join of Tables**

In ArcView, the tables can be connected with others either with the primary or secondary keys. A join connects two tables -a source table and a table of objective- by means of a common attribute (well-known like join attribute). This necessarily must not have the same name in the two tables, but it must have the same data type.

The operation of join, that it is possible to be activated from the menu of *Table* or using the icon, adds to the source table from the objective table all the attributes and their values. All the other functions of ArcView can be used in these attributes (classification, thematic representation, etc.). In the objective table, all the registries of data are enumerated, can be connected or not by using the join attribute. Identical attributes still are there but they will not be visible (see Table of Properties). When the operation of join is executed, the objective table must be the active document of ArcView.

#### ***Example:***

Open the tables that you wish to connect (the objective table must be active). Select the attribute of join in the two tables. Execute the join.

The connections that represent a relation 1:1 or n:1 between the objective and source tables can create in ArcView. (Simply, the new information that can be done present one or multiple times will be assigned to each geo-object). When the project of ArcView is saved, all the relations of join will be saved.

**Suggestion:** The connection between tables exists only during the duration of the project of ArcView, the objective tables that have been extended with an operation of join are not physically saved, but they are stored like temporary connections in the file of the project. The operation of join must be executed again with the beginning of each new project!

### **Link**

The tables that you wish to connect on their attributes and that have a relation 1:n to each other, are possible to be combined through an operation of link. In an operation of this nature, in contrast to an operation of join, the attributes of the source table are not added within the objective table, then, a temporary connection is created.

#### ***Example***

Open the tables that you wish to link (the objective table must be active.). Select the connections of attributes in each table. Execute the connection (Example of a relation 1:N). Use the link (Make a selection of the View)

If you select a registry of data in the objective table, the registry of data also connected will be selected in the source table (stood out with another color).

## **Import of Data**

### **Import of external files of data bases**

ArcView can directly read system files of handling of corelative data bases. Like the integration of SQL data bases with ArcView using the ODBC interphase. Also, the tables can be constructed from the ASCII text files. The fields in these tables must be limited using tabulators or commas.

The following data formats are directly supported:

- dBase III and files IV-files (\*.dbf)
- INFO Tables
- Text files with tabulators or fields comma delimited (\*.txt)

### **Use of other data bases with ODBC**

Tables of other data bases (for example, information of servers such as Oracle, Ingres, Informix, Microsoft Access, Microsoft Excel, Netware SQL, and SQLBase) can be included in ArcView using the SQL connection. This connection is established via ODBC (Open Connectivity Database).

The constructed consultations using SQL "Structured Query Language" are stored like temporary tables in ArcView. In the practical part, this means that only ODBC connectivity is saved and the information remains in the external data base.

### **Creation of New Shape-Files**

Two methods exist that can be used to create special information in ArcView. One method involves the creation of a new theme and the edition of the geometric and thematic information within that same theme. Another method is the conversion of one or more geo-objects of another theme in shape files of ArcView.

The shape files of ArcView consist of simple non topologic data that keeps the geometric position and the information from attributes of the geo-objects of a theme.

### **Conversion in Shape Files**

A simple manner to generate vectors of editable themes is by means of the conversion of the ARC/ INFO covers in shape files.

When choosing the function *Convert toShapefile* from the menu of Theme, any vector of active theme within the present View can be exported as a shape file with the corresponding geometric type. If certain objects are selected, only these will be converted.

After the definition of the name (\*.shp) and the location in where the file will be saved, the theme also can be unloaded in any View and therefore, it would be available for a future process. The data of attributes that belong to a cover are retained and located within the present View that belongs to the shape file. This allows a process and a delayed edition of the attributes of a theme.

*Suggestion:*

*If a selection is activate in a vector of a theme, which will be converted, only the selected objects will be within the conversion process. When doing use of this option, several spacial selections and operations of analysis could be simplified in great amount!*

### **Creation of New Shape Files**

If you wish to create geometric and thematic information within ArcView, a shape theme can be added to a View using the function *New Theme* of the menu of View. After specifying the type of geometry (point, line or polygon) and defining the name and the directory of location in where the shape file must be saved, the new theme will be added at the present view.

In contrast to the shape files created by means of the method of Conversion to Shape File, the new shape files are already in the edit mode when they are added to a View.

A pointed line that groups the check-box of the theme, it indicates that the theme is under edition.

*Suggestion:*

*The rank of coordinates of the new theme is determined by the already existing ones in other themes. If themes have not been loaded, these configurations can be defined in the dialogue of Properties of View.*

### **Digitalization of Geo-Objects**

In order to create geo-objects in shape files, the theme must be located in the edit mode (if the theme already exists), or a new theme must be generated.

The geometries of a geo-object can be created using tools to work with primitive graphs, known like graphical editors. These tools can be found clicking in the icon located to the right of the bar of tools. Aside from the six tools to create primitive graphs that also can be used like drawing instruments, three additional tools exist to make more complex works during the digitalization of objects shape.

The tools that are available for the digitalization of geo-objects depend on the type of geometry of the present objects within the theme.

Tools of Drawing and Digitalization

Tool	Function
<b>Points</b>	Creates Points (type of point geometry)
<b>Lines</b>	Creates only simple lines (only to edit graphs)
<b>Poli-lines</b>	Creates lines (type of line geometry)
<b>Rectangles</b>	Creates rectangles (type of geometry of polygons)
<b>Circles</b>	Creates circles (type of geometry of polygons)
<b>Polygons</b>	Creates polygons freely definible (type of geometry of polygons)

Advance Tools for Digitalization

Tool	Function
<b>Line Split</b>	This function creates a line that is divided when it intercepts an existing line; this second one also is divided when a new line crosses it (type of line geometry).
<b>Polygon Split</b>	This function divides polygons when a new and digitized line intercepts one or more polygons. ArcView divides the polygons throughout the line and at the same time it eliminates the leftover of the line (type of geometry of polygons).
<b>AutoComplete</b>	This function must be used to create polygons that share limits. Making use of this function non wished spacial between polygons are prevented. An open line segment is digitized at the beginning of a point in the limit of an existing polygon and at the end of another one. The polygon will be closed automatically and as well as in the function of <i>division of polygons</i> , any leftover will be eliminated (type of geometry of polygons).

**Snapping**

In order to facilitate the work of edition and writing of geometries of objects, the function of *snapping* is including in ArcView. When using the tolerance of snapping when objects adjacent to others are constructed, the points and the lines can be aligned perfectly to each other. The dialogue that allows

the definition of this function can be found in the dialogue of *Properties of Theme* including in the *Edition* option.

ArcView supports two different surroundings of snapping:

### **General Surroundings of Snapping**

### **Interactive Surroundings of Snapping**

- In the *general surroundings of snapping*, all the vertices or limits of polygons that enter a defined radius search will be aligned to each other.
- During the process of creation of data using the *interactive surroundings of snapping*, when making a click with the right button of the mouse, a menu activates that allows that the criteria of snapping are defined for the following vertex (!). The following options are available:
  - closest vertex
  - closest limit
  - full stop closest of a line (available only para lines)
  - nearer intersection

*Suggestion:*

*The size of the tolerance of snapping also can be defined directly in the View: After activating the interactive surroundings of snapping, the tolerance can be defined when selecting the appropriate symbols of the bar of tools and drawing a circle to represent in the View the wished tolerance. The radius of the circle will be visualized in the state bar.*

### ***Edition of the Geometry of Objects***

When a file "shape" is in edit mode, one or more objects can be selected with the selection tool, and then to erase them, to move them, to copy them and to paste them, etc. (Edition of Objects). The selected objects can be identified by the presence of solid black squares that surround the objects. These objects can be eliminated completely, scaled or moved.

If it is desired to modify the geometry of an object (Edition of geometry), the vertex of the edition tool must be chosen. This allows to edit the intermediate points that define the lines. Each vertex is identified by an empty box instead of a complete box.

Only one of two geometries of polygons must be edited. After selecting the polygon to be edited by pressing the button of the mouse in its interior, a vertex can be selected directly or be inserted. The geometry of an individual object within a "mosaic of polygon" can be changed in this manner.

In order to edit a limit shared between two polygons:

Pressing the mouse directly on the limit that is desired to edit, all the vertices will be shown there. The first and last vertex of common geometry will be shown like circles; the vertices among them will be shown with black rectangles. Now, the intermediate rectangles can be edited as it were described previously, and any change will affect both polygons.

In order to edit a common node to several polygons. Pressing the mouse on this node will cause that a box of handling appears; the adjacent vertices to this node will be identified with circular handles. Now, the node can be moved or be erased.

### **Geometry of Superposed Objects**

Altogether with the options described previously for the work with shape objects, four additional functions exist that can be found in the *Edit* menu. The existing shape objects can be held between them, in a variety of forms with these functions. This allows the creation of the new geometries with base in the existing ones.

Before executing these individual functions, it is necessary to select the objects to modify.

### **Join of Shape objects**

The selected objects are grouped and united to create an object. The common limits between polygons or identical line segments are erased.

### ***Combination of Shape Objects***

Like in the *Join Features*, two objects also can be combined to create one. However, the areas of superposed polygons are removed with this option. This option can be used to create a hole or an island.

### ***Subtraction of Shape Objects***

The option of *Subtract Features* can be used to create united polygons transparently. Of the superposed polygons the area of the base polygon is eliminated, leaving the one of the superior part without any change. The subtraction action can be done in opposite form by maintaining pressed the SHIFT key, leaving therefore the polygon of base without changes.

### ***Compilation of Shape Objects***

Using the function *Summarize* that was introduced in the chapter of the document table, also spacial compilations can be carried out on the geometric data of the objects. This can take control of all the geometric information.



After the field on which the spacial compilation will be carried out (of the table of attributes), the dialog window of of the summary table can be used to add the information. Selecting the Shape field, the *Merge* option will be selected automatically in *Summarize*. Before the operation is executed, a name to the file and an access route must be assigned to.

- Choose the theme of the window of the table of content.
- Choose attribute field upon which the compilation is to be based.
- Execute the summarize function using the SHAPE field.
- The results can be observed in the View and the table.

### **Updating the Table of Attributes**

When the objects are separated or fused, not only geometries of the objects but also their attributes are updated. The type of update that will be carried out can be user defined in the dialog box of *Theme Properties* within the *Edit* option.

A rule can be selected for each field of attribute in connected objects created from one join, as well as for the new resulting objects of a separation (split action).

The following options are available:

<b>Blank</b>	No value is assigned.
<b>Copy</b>	The value is copied; in superpositions, the value of the object that is in the superior part is assigned.
<b>Proportion</b>	The value is proportional to the area of the polygon or the line lenght.
<b>Add</b>	The values are added (only to cover).
<b>Average</b>	The value average is assigned to.
<b>Shape-Area</b>	The area of the polygon is assigned to.
<b>Shape-Perimeter/Length</b>	The length of the perimeter of the polygon is assigned to.

### **Suggestion:**

*To the defined fields of attribute as type = character only the options Blank or Copy can be assigned to them.*

### *Selection of Spatial Reference*

The objective of the selection of spatial reference is to emphasize the spatial relations that exist between the elements of one or more themes. The result of such analyses can contribute to answer concrete questions as part of the process of decision making.

ArcView 3.2a provides two functions that can be used to complete the following tasks:

- Selection by theme
- Spatial join of tables

After successfully executing a defined spatial selection, the selected objects can be saved in their own *Theme* using the menu option *Convert to Shapefile*. These shapefiles can be edited and are available to be used like a new theme.

#### Selection by Theme

This function of ArcView uses a theme to select certain objects from another theme. The objects used to select other objects from a second theme are defined in the selection of themes. Also a pre-selection in theme selection can be carried out. The theme from where the objects are selected is called *target theme*. This theme must be active in the index of themes and is to write down that several themes can be active at the same time. If several themes are active, separated analyses are carried out, and the selections are done in each active theme. The different ways in that the spatial selection can be done, they can be found in the option of *Selection by Theme* in the menu of themes:

completely **contained** within the selection

...completely **contained** in the selection

...whose **central point** is within the selection

...it contains the **central point** of the selected object(s)

... it **intercepts** the selection

...they are within a **specific distance** of the selection

#### *Selection of Objects from the Interior of other Objects*

This function of analysis allows the selection of objects that fall completely within the theme of the selected polygon. For example, lines that intersect the objects of the polygon will be selected.

Selection of a target theme. Introduction of the selection parameters. Results of the distance-

dependent selection.

The selection can be based on a point, line or themes of polygon

***Suggestion:** Also it is possible to select objects that are contained completely in the selection.*

### ***Selection of Objects that Contain other Objects Completely***

All the polygons that completely contain one second selection of objects of themes will be selected:

- Definition of the selected theme.
- Selection of the target theme.
- Introduction of the selection parameters. Result of the selection of distance dependency.

### ***Selection of Objects of Polygon based on if They Contain the Central Point of Another Selected Object***

This type of spacial analysis exactly selects those polygons that contain the central point of a second theme of polygon.

- Selection of the target theme.
- Definition of the selection parameters.
- Results of the selection.

### ***Selection of Objects that Intersectan other Objects***

Objects that intersectan objects of another theme of line or polygon can be selected easily in the manner that is shown next.

In this example, some objects of the selection theme have been preselected.

Definition of the theme of selection by means of the thematic selection (preselection mentioned previously).

- Selection of the target theme.
- Definition of the selection of parameters.
- Results of the selection.

### **Selecting Objects that are Inside a Specific Distance**

*This function allows the selection of objects from a theme that is within a specific distance from a point of a second theme, line or objects of polygon.*

- Selection of an target theme.

- Definition of the selection parameters.
- Results of the selection of distance dependency.

*Suggestion:*

*If the same theme of polygon is identified like theme of selection and target theme, and a distance search of 0 is introduced, all the objects of polygon that border the selected polygon as well will be selected ("neighborhood selection").*

### Spacial Join of Tables

Using the fields "shape" like join attributes, and the command of the Join Tables that was described in the chapter of *Document of Table*, it is possible to select presentations based on spacial relations with other objects.

The type of spacial join is determined by the type of form "shape" of both themes:

With	Point	Line	Polygon
Point	Closest	Closest	Inside
Line	Closest	Inside	Inside
Polygon	-	-	Inside

The following scenarios show two examples of spacial joins.

#### Point - Line

For each theme, to determine the name of the closest river:

- Open the two tables of attributes.
- Select to the attribute "shape".
- Results of the join.

#### Line - Polygon

Report to the government in which district the streets are located:

- Open the two tables of attributes.
- Select to the form attribute "shape".
- Results of the join.

*Suggestion:*

*Information of the line segments that are located in more of a district will not be recovered.*

The maps or graphics of ArcView are dynamic presentations of information, and they are generated using the contained information in tables. The relations of thematic spatial references (attributes) can be analyzed in a faster form with the help of these maps.

ArcView supports or handles different types from maps or graphs (for example, bars or type cake graphs). The user can specify the type of presentation as the size of the figure, the position and size of the legend, the title of the graph, as well as the labels that describe the axes of the figure.

#### *Creating Charts/ Graphs*

The first step in the creation of graphs is to open and to activate a table of the document of tables. The button, located in the bar of buttons, can be used to open a window of dialog in which the properties of the chart/ graph can be defined.

In the window of properties of the chart, the attributes of the table can be defined to be shown graphically and which attributes will be shown as labels.

If one already is in a graph document and wants to modify the properties of the existing graph, choose this one from the project window and press click in the button of Chart Properties, or it selects the appropriate menu of the Chart menu.

#### *Elements of Charts/ Graphs*

The elements of a chart can be shown in different forms. First, click on Chart Element Properties and then in the property that you want to change.

#### **Title of Table:**

Properties that can be changed and be defined:

- Title of text
- Position of the title

#### **Legend of Charts/ Graphs:**

Properties that can be changed and be defined:

- Legend Labels
- Legend Position

#### **Access to Charts/ Graphs:**

Properties that can be changed and be defined:

- Visualization/ hiding axes
  - Changing labels of axes, visualization/ hiding labels of axes
  - Changing groups of labels, visualization/ hiding group of labels
  - Visualization/ hiding lines of grid
  - Position of axes
- and for numerical values:
- Minimum/ maximum values of axes

### **Colors of Columns, Lines and Sectors of Pie:**

In order to specify or to change the color of a column, line or a pie sector, click on the tool of *Chart Color*. Then, use the window of Menu to call the trowel of colors. Select a color of the trowel of colors available. Now it is possible to choose a column, line, or sector of pie with a click of mouse. The selected elements acquire therefore the chosen color of the trowel of colors.

### **Eliminating Data Markers**

The erasure button allows eliminating individual columns, pie sectors, etc. of a graph. The registries of information associated with the eliminated elements will be cancelled of the selection in the table.

#### *Types of Charts/ Graphs*

ArcView allows creating different types from graphs in order to present/ display the information saved in the tables:

- Areas
- Bars
- Columns
- Lines
- Cake
- Dispersed

### **Layouts**

The documents of Design (Layout) allow creating maps of high quality. In order to create these maps, the graphical position of the elements needed for each map is due to design as it is shown in the screen of the computer. The exit file can be sent to printers or plotters like printing files.

The Layouts can be defined as dynamic, because these are connected to the information on which they are based. This means that any change that is made in the documents used as base information of the Layout will be reflected in this. This provides a source of update of maps that is used to represent these changes or updates visually. In the same way, the changes in the information are reflected in the View, and any change in the View is incorporated automatically in the layout.

**Edition functions of the Layout:**

- Configuration of the layout page
- Definition, positioning and edition of the frame and all the types of document.
- Use and edition of the bars of scale and the Wind Rose (Direction)
- Insertion of simple graphical elements and texts
- Import of other graphical components
- Print
- Export to other formats and programs

**Print and Export**

Print functions of the document of Layout allow the handling of the controllers of printing for a variety of printers and plotters. Layout that is wanted to print also can be written in a file. Printing in ArcView generally follows the WYSIWYG (What-You-See-Is-What-You-Get or "What sees is what obtains") principle, which means that what prints in a plotter or a printer is what is in the screen of the computer. Layout also can be exported to an output format. ArcView 3.2a supports or is compatible with the following formats:

- Encapsulated PostScript (EPS)
- Illustrator Marinates
- CGM Binary
- CGM Character
- CGM Clear Text
- Metafile Windows
- Bitmap Windows

**Table S20.1.1.1 Extent Based on Political Boundaries**

Extent Code	Geographical Extent
DMC	Caracas Metropolitan District Area
LIB	Municipality Libertador
CHA	Municipality Chacao
SUC	Municipality Sucre
BAR	Municipality Baruta
HAT	Municipality El Hatillo
VEN	Venezuela
MIR	Miranda
VAR	Vargas
Extent Based on Study Area	
SED	Study Area for Sediment Disaster
EAR	Study Area for Earthquake Disaster

Extent Based on Catchments

QCA	Subcatchment Caurimare Stream
QTO	Subcatchment Tocome Stream
QSE	Subcatchment Sebulan Stream
QAG	Subcatchment Agua de Maiz Stream
QSE	Subcatchment Seca Stream
QCH	Subcatchment Chacaito Stream
QMA	Subcatchment Mariperez Stream
QAN	Subcatchment Anauco Stream
QCA	Subcatchment Catuche Stream
QCA	Subcatchment Caroata Stream

Projection Code

Coordinate System	Code
Loma Quintana	1
La Canoa	2
REGVEN	3
LatLon	4

Accuracy Code

Accuracy	Code
Low	L
Medium	M
Precise	P

Scale Code

Scala	Code
1:1 000	01
1:2 500	02
1:5 000	03
1:10 000	04
1:25 000	05



**Table S20.1.1.2 Names of the Directory and Files Used.**

Directory Name	File Type	Description
Caracas/GIS/01_GENERAL_CONDITIONS/ 01_Study_Area	01_GENERAL_CONDITIONS	
	aed2p03mun5ol.htm	External Municipality Boundary (5 Municipalities) -Metadata in HTML Format
	aed2p03mun5ol.met	External Municipality Boundary (5 Municipalities) - Metadata in ASCII Format
	aed2p03mun5ol.shp	External Municipality Boundary (5 Municipalities)
	aed2p03munic3.htm	Municipality Boundary (3 Municipalities) - Metadata in HTML Format
	aed2p03munic3.met	Municipality Boundary (3 Municipalities) - Metadata in ASCII Format
	Aed2P03Munic3.shp	Municipality Boundary (3 Municipalities)
	aed2p03munic5.htm	Municipality Boundary (5 Municipalities) - Metadata in HTML Format
	aed2p03munic5.met	Municipality Boundary (5 Municipalities) - Metadata in ASCII Format
	Aed2P03Munic5.shp	Municipality Boundary (5 Municipalities)
	dmc2p03locnam.htm	Local Names (Point map) - Metadata in HTML Format
	dmc2p03locnam.met	Local Names (Point map) - Metadata in ASCII Format
	Dmc2P03Locnam.shp	Local Names (Point map)
	dmc2p03mainn3.htm	Municipality Names (3 Municipalities) - Metadata in HTML Format
	dmc2p03mainn3.met	Municipality Names (3 Municipalities) - Metadata in ASCII Format
	dmc2p03mainn3.shp	Municipality Names (3 Municipalities)
	dmc2p03mainna.htm	Municipality Names (5 Municipalities) - Metadata in HTML Format
	dmc2p03mainna.met	Municipality Names (5 Municipalities) - Metadata in ASCII Format
	dmc2p03mainna.shp	Municipality Names (5 Municipalities)
	dmc2p05mceplip.shp	Municipality Boundary (5 Municipalities)
	dmc2p05parrop.shp	Parroquia Boundary
Caracas/GIS/01_GENERAL_CONDITIONS/ 02_Working_Map_5000		
	dmc2p03allayr.htm	All Layers - Metadata in HTML Format
	dmc2p03allayr.met	All Layers - Metadata in ASCII Format
	Dmc2P03Allayr.shp	All Layers

dmc2p03hydro1.htm Secondary River - Metadata in HTML Format  
dmc2p03hydro1.met Secondary River - Metadata in ASCII Format  
Dmc2P03Hydro1.shp Secondary River  
dmc2p03mailhyd.htm Main River - Metadata in HTML Format  
dmc2p03mailhyd.met Main River - Metadata in ASCII Format  
dmc2p03mailhyd.shp Main River  
dmc2p03mainro.htm Main Road - Metadata in HTML Format  
dmc2p03mainro.met Main Road - Metadata in ASCII Format  
Dmc2P03Mainro.shp Main Road  
Dmc2P03Textal.dgn General Annotation Layer  
dmc2p03textal.htm General Annotation Layer - Metadata in HTML Format  
dmc2p03textal.met General Annotation Layer - Metadata in ASCII Format  
dmc2p03txmnh.dxf Annotation for Main Stream  
dmc2p03txmnh.htm Annotation for Main Stream - Metadata in HTML Format  
dmc2p03txmnh.met Annotation for Main Stream - Metadata in ASCII Format

Dmc2P03Top23a.dwg Topographic Map # 23a  
Dmc2P03Topo01.dwg Topographic Map # 01  
Dmc2P03Topo02.dwg Topographic Map # 02  
Dmc2P03Topo03.dwg Topographic Map # 03  
Dmc2P03Topo04.dwg Topographic Map# 04  
Dmc2P03Topo05.dwg Topographic Map # 05  
Dmc2P03Topo06.dwg Topographic Map # 06  
Dmc2P03Topo07.dwg Topographic Map # 07  
Dmc2P03Topo08.dwg Topographic Map # 08  
Dmc2P03Topo09.dwg Topographic Map # 09  
Dmc2P03Topo10.dwg Topographic Map # 10  
Dmc2P03Topo11.dwg Topographic Map # 11  
Dmc2P03Topo12.dwg Topographic Map # 12  
Dmc2P03Topo13.dwg Topographic Map # 13

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
03\_Working\_Map\_All\_Layers\_5000(DWG)/La  
Canoa

Dmc2P03Topo14.dwg	Topographic Map # 14
Dmc2P03Topo15.dwg	Topographic Map # 15
Dmc2P03Topo16.dwg	Topographic Map # 16
Dmc2P03Topo17.dwg	Topographic Map # 17
Dmc2P03Topo18.dwg	Topographic Map # 18
Dmc2P03Topo19.dwg	Topographic Map # 19
Dmc2P03Topo20.dwg	Topographic Map # 20
Dmc2P03Topo21.dwg	Topographic Map # 21
Dmc2P03Topo22.dwg	Topographic Map # 22
Dmc2P03Topo23.dwg	Topographic Map # 23
Dmc2P03Topo24.dwg	Topographic Map # 24
Dmc2P03Topo25.dwg	Topographic Map # 25
Dmc2P03Topo26.dwg	Topographic Map # 26
Dmc2P03Topo27.dwg	Topographic Map # 27
Dmc2P03Topo28.dwg	Topographic Map # 28
Dmc2P03Topo29.dwg	Topographic Map # 29
Dmc2P03Topo30.dwg	Topographic Map # 30
Dmc2P03Topo31.dwg	Topographic Map # 31
Dmc2P03Topo34.dwg	Topographic Map # 34
Dmc2P03Topo35.dwg	Topographic Map # 35
Dmc2P03Topo36.dwg	Topographic Map # 36
Dmc2P03Topo37.dwg	Topographic Map # 37
Dmc2P03Topo38.dwg	Topographic Map # 38
Dmc2P03Topo39.dwg	Topographic Map # 39
INDICE_HOJAS.xls	Topographic Map Index

Dmc1P03Top23a.dwg	Topographic Map # 23a
Dmc1P03Topo01.dwg	Topographic Map # 01
Dmc1P03Topo02.dwg	Topographic Map # 02

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
03\_Working\_Map\_All\_Layers\_5000(DWG)/Lom  
a  
Quintana

Dmc1P03Topo03.dwg	Topographic Map # 03
Dmc1P03Topo04.dwg	Topographic Map# 04
Dmc1P03Topo05.dwg	Topographic Map # 05
Dmc1P03Topo06.dwg	Topographic Map # 06
Dmc1P03Topo07.dwg	Topographic Map # 07
Dmc1P03Topo08.dwg	Topographic Map # 08
Dmc1P03Topo09.dwg	Topographic Map # 09
Dmc1P03Topo10.dwg	Topographic Map # 10
Dmc1P03Topo11.dwg	Topographic Map # 11
Dmc1P03Topo12.dwg	Topographic Map # 12
Dmc1P03Topo13.dwg	Topographic Map # 13
Dmc1P03Topo14.dwg	Topographic Map # 14
Dmc1P03Topo15.dwg	Topographic Map # 15
Dmc1P03Topo16.dwg	Topographic Map # 16
Dmc1P03Topo17.dwg	Topographic Map # 17
Dmc1P03Topo18.dwg	Topographic Map # 18
Dmc1P03Topo19.dwg	Topographic Map # 19
Dmc1P03Topo20.dwg	Topographic Map # 20
Dmc1P03Topo21.dwg	Topographic Map # 21
Dmc1P03Topo22.dwg	Topographic Map # 22
Dmc1P03Topo23.dwg	Topographic Map # 23
Dmc1P03Topo24.dwg	Topographic Map # 24
Dmc1P03Topo25.dwg	Topographic Map # 25
Dmc1P03Topo26.dwg	Topographic Map # 26
Dmc1P03Topo27.dwg	Topographic Map # 27
Dmc1P03Topo28.dwg	Topographic Map # 28
Dmc1P03Topo29.dwg	Topographic Map # 29
Dmc1P03Topo30.dwg	Topographic Map # 30
Dmc1P03Topo31.dwg	Topographic Map # 31
Dmc1P03Topo34.dwg	Topographic Map # 34
Dmc1P03Topo35.dwg	Topographic Map # 35

Dmc1P03Topo36.dwg	Topographic Map # 36
Dmc1P03Topo37.dwg	Topographic Map # 37
Dmc1P03Topo38.dwg	Topographic Map # 38
Dmc1P03Topo39.dwg	Topographic Map # 39
INDICE_HOJAS.xls	Topographic Map Index
Caracas/GIS/01_GENERAL_CONDITIONS/04_Base_Map_25000	All Layer - Legend File
Dmc2P05Allayr.avl	All Layer - Metadata in HTML Format
dmc2p05allayr.htm	All Layer - Metadata in ASCII Format
dmc2p05allayr.met	All Layer
Dmc2P05Allayr.shp	Secondary River - Metadata in HTML Format
dmc2p05hydrol.htm	Secondary River - Metadata in ASCII Format
dmc2p05hydrol.met	Secondary River
Dmc2P05Hydrol.shp	Main Road - Metadata in HTML Format
dmc2p05mainro.htm	Main Road - Metadata in ASCII Format
dmc2p05mainro.met	Main Road
Dmc2P05Mainro.shp	General Annotation Layer
Dmc2P05Textal.dwg	General Annotation Layer - Metadata in HTML Format
dmc2p05textal.htm	General Annotation Layer - Metadata in ASCII Format
dmc2p05textal.met	
Caracas/GIS/01_GENERAL_CONDITIONS/05_Georeferenced_1954_Base_Maps	Georeferenced Map IV-07a
Asd2P03Giv07a.tif	Georeferenced Map IV-08a
Asd2P03Giv08a.tif	Georeferenced Map IV-09a
Asd2P03Giv09a.tif	Georeferenced Map IV-10a
Asd2P03Giv10a.tif	Georeferenced Map IV-11a
Asd2P03Giv11a.tif	Georeferenced Map VI-09a
Asd2P03Gvi09a.tif	Georeferenced Map VI-10a
Asd2P03Gvi10a.tif	Georeferenced Map VI-11a
Asd2P03Gvi11a.tif	Georeferenced Map V-07a
Asd2P03G_v07a.tif	Georeferenced Map V-08a
Asd2P03G_v08a.tif	

Asd2P03G\_v09a.tif  
Asd2P03G\_v10a.tif  
Asd2P03G\_v11a.tif

Georeferenced Map V-09a  
Georeferenced Map V-10a  
Georeferenced Map V-11a

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
06\_Georeferenced\_1984\_Base\_Maps

Dmc2P03G\_e42.tif  
Dmc2P03G\_e43.tif  
Dmc2P03G\_e44.tif  
Dmc2P03G\_f41.tif  
Dmc2P03G\_f42.tif  
Dmc2P03G\_f43.tif  
Dmc2P03G\_f44.tif  
Dmc2P03G\_f45.tif  
Dmc2P03G\_f46.tif  
Dmc2P03G\_f47.tif  
Dmc2P03G\_f48.tif  
Dmc2P03G\_g40.tif  
Dmc2P03G\_g41.tif  
Dmc2P03G\_g42.tif  
Dmc2P03G\_g43.tif  
Dmc2P03G\_g44.tif  
Dmc2P03G\_g45.tif  
Dmc2P03G\_g46.tif  
Dmc2P03G\_g47.tif  
Dmc2P03G\_g48.tif  
Dmc2P03G\_g49.tif  
Dmc2P03G\_h39.tif  
Dmc2P03G\_h40.tif  
Dmc2P03G\_h41.tif  
Dmc2P03G\_h42.tif  
Dmc2P03G\_h43.tif

Georeferenced Map E-42  
Georeferenced Map E-43  
Georeferenced Map E-44  
Georeferenced Map F-41  
Georeferenced Map F-42  
Georeferenced Map F-43  
Georeferenced Map F-44  
Georeferenced Map F-45  
Georeferenced Map F-46  
Georeferenced Map F-47  
Georeferenced Map F-48  
Georeferenced Map G-40  
Georeferenced Map G-41  
Georeferenced Map G-42  
Georeferenced Map G-43  
Georeferenced Map G-44  
Georeferenced Map G-45  
Georeferenced Map G-46  
Georeferenced Map G-47  
Georeferenced Map G-48  
Georeferenced Map G-49  
Georeferenced Map H-39  
Georeferenced Map H-40  
Georeferenced Map H-41  
Georeferenced Map H-42  
Georeferenced Map H-43

Dmc2P03G\_h44.tif  
Dmc2P03G\_h46.tif  
Dmc2P03G\_h47.tif  
Dmc2P03G\_h48.tif  
Dmc2P03G\_h49.tif  
Dmc2P03G\_i40.tif  
Dmc2P03G\_i41.tif  
Dmc2P03G\_i42.tif  
Dmc2P03G\_i43.tif  
Dmc2P03G\_i44.tif  
Dmc2P03G\_i48.tif  
Dmc2P03G\_i49.tif  
Dmc2P03G\_j41.tif  
Dmc2P03G\_j42.tif  
Dmc2P03G\_j43.tif  
Dmc2P03G\_j49.tif

Georeferenced Map H-44  
Georeferenced Map H-46  
Georeferenced Map H-47  
Georeferenced Map H-48  
Georeferenced Map H-49  
Georeferenced Map I-40  
Georeferenced Map I-41  
Georeferenced Map I-42  
Georeferenced Map I-43  
Georeferenced Map I-44  
Georeferenced Map I-48  
Georeferenced Map I-49  
Georeferenced Map J-41  
Georeferenced Map J-42  
Georeferenced Map J-43  
Georeferenced Map J-49

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
07\_Contour\_Lines

Dmc2M05Contwg.htm  
Dmc2M05Contwg.met  
Dmc2M05Contwg.shp  
dmc2p03cntlav.htm  
dmc2p03cntlav.met  
Dmc2P03Cntlav.shp  
dmc2p03majcnt.htm  
dmc2p03majcnt.met  
Dmc2P03Majcnt.shp  
dmc2p03mincnt.htm  
dmc2p03mincnt.met  
Dmc2P03Mincnt.shp  
Dmc2P03Texcnt.dgn  
dmc2p03texcnt.htm

Contour line – Metadata in HTML format  
Contour line – Metadata in ASCII format  
Ground Water Contour Line  
Avila Contour Line - Metadata in HTML Format  
Avila Contour Line - Metadata in ASCII Format  
Avila Contour Line  
Major Contour Line - Metadata in HTML Format  
Major Contour Line - Metadata in ASCII Format  
Major Contour Line  
Minor Contour Line - Metadata in HTML Format  
Minor Contour Line - Metadata in ASCII Format  
Minor Contour Line  
Contour Line Value  
Contour Line Value - Metadata in HTML Format

dmc2p03texcnt.met	Contour Line Value - Metadata in ASCII Format
dmc2p05cntlin.avl	Contour Line Map - Legend File
dmc2p05cntlin.htm	Contour Line Map - Metadata in HTML Format
dmc2p05cntlin.met	Contour Line Map - Metadata in ASCII Format
Dmc2P05Cntlin.shp	Contour Line Map
Dtm_2m.mpr	Digital Elevation Model (Pixel=2 mt)
Dtm_2m_resam15.mpr	Digital Elevation Model (Pixel=2 mt) with Resample 15 mt
Dtm_5m.mpr	Digital Elevation Model (Pixel=5 mt)
Dtm_5m_resam15m.mpr	Digital Elevation Model (Pixel=5 mt) with Resample 15 mt
Sed_dtm.mpr	Digital Elevation Model for Sediment Studies
Sed_dtm1.mpr	Digital Elevation Model for Sediment Studies Area
Shd5m.mpr	Shadow Map (Pixel=5 mt)
Shd_2m.mpr	Shadow Map (Pixel=2 mt)
DEM.mpr	Digital Elevation Model (Pixel = 15 mt)
Dem_25.mpr	Digital Elevation Model (Pixel = 25 mt)
Dem_30m.mpr	Digital Elevation Model (Pixel = 30 mt)
Dem_dx.mpr	Digital Elevation Model (Pixel = 15 mt) applied Filter X direction
Dem_dy.mpr	Digital Elevation Model (Pixel = 15 mt) applied Filter Y direction
Shdb.mpr	Shadow Map (Pixel=15 mt)
dmc2p03bridge.htm	Bridge (5000) - Metadata in HTML Format
dmc2p03bridge.met	Bridge (5000) - Metadata in ASCII Format
Dmc2P03Bridge.shp	Bridge (5000)
dmc2p03cenisl.htm	Central aisle (5000) - Metadata in HTML Format
dmc2p03cenisl.met	Central aisle (5000) - Metadata in ASCII Format
Dmc2P03Cenisl.shp	Central aisle (5000)
dmc2p03mainrd.htm	Main Road (5000) - Metadata in HTML Format
dmc2p03mainrd.met	Main Road (5000) - Metadata in ASCII Format
Caracas/GIS/01_GENERAL_CONDITIONS/08_DTM_5000	
Caracas/GIS/01_GENERAL_CONDITIONS/09_DTM_25000	
Caracas/GIS/01_GENERAL_CONDITIONS/10_Road_Network	



Dmc2P03Mainrd.shp	Main Road (5000)
dmc2p03pavrod.htm	Paved Road (5000) - Metadata in HTML Format
dmc2p03pavrod.met	Paved Road (5000) - Metadata in ASCII Format
Dmc2P03Pavrod.shp	Paved Road (5000)
dmc2p03secrod.htm	Secondary Road (5000) - Metadata in HTML Format
dmc2p03secrod.met	Secondary Road (5000) - Metadata in ASCII Format
Dmc2P03Secrod.shp	Secondary Road (5000)
dmc2p05mainrp.htm	Main Road (25000) - Metadata in HTML Format
dmc2p05mainrp.met	Main Road (25000) - Metadata in ASCII Format
Dmc2P05Mainrp.shp	Main Road (25000)
dmc2p05patrod.htm	Path Road (25000) - Metadata in HTML Format
dmc2p05patrod.met	Path Road (25000) - Metadata in ASCII Format
Dmc2P05Patrod.shp	Path Road (2500)
dmc2p05pavrod.htm	Paved Road (25000) - Metadata in HTML Format
dmc2p05pavrod.met	Paved Road (25000) - Metadata in ASCII Format
Dmc2P05Pavrod.shp	Paved Road (25000)
dmc2p05secrod.htm	Secondary Road (25000) - Metadata in HTML Format
dmc2p05secrod.met	Secondary Road (25000) - Metadata in ASCII Format
Dmc2P05Secrod.shp	Secondary Road (25000)
dmc2p05tunnel.htm	Tunnel (25000) - Metadata in HTML Format
dmc2p05tunnel.met	Tunnel (25000) - Metadata in ASCII Format
Dmc2P05Tunnel.shp	Tunnel (25000)
DmcP03Mainrd.avl	Main Road (5000) – Legend File
asd2p05hidrol.htm	Main Streams (25000) - Metadata in HTML Format
asd2p05hidrol.met	Main Streams (25000) - Metadata in ASCII Format
Asd2P05Hidrol.shp	Main Streams (25000)
asd2p05qdasim.htm	Important Streams (25000) - Metadata in HTML Format
asd2p05qdasim.met	Important Streams (25000) - Metadata in ASCII Format
Asd2P05Qdasim.shp	Important Streams (25000)
asd2p05rivers.shp	Rivers (25000)

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
11\_Hydrologic\_Network

dmc2p03chanel.htm	Channel (5000) - Metadata in HTML Format
dmc2p03chanel.met	Channel (5000) - Metadata in ASCII Format
Dmc2P03Chanel.shp	Channel (5000)
dmc2p03guaire.htm	Guaire River (5000) - Metadata in HTML Format
dmc2p03guaire.met	Guaire River (5000) - Metadata in ASCII Format
Dmc2P03Guaire.shp	Guaire River (5000)
dmc2p03lagoon.htm	Lagoon (5000) - Metadata in HTML Format
dmc2p03lagoon.met	Lagoon (5000) - Metadata in ASCII Format
Dmc2P03Lagoon.shp	Lagoon (5000)
dmc2p03secriv.htm	Secondary River (5000) - Metadata in HTML Format
dmc2p03secriv.met	Secondary River (5000) - Metadata in ASCII Format
Dmc2P03Secriv.shp	Secondary River (5000)
Dmc2P03Strord.avl	Stream Order (5000) – Legend File
dmc2p03strord.htm	Stream Order (5000) – Metadata in HTML Format
dmc2p03strord.met	Stream Order (5000) – Metadata in ASCII Format
Dmc2P03Strord.shp	Stream Order (5000)
dmc2p03tankpo.htm	Water Tank (5000) - Metadata in HTML Format
dmc2p03tankpo.met	Water Tank (5000) - Metadata in ASCII Format
Dmc2P03Tankpo.shp	Water Tank (5000)
dmc2p05chanel.htm	Channel (25000) - Metadata in HTML Format
dmc2p05chanel.met	Channel (25000) - Metadata in ASCII Format
Dmc2P05Chanel.shp	Channel (25000)
dmc2p05chedam.htm	Check Dam (25000) - Metadata in HTML Format
dmc2p05chedam.met	Check Dam (25000) - Metadata in ASCII Format
Dmc2P05Chedam.shp	Check Dam (25000)
dmc2p05coastl.htm	Coastal Line (25000) - Metadata in HTML Format
dmc2p05coastl.met	Coastal Line (25000) - Metadata in ASCII Format
Dmc2P05Coastl.shp	Coastal Line (25000)
dmc2p05lagsre.htm	Lagoon (25000) - Metadata in HTML Format
dmc2p05lagsre.met	Lagoon (25000) -Metadata in ASCII Format
Dmc2P05Lagsre.shp	Lagoon (25000)

dmc2p05mainri.htm	Main River (25000) - Metadata in HTML Format
dmc2p05mainri.met	Main River (25000) - Metadata in ASCII Format
Dmc2P05Mainri.shp	Main River (25000)
dmc2p05mainrv.shp	Main Rivers (25000)
dmc2p05mainrv.avl	Main Rivers (25000)– Legend File
dmc2p05reserv.htm	Reservoir (25000) - Metadata in HTML Format
dmc2p05reserv.met	Reservoir (25000) - Metadata in ASCII Format
Dmc2P05Reserv.shp	Reservoir (25000)
dmc2p05secriv.htm	Secondary River (25000) - Metadata in HTML Format
dmc2p05secriv.met	Secondary River (25000) - Metadata in ASCII Format
Dmc2P05Secriv.shp	Secondary River (25000)
dmc2p05mcolim.avl	5 Municipalities (Polygons) – Legend File
dmc2p05parroq.avl	Parroquias – Legend File
dmc2p05mceplim.htm	5 Municipalities (Polygons) - Metadata in HTML Format
dmc2p05mceplim.met	5 Municipalities (Polygons) - Metadata in ASCII Format
Dmc2P05Mceplim.shp	5 Municipalities (Polygons)
dmc2p05parroq.htm	Parroquias - Metadata in HTML Format
dmc2p05parroq.met	Parroquias - Metadata in ASCII Format
Dmc2P05Parroq.shp	Parroquias
dmc2p05manzana.shp	Manzana
dmc2p05segmnt.htm	Segment - Metadata in HTML Format
dmc2p05segmnt.met	Segment - Metadata in ASCII Format
Dmc2P05Segmnt.shp	Segment
dmc2p05segpop.htm	Segment Population Density - Metadata in HTML Format
dmc2p05segpop.met	Segment Population Density - Metadata in ASCII Format
dmc2p05segpop.shp	Segment Population Density
dmc2p05segpop.avl	Segment by Population – Legend File
dmc2p05popden.avl	Population density – legend File

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
12\_Administrative\_Boundary

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
13\_Census\_Division

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
14\_Microzone

Dmc2P05Barinv.tif	Barrio Inventory (Raster)
Dmc2P05Miczon.avl	Microzone – Legend File
dmc2p05miczon.htm	Microzone - Metadata in HTML Format
dmc2p05miczon.met	Microzone - Metadata in ASCII Format
Dmc2P05Miczon.shp	Microzone
dmc2p05uduinv.htm	UDU's Inventory - Metadata in HTML Format
dmc2p05uduinv.met	UDU's Inventory - Metadata in ASCII Format
Dmc2P05Uduinv.shp	UDU's Inventory

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
15\_Aerial\_Phographs

Dmc2P03Ap131.s.tif	Orthorectified Aerial Photograph # 131 south
Dmc2P03Ap147n.tif	Orthorectified Aerial Photograph # 147 north
Dmc2P03Ap147s.tif	Orthorectified Aerial Photograph # 147 south
Dmc2P03Ap149s.tif	Orthorectified Aerial Photograph # 149 south
Dmc2P03Ap169n.tif	Orthorectified Aerial Photograph # 169 north
Dmc2P03Ap190n.tif	Orthorectified Aerial Photograph # 190 north
Dmc2P03Ap190s.tif	Orthorectified Aerial Photograph # 190 south
Dmc2P03Ap239n.tif	Orthorectified Aerial Photograph # 239 north
Dmc2P03Ap243n.tif	Orthorectified Aerial Photograph # 243 north
Dmc2P03Ap530s.tif	Orthorectified Aerial Photograph # 530 south
Dmc2P03Ap541n.tif	Orthorectified Aerial Photograph # 541 north
Dmc2P03Ap541s.tif	Orthorectified Aerial Photograph # 541 south
Dmc2P03Ap575n.tif	Orthorectified Aerial Photograph # 575 north
Dmc2P03Ap575s.tif	Orthorectified Aerial Photograph # 575 south
Dmc2P03Ap586n.tif	Orthorectified Aerial Photograph # 586 north
Dmc2P03Ap590n.tif	Orthorectified Aerial Photograph # 590 north
Dmc2P03Ap590s.tif	Orthorectified Aerial Photograph # 590 south
Dmc2P03Ap651n.tif	Orthorectified Aerial Photograph # 651 north
Dmc2P03Ap651s.tif	Orthorectified Aerial Photograph # 651 south
Dmc2P03Ap655n.tif	Orthorectified Aerial Photograph # 655 north

Dmc2P03Ap655s.tif	Orthorectified Aerial Photograph # 655 south
Dmc2P03Ap765s.tif	Orthorectified Aerial Photograph # 765 south
Dmc2P03Ap770s.tif	Orthorectified Aerial Photograph # 770 south
dmc2p03asterb.shp	Aster Image Background
dmc2p16iaster.tif	Aster Image (Band Combination 1, 2,3, 15mt)
Band1.mpr	Band 1 (Scene 004-053, 09-04)
Band2.mpr	Band 2 (Scene 004-053, 09-04)
Band5.mpr	Band 5 (Scene 004-053, 09-04)
Band7.mpr	Band 7 (Scene 004-053, 09-04)
Band1.mpr	Band 1 (Scene 004-053, 24-05)
Band4.mpr	Band 4 (Scene 004-053, 24-05)
Band5.mpr	Band 5 (Scene 004-053, 24-05)
Cc451.mpr	Color Composite (Bands 4,5,1) (Scene 004-053, 24-05)
004053100597.b1	Satellite Image Band 1
004053100597.b2	Satellite Image Band 2
004053100597.b3	Satellite Image Band 3
004053100597.b4	Satellite Image Band 4
004053100597.b5	Satellite Image Band 5
004053100597.b6	Satellite Image Band 6
004053100597.b7	Satellite Image Band 7
cc453.jpg	Color composition band4,5,3 (RGB)
cc753.jpg	Color composition band7,5,3 (RGB)
p004r53_7t20010314_nn1.mpr	Band 1 (Scene 004-053, 14-03)
p004r53_7t20010314_nn2.mpr	Band 2 (Scene 004-053, 14-03)

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
16\_Satellite\_Images/Aster

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
16\_Satellite\_Images/Landsat/1990

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
16\_Satellite\_Images/Landsat/1992

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
16\_Satellite\_Images/Landsat/1997

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
16\_Satellite\_Images/Landsat/2001

p004r53_7t20010314_nn3.mpr	Band 3 (Scene 004-053, 14-03)
p004r53_7t20010314_nn4.mpr	Band 4 (Scene 004-053, 14-03)
p004r53_7t20010314_nn5.mpr	Band 5 (Scene 004-053, 14-03)
p004r53_7t20010314_nn6.mpr	Band 7 (Scene 004-053, 14-03)
Cc_453.mpr	Color Composite (Bands 4,5,3) (Scene 004-053, 14-03)
Caracas/GIS/01_GENERAL_CONDITIONS/ 17_Soil_Conditions	
dmc2m05aluvum.htm	Alluvions - Metadata in HTML format
dmc2m05aluvum.met	Alluvions - Metadata in ASCII format
dmc2m05aluvum.shp	Alluvions
dmc2m05borhol.avi	Borehole – Legend File
Dmc2M05Borhol.shp	Borehole
dmc2m05microb.shp	Subwatersheds
dmc2m05microt.shp	Subwatersheds
dmc2m05slopbg.avi	Mesh (Earthquake) – Legend File
Dmc2M05Slopbg.shp	Mesh (Earthquake)
Dmc2M05Slopth.shp	Soil Depth
Caracas/GIS/01_GENERAL_CONDITIONS/ 18_Ground_Water	
dmc2m05bogrwa.htm	Ground Water Boundary - Metadata in HTML format
dmc2m05bogrwa.met	Ground Water Boundary - Metadata in ASCII format
Dmc2M05Bogrwa.shp	Ground Water Boundary
dmc2m05bogrwa.avi	Ground Water Boundary – Legend File
Dmc2M05Cntlwgw.htm	Ground Water Contour - Metadata in HTML format
Dmc2M05Cntlwgw.met	Ground Water Contour - - Metadata in ASCII format
Dmc2M05Cntlwgw.shp	Ground Water Contour
dmc2m05contwg.avi	Ground Water Contour – Legend File
Dmc2M05Stadle.htm	Nivel Estático - Metadata in HTML format
Dmc2M05Statle.met	Nivel Estático - Metadata in ASCII format
Dmc2M05Statle.shp	Static Level
dmc2m05statle.avi	Static Level – Legend File
Dmc2M05Wadec1.htm	Water Depth Classification - Metadata in HTML format

Dmc2M05Wadec1.met	Water Depth Classification - Metadata in ASCII format
Dmc2M05Wadec1.shp	Water Depth Classification
aed2p03cuaf1t.shp	Quaternary Faults
aed2p03scnfl.t.shp	Scenario Faults
Dmc4M05Geolog.htm	Geology - Metadata in HTML format
Dmc4M05Geolog.met	Geology - Metadata in ASCII format
Dmc4M05Geolog.shp	Geology
Dmc4M05Geolog.avl	Geology – Legend File
Asd2P05Lineam.shp	Lineaments
Dmc2M05Linavi.avl	Avila Mountain Lineaments – Legend File
Dmc2M05Linavi.shp	Avila Mountain Lineaments
Empty	
dmc2p03slpdeg.shp	Slope Gradient
dmc2p03slppct.shp	Slope Percentage
dmc2p03lands1.htm	Landslide - Metadata in HTML Format
dmc2p03lands1.met	Landslide - Metadata in ASCII Format
Dmc2P03Landsl.shp	Landslide
Dmc2P03Landsl.avl	Landslide – Legend File
Asd2P03Actcol.htm	Derrumbe Activo - Metadata in HTML Format
Asd2P03Actcol.met	Derrumbe Activo - Metadata in ASCII Format
Asd2P03Actcol.shp	Active Collapse Landslide
Asd2P03Alpssf.htm	Potential Sediment deposit- Metadata in HTML Format
Asd2P03Alpssf.met	Potential Sediment deposit - Metadata in ASCII Format

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
19\_Geology

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
20\_Lineaments

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
21\_Geomorphology

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
22\_Slope\_Gradient

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
23\_Landslide

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
24\_Potential\_Sediments\_Deposits

Asd2P03Alpssf.shp	Total Potential Sediment deposit
Asd2P03Alpssf.avl	All Potential Sediment deposit – Legend File
Asd2P03Nccwg.htm	New Collapse Covered with Grass - - Metadata in HTML Format
Asd2P03Nccwg.met	New Collapse Covered with Grass - Metadata in ASCII Format
Asd2P03Nccwg.shp	New Collapse Covered with Grass
Asd2P03Neutre.htm	New Collapse Under Trees - Metadata in HTML format
Asd2P03Neutre.met	New Collapse Under Trees - Metadata in ASCII format
Asd2P03Neutre.shp	New Collapse Under Trees
Asd2P03Ocwtr.htm	Old Collapse Covered with trees- Metadata in HTML format
Asd2P03Ocwtr.met	Old Collapse Covered with trees- Metadata in ASCII format
Asd2P03Ocwtr.shp	Old Collapse Covered with trees
Asd2P03Ocwtre.htm	Old Collapse Covered without trees- Metadata in HTML format
Asd2P03Ocwtre.met	Old Collapse Covered without trees- Metadata in ASCII format
Asd2P03Ocwtre.shp	Old Collapse Cover without Tree
Asd2P03Unssed.htm	Unstable Sediment - Metadata in HTML format
Asd2P03Unssed.met	Unstable Sediment - Metadata in ASCII format
Asd2P03Unssed.shp	Unstable Sediment
asd2p03unssed.avl	Unstable Sediment – Legend File
Asd2P03Allare.htm	Sediment-Flood Study Areas - Metadata in HTML format
Asd2P03Allare.met	Sediment-Flood Study Areas - Metadata in ASCII format
Asd2P03Allare.shp	Sediment-Flood Study Areas
asd2p03Allarl.shp	Sediment-Flood Study Areas Lines
Asd2P03Floods.htm	Flood Study Areas - Metadata in HTML format
Asd2P03Floods.met	Flood Study Areas - Metadata in ASCII format
Asd2P03Floods.shp	Flood Study Areas
Asd2P03Poised.htm	Sediment Potential Study Area - Metadata in HTML format
Asd2P03Poised.met	Sediment Potential Study Area - Metadata in ASCII format
Asd2P03Poised.shp	Sediment Potential Study Area
asd2p03totare.shp	Total Area
Asd2P03Unitcat.htm	Sub-catchment units - Metadata in HTML format
Caracas/GIS/01_GENERAL_CONDITIONS/ 25_Watershed	



Caracas/GIS/01_GENERAL_CONDITIONS/ 26_Evolution_of_ADMC	Asd2P03Unitcat.met Asd2P03Unitcat.shp Asd2P03Potsed.shp Asd2P03Unitcat.shp  admc_today admc_today.shp municipio_decada60.shp municipio_evolution.shp	Sub-catchment units - Metadata in ASCII format Sub-catchment units Potential Sediment Study Area Sub Catchment's Units  ADMC Boundary today ADMC Boundary today ADMC Boundary in the decades of 60 Evolution of the municipalities
Caracas/GIS/01_GENERAL_CONDITIONS/ 27_Population_Distribution	population_by_microzone.shp	Population Distribution by Microzone
Caracas/GIS/01_GENERAL_CONDITIONS/ 28_Population_Density	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 29_Building_Distribution_Total	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 30_Building_Distribution_Type1	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 31_Building_Distribution_Type2	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 32_Infrastructure_Bridges	dmc2p03Bridge.shp Dmc2P03Viaduc.shp	Bridge Location Viaduct Location
Caracas/GIS/01_GENERAL_CONDITIONS/ 33_Infrastructure_Metro_Line	Dmc2P03Equesm.shp Dmc2P03Metrii.shp	Metro Station Metro Line
Caracas/GIS/01_GENERAL_CONDITIONS/ Empty	Empty	

34\_Regional\_Water\_Supply\_ADMC

Caracas/GIS/01_GENERAL_CONDITIONS/ 35_Lifeline_Water	Dmc2P03Esbtan.shp Dmc2P03Redpri.avi Dmc2P03Redpri.shp	Pumping Station and Water Tank Location Principal Water Pipe Network – Legend File Principal Water Pipe Network
Caracas/GIS/01_GENERAL_CONDITIONS/ 36_Lifeline_Telecommunication_CANTV	Dmc2P03Ctctv.shp	CANTV Centrals
Caracas/GIS/01_GENERAL_CONDITIONS/ 37_Lifeline_Electricity	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 38_Natural_Gas	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 39_Public_Facilities	Dmc2P03Egnato.shp Dmc2P03Egubim.shp Dmc2P03Equbom.shp Dmc2P03Equdep.shp Dmc2P03Equgub.shp Dmc2P03Equpla.shp Dmc2P03Equpol.shp Govt_Buildings_List.bmp Police_Stations_List.bmp	Government National Buildings Important Government Buildings Firefighting Station Sport Building Governmental Buildings Main Square Police Station Important Government Buildings List Police Station List
Caracas/GIS/01_GENERAL_CONDITIONS/ 40_Health_Facilities	Dmc2P03Equasi.shp	Medical Buildings
Caracas/GIS/01_GENERAL_CONDITIONS/ 41_Educational_Facilities	dmc2p03equeds.avi Dmc2P03Equeds.shp Dmc2P03Equemb.shp	University and Technical Institutes – Legend File University and Technical Institutes Basic Schools

Caracas/GIS/01_GENERAL_CONDITIONS/ 42_Open_Space	intsec_openspace_municipio.shp  open_space.shp	Crossing of Openspace and municipality  Open Spaces
Caracas/GIS/01_GENERAL_CONDITIONS/ 44_Distribution_of_Industrial_Facilities	Empty	
Caracas/GIS/01_GENERAL_CONDITIONS/ 45_Hazardous_Materials_Facilities	Dmc2P03Equest.htm Dmc2P03Equest.met Dmc2P03Equest.shp dmc2p03equest.avl	Gasoline Station - Metadata in HTML format Gasoline Station - Metadata in ASCII format Gasoline Station Gasoline Station - Legend
Caracas/GIS/01_GENERAL_CONDITIONS/ 46_Landuse	Dmc2P03Ldusav.shp Dmc2P03Ldusav.avl Dmc2P03Lnduse.shp Dmc2P03Lnduse.avl Landuseadm.shp	Land Use Avila Sector Land Use Avila Sector – Legend File Land Use Land Use – Legend File Landuse ADMC
Caracas/GIS/01_GENERAL_CONDITIONS/ 47_Geotechnical	Dmc2M05Allcls.avl Dmc2M05Allcls.shp Dmc2M05Allfan.shp dmc2m05bounal.avl Dmc2M05Bounal.shp	Alluviums/Colluviums – Legend File Alluviums/Colluviums Alluvial Fan Direction Alluvium Boundary – Legend File Alluvium Boundary
Caracas/GIS/01_GENERAL_CONDITIONS/ 48_Georeferenced_Color_Aerial_Photos	Dmc2P0567471e.aux Dmc2P0567471e.lan Dmc2P0567471e.TXT	Color Aerial Photograph, Number 67471se – Header File Color Aerial Photograph, Number 67471se Color Aerial Photograph, Number 67471se – Coordinate File

Dmc2P0568471o.aux  
Dmc2P0568471o.lan  
Dmc2P0568471o.TXT  
Dmc2P0568474e.aux  
Dmc2P0568474e.lan  
Dmc2P0568474e.TXT  
Dmc2P0568474o.aux  
Dmc2P0568474o.lan  
Dmc2P0568474o.TXT

Color Aerial Photograph, Number 68471so – Header File  
Color Aerial Photograph, Number 68471so  
Color Aerial Photograph, Number 68471so – Coordinate File  
Color Aerial Photograph, Number 68474se – Header File  
Color Aerial Photograph, Number 68474se  
Color Aerial Photograph, Number 68474se – Coordinate File  
Color Aerial Photograph, Number 68474so – Header File  
Color Aerial Photograph, Number 68474so  
Color Aerial Photograph, Number 68474so – Coordinate File

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
48\_Georeferenced\_Aerial\_Photos\_Color(19  
94)

Dmc2P05674712.txt  
Dmc2P05674712.aux  
Dmc2P05674712.lan  
dmc2p05674712.rrd  
Dmc2P05674721.tif  
Dmc2P05674721.aux  
Dmc2P05674721.rrd  
Dmc2P05674722.tif  
Dmc2P05674722.aux  
Dmc2P05674722.rrd  
Dmc2P05674723.tif  
Dmc2P05674723.aux  
Dmc2P05674723.rrd  
Dmc2P05674724.tif  
Dmc2P05674724.aux  
Dmc2P05674724.rrd  
Dmc2P05684713.txt  
Dmc2P05684713.aux  
Dmc2P05684713.lan  
Dmc2P05684713.rrd

Color Georeferenced Aerial Photos (1994)  
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Color Georeferenced Aerial Photos (1994)

Dmc2P05684723.tif  
 Dmc2P05684723.aux  
 Dmc2P05684723.rrd  
 Dmc2P05684724.tif  
 Dmc2P05684724.aux  
 Dmc2P05684724.rrd  
 Dmc2P05684731.tif  
 Dmc2P05684731.aux  
 Dmc2P05684731.rrd  
 Dmc2P05684732.tif  
 Dmc2P05684732.aux  
 Dmc2P05684732.rrd  
 Dmc2P05684733.tif  
 Dmc2P05684733.aux  
 Dmc2P05684733.rrd  
 Dmc2P05684734.tif  
 Dmc2P05684742.txt SIN .TIF  
 Dmc2P05684742.aux  
 Dmc2P05684742.lan  
 Dmc2P05684742.rrd  
 Dmc2P05684743.txt. SIN TIF  
 Dmc2P05684743.aux  
 Dmc2P05684743.lan  
 Dmc2P05684743.rrd

Color Georeferenced Aerial Photos (1994)  
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 Color Georeferenced Aerial Photos (1994)

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 49\_Georeferenced\_Maracay\_Base\_Maps

Mry2P0566472o.tif  
 Mry2P0566461o.tif  
 Mry2P0566461e.tif  
 Mry2P0566472e.tif

Maracay's Georeferenced Base Map – 6647-II-SO  
 Maracay's Georeferenced Base Map – 6647-II-SE  
 Maracay's Georeferenced Base Map – 6646-I-NO  
 Maracay's Georeferenced Base Map – 6646-I-NE

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
50\_Georeferenced\_Vargas\_Base\_Maps

Var2P0300III10.tif  
Var2P0300III11.tif  
Var2P0300III10.tif  
Var2P0300III11.tif  
Var2P0300III8.tif  
Var2P0300III9.tif  
Var2P0300IV10.tif  
Var2P0300IV11.tif  
Var2P0300II10.tif  
Var2P0300II8.tif  
Var2P0300II9.tif  
Var2P0300IV8.tif  
Var2P0300IV9.tif

Vargas's Georeferenced Base Map – III 10  
Vargas's Georeferenced Base Map – III 11  
Vargas's Georeferenced Base Map – II 10  
Vargas's Georeferenced Base Map – II 10  
Vargas's Georeferenced Base Map – III 8  
Vargas's Georeferenced Base Map – III 9  
Vargas's Georeferenced Base Map – IV 9  
Vargas's Georeferenced Base Map – IV 11  
Vargas's Georeferenced Base Map – I 10  
Vargas's Georeferenced Base Map – II 8  
Vargas's Georeferenced Base Map – II 9  
Vargas's Georeferenced Base Map – IV 8  
Vargas's Georeferenced Base Map – IV 9

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
51\_Georeferenced\_Landslide\_Base\_Maps

Dmc2P031jgf43.jgw  
Dmc2P031jgf43.jpg  
Dmc2P031jgf44.jgw  
Dmc2P031jgf44.jpg  
Dmc2P032jge42.jgw  
Dmc2P032jge42.jpg  
Dmc2P032jge43.jgw  
Dmc2P032jge43.jpg  
Dmc2P032jge44.jgw  
Dmc2P032jge44.jpg  
Dmc2P032jgf42.jgw  
Dmc2P032jgf42.jpg  
Dmc2P032jgf46.jgw  
Dmc2P032jgf46.jpg  
Dmc2P032jgf47.jgw  
Dmc2P032jgf47.jpg

Georeferenced Base Map F-43 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-43 (Scale 1:5.000)  
Georeferenced Base Map F-44 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-44 (Scale 1:5.000)  
Georeferenced Base Map E-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map E-42 (Scale 1:5.000)  
Georeferenced Base Map E-43 (Scale 1:5.000) - Header File  
Georeferenced Base Map E-43 (Scale 1:5.000)  
Georeferenced Base Map E-44 (Scale 1:5.000) - Header File  
Georeferenced Base Map E-44 (Scale 1:5.000)  
Georeferenced Base Map F-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-42 (Scale 1:5.000)  
Georeferenced Base Map F-46 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-46 (Scale 1:5.000)  
Georeferenced Base Map F-47 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-47 (Scale 1:5.000)

Dmc2P032jgf48.jgw  
Dmc2P032jgf48.jpg  
Dmc2P032jgg41.jgw  
Dmc2P032jgg41.jpg  
Dmc2P032jgg43.jgw  
Dmc2P032jgg43.jpg  
Dmc2P032jgg44.jgw  
Dmc2P032jgg44.jpg  
Dmc2P032jgg45.jgw  
Dmc2P032jgg45.jpg  
Dmc2P032jgg46.jgw  
Dmc2P032jgg46.jpg  
Dmc2P032jgg47.jgw  
Dmc2P032jgg47.jpg  
Dmc2P032jgg48.jgw  
Dmc2P032jgg48.jpg  
Dmc2P032jgg49.jgw  
Dmc2P032jgg49.jpg  
Dmc2P032jgh39.jgw  
Dmc2P032jgh39.jpg  
Dmc2P032jgh40.jgw  
Dmc2P032jgh40.jpg  
Dmc2P032jgh41.jgw  
Dmc2P032jgh41.jpg  
Dmc2P032jgh42.jgw  
Dmc2P032jgh42.jpg  
Dmc2P032jgh43.jgw  
Dmc2P032jgh43.jpg  
Dmc2P032jgh44.jgw  
Dmc2P032jgh44.jpg  
Dmc2P032jgh46.jgw

Georeferenced Base Map F-48 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-48 (Scale 1:5.000)  
Georeferenced Base Map G-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-41 (Scale 1:5.000)  
Georeferenced Base Map G-43 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-43 (Scale 1:5.000)  
Georeferenced Base Map G-44 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-44 (Scale 1:5.000)  
Georeferenced Base Map G-45 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-45 (Scale 1:5.000)  
Georeferenced Base Map G-46 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-46 (Scale 1:5.000)  
Georeferenced Base Map G-47 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-47 (Scale 1:5.000)  
Georeferenced Base Map G-48 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-48 (Scale 1:5.000)  
Georeferenced Base Map G-49 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-49 (Scale 1:5.000)  
Georeferenced Base Map H-39 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-39 (Scale 1:5.000)  
Georeferenced Base Map H-40 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-40 (Scale 1:5.000)  
Georeferenced Base Map H-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-41 (Scale 1:5.000)  
Georeferenced Base Map H-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-42 (Scale 1:5.000)  
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Georeferenced Base Map H-43 (Scale 1:5.000)  
Georeferenced Base Map H-44 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-44 (Scale 1:5.000)  
Georeferenced Base Map H-46 (Scale 1:5.000) - Header File

Dmc2P032jgh46.jpg  
Dmc2P032jgh49.jgw  
Dmc2P032jgh49.jpg  
Dmc2P032jgt41.jgw  
Dmc2P032jgt41.jpg  
Dmc2P032jgt44.jgw  
Dmc2P032jgt44.jpg  
Dmc2P032jgt48.jgw  
Dmc2P032jgt48.jpg  
Dmc2P032jgt41.jgw  
Dmc2P032jgt41.jpg  
Dmc2P032jgt43.jgw  
Dmc2P032jgt43.jpg  
Dmc2P032jgt49.jgw  
Dmc2P032jgt49.jpg  
Dmc2P032jgg42.jgw  
Dmc2P032jgg42.jpg  
Dmc2P032jgt42.jgw  
Dmc2P032jgt42.jpg  
Dmc2P032jgt43.jgw  
Dmc2P032jgt43.jpg  
Dmc2P032jgt42.jgw  
Dmc2P032jgt42.jpg  
Dmc2P032jgt41.jgw  
Dmc2P032jgt41.jpg  
Dmc2P032jgt45.jgw  
Dmc2P032jgt45.jpg  
Dmc2P032jgg40.jgw  
Dmc2P032jgg40.jpg  
Dmc2P032jgh40.jgw  
Dmc2P032jgh40.jpg

Georeferenced Base Map H-46 (Scale 1:5.000)  
Georeferenced Base Map H-49 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-49 (Scale 1:5.000)  
Georeferenced Base Map I-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-41 (Scale 1:5.000)  
Georeferenced Base Map I-44 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-44 (Scale 1:5.000)  
Georeferenced Base Map I-48 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-48 (Scale 1:5.000)  
Georeferenced Base Map J-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map J-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map J-43 (Scale 1:5.000) - Header File  
Georeferenced Base Map J-43 (Scale 1:5.000)  
Georeferenced Base Map J-49 (Scale 1:5.000) - Header File  
Georeferenced Base Map J-49 (Scale 1:5.000)  
Georeferenced Base Map G-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-42 (Scale 1:5.000)  
Georeferenced Base Map I-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-42 (Scale 1:5.000)  
Georeferenced Base Map I-43 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-43 (Scale 1:5.000)  
Georeferenced Base Map I-42 (Scale 1:5.000) - Header File  
Georeferenced Base Map I-42 (Scale 1:5.000)  
Georeferenced Base Map F-41 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-41 (Scale 1:5.000)  
Georeferenced Base Map F-45 (Scale 1:5.000) - Header File  
Georeferenced Base Map F-45 (Scale 1:5.000)  
Georeferenced Base Map G-40 (Scale 1:5.000) - Header File  
Georeferenced Base Map G-40 (Scale 1:5.000)  
Georeferenced Base Map H-40 (Scale 1:5.000) - Header File  
Georeferenced Base Map H-40 (Scale 1:5.000)



Georeferenced Base Map H-47 (Scale 1:5.000) - Header File  
 Georeferenced Base Map H-47 (Scale 1:5.000)  
 Georeferenced Base Map H-48 (Scale 1:5.000) - Header File  
 Georeferenced Base Map H-48 (Scale 1:5.000)  
 Georeferenced Base Map I-49 (Scale 1:5.000) - Header File  
 Georeferenced Base Map I-49 (Scale 1:5.000)

Dmc2P034jgh47.jgw  
 Dmc2P034jgh47.jpg  
 Dmc2P034jgh48.jgw  
 Dmc2P034jgh48.jpg  
 Dmc2P034jgi49.jgw  
 Dmc2P034jgi49.jpg

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 52\_Notice\_Boards

Notice Board

notice\_board.shp

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 53\_StaffGauge

Staff Gauge Locations

aed2p03staffg.shp

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 54\_building\_Distribution

Buildings inventory provided by CANTV  
 Buildings extracted from working map 1:5000  
 Buildings higher than 10 stories

bid\_CANTV\_lc.shp  
 building\_5000\_polygons.shp  
 buildings\_higher\_10stories.shp

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 55\_Machinery\_Distribution

Heavy Machinery Distribution

dmc2p03machin.shp

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 56\_Volunteer\_Group

Volunteer Groups

dmc2p05volgrp.shp

Caracas/GIS/01\_GENERAL\_CONDITIONS/  
 57\_Grid\_Index

Grid Index

dmc2p05index.shp

**02\_HAZARD**

Caracas/GIS/02\_HAZARD/  
 01\_Scenario\_Earthquakes

Quaternary faults

aed2p03quaflt.shp  
 aed2p03scnflt.shp  
 past\_earthquakes.shp  
 vzla\_norte.shp

Limits of states of Venezuela

Caracas/GIS/02\_HAZARD/  
 02\_MMI\_1812\_Earthquake\_Model

Earthquake Model MMI 1812  
 Earthquake Model MMI 1812 – Legend File

Aed2P05Mi1812.shp  
 Aed2P05Mi1812.avl

Caracas/GIS/02_HAZARD/ 03_MMI_1967_Earthquake_Model	Aed2P05Mi1967.shp Aed2P05Mi1967.avl	Earthquake Model MMI 1967 Earthquake Model MMI 1967 – Legend File
Caracas/GIS/02_HAZARD/ 04_MMI_1878_Earthquake_Model	Aed2P05Mi1878.shp Aed2P05Mi1878.avl	Earthquake Model MMI 1878 Earthquake Model MMI 1878 – Legend File
Caracas/GIS/02_HAZARD/ 05_MMI_Avila_Fault_Model	Aed2P05Miavfa.shp Aed2P05Miavfa.avl	Avila Fault Model MMI Avila Fault Model MMI – Legend File
Caracas/GIS/02_HAZARD/ 06_PGA_1812_Earthquake_Model	Aed2P05Pa1812.shp Aed2P05Pa1812.avl	Earthquake Model PGA 1812 Earthquake Model PGA 1812 – Legend File
Caracas/GIS/02_HAZARD/ 07_PGA_1878_Earthquake_Model	Aed2P05Pa1878.shp Aed2P05Pa1878.avl	Earthquake Model PGA 1878 Earthquake Model PGA 1878 – Legend File
Caracas/GIS/02_HAZARD/ 08_PGA_1967_Earthquake_Model	Aed2P05Pa1967.shp Aed2P05Pa1967.avl	Earthquake Model PGA 1967 Earthquake Model PGA 1967 – Legend File
Caracas/GIS/02_HAZARD/ 09_PGA_Avila_Fault_Model	Aed2P05Paavfa.shp Aed2P05Paavfa.avl	Avila Fault Model PGA Avila Fault Model PGA – Legend File
Caracas/GIS/02_HAZARD/ 10_PGV_1812_Earthquake_Model	Aed2P05Pv1812.shp Aed2P05Pv1812.avl	Earthquake Model PGV 1812 Earthquake Model PGV 1812 – Legend File
Caracas/GIS/02_HAZARD/ 11_PGV_1878_Earthquake_Model	Aed2P05Pv1878.shp Aed2P05Pv1878.avl	Earthquake Model PGV 1878 Earthquake Model PGV 1878 – Legend File

Caracas/GIS/02_HAZARD/ 12_PGV_1967_Earthquake_Model	Aed2P05Pv1967.shp Aed2P05Pv1967.avi	Earthquake Model PGV 1967 Earthquake Model PGV 1967 – Legend File
Caracas/GIS/02_HAZARD/ 13_PGV_Avila_Fault_Model	Aed2P05Pvavfa.shp Aed2P05Pvavfa.avi	Avila Fault Model PGV Avila Fault Model PGV
Caracas/GIS/02_HAZARD/ 14_Flood_Hazard/30_Meters_Grid	Asd2P03Allque.avi Qam2P03Depvel.shp Qan2P03Depvel.shp Qca2P03Depvel.shp Qch2P03Depvel.shp Qcr2P03Depvel.shp Qct2P03Depvel.shp Qma2P03Depvel.shp Qsb2P03Depvel.shp Qse2P03Depvel.shp Qto2P03Depvel.shp	All Streams – Legend File Agua Maiz Stream (Depth and Velocity) Anauco Stream (Depth and Velocity) Caurimare Stream (Depth and Velocity) Chacaito Stream (Depth and Velocity) Caroata Stream (Depth and Velocity) Catuche Stream (Depth and Velocity) Mariperez Stream (Depth and Velocity) Quebrada Seca Stream (Depth and Velocity) Sebucan Stream (Depth and Velocity) Tocome Stream (Depth and Velocity)
Caracas/GIS/02_HAZARD/ 14_Flood_Hazard/100_Meters_Grid	Asd2P03Eagrid.shp Asd2P03eagrid.avi Asd2P03Wegrid.shp Asd2P03wegrid.avi depth_east  Grids by Watersheds.xls Houses byGrids vel_east	East Grid (100 Meters) East Grid – Legend File West Grid (100 Meters) West Grid– Legend File East Grid Flood depth  Grids by Watersheds Houses byGrids East Grid Flood Velocity

Caracas/GIS/02_HAZARD/ 15_Landslide_Hazard	Empty		
<b>03_VULNERABILITY</b>			
Caracas/GIS/ 01_Physical_Vulnerability	03_Vulnerability/ dmc2p05fptyvul.shp		Physical Vulnerability
Caracas/GIS/ 02_Social_Vulnerability	03_Vulnerability/ Dmc2P05Soczon.shp dmc2p05sovuic.avl dmc2p05sovuud.avl dmc2p05sovuie.avl dmc2p05sovuif.avl dmc2p05sovuik.avl Dmc2P05Sovuin.avl Dmc2P05Sovuin.shp dmc2p05soznuu.shp dmc2p05intvul.shp		Social Zone (Zone Code, Polygons) Social Vulnerability Community – Legend File Social Vulnerability Demographic – Legend File Social Vulnerability Economic – Legend File Social Vulnerability Facility – Legend File Social Vulnerability Knowledge – Legend File Social Vulnerability Total - Legend File) Social Vulnerability (Total) Social Zone Number (Zone Code, Points) Integrated Vulnerability
Caracas/GIS/03_Integrated_Vulnerability	03_Vulnerability/ dmc2p05intvul.shp		Integrated Vulnerability
<b>04_RISK</b>			
Caracas/GIS/04_RISK/ 01_Building_Damage_Ratio_1812_Total	Aed2P05Bymesh.shp Aed2P05Bymesh.avl Aed2P05ByMicr.shp Aed2P05ByMicr.avl Aed2P05Byparr.shp Aed2P05Byparr.avl		Building Damage Ratio 1812 Total -Mesh Building Damage Ratio 1812 Total -Mesh – Legend file Building Damage Ratio 1812 Total -Microzone Building Damage Ratio 1812 Total -Microzone – Legend file Building Damage Ratio 1812 Total -Parroquia Building Damage Ratio 1812 Total -Parroquia – Legend File
Caracas/GIS/04_RISK/ 02_Building_Damage_Ratio_1967_Total	Aed2P05Bymesh.shp Aed2P05Bymesh.avl Aed2P05ByMicr.shp		Building Damage Ratio 1967 Total Mesh Building Damage Ratio 1967 Total Mesh- Legend File Building Damage Ratio 1967 Total -Microzone

Aed2P05ByMicc.avl	Building Damage Ratio 1967 Total -Microzone – Legend File
Aed2P05ByParr.shp	Building Damage Ratio 1967 Total -Parroquia
Aed2P05ByParr.avl	Building Damage Ratio 1967 Total -Parroquia – Legend File
aed2p05byparr.shp	High Building Damage Ratio 1812 -Parroquia
aed2p05byparr.avl	High Building Damage Ratio 1812 – Parroquia- Legend File
aed2p05byparr.shp	High Building Damage Ratio 1967 -Parroquia
aed2p05byparr.avl	High Building Damage Ratio 1967–Parroquia- Legend File
aed2p05byparr.shp	Low Building Damage Ratio 1812 -Parroquia
aed2p05byparr.avl	Low Building Damage Ratio 1812 - Parroquia- Legend File
aed2p05byparr.shp	Low Building Damage Ratio 1967-Parroquia
aed2p05byparr.avl	Low Building Damage Ratio 1967 –Parroquia- Legend File
aed2p05byparr.shp	Human Casualties 1812 -Parroquia
aed2p05byparr.avl	Human Casualties 1812 –Parroquia- Legend File
aed2p05hinjur.avl	Injured 1812 – Legend File
aed2p05byparr.shp	Human Casualties 1967 -Parroquia
aed2p05hdeath.avl	Human Casualties 1967 –Parroquia- Legend File
aed2p05hinjur.avl	Injured 1967 – Legend File
Empty	
aed2p03potliq.avl	
Caracas/GIS/04_RISK/ 03_Building_Damage_Ratio_1812_High_Buildin g	
Caracas/GIS/04_RISK/ 04_Building_Damage_Ratio_1967_High_Buildin g	
Caracas/GIS/04_RISK/ 05_Building_Damage_Ratio_1812_Low_Building	
Caracas/GIS/04_RISK/ 06_Building_Damage_Ratio_1967_Low_Building	
Caracas/GIS/04_RISK/ 07_Human_Casualty_1812	
Caracas/GIS/04_RISK/ 08_Human_Casualty_1967	
Caracas/GIS/04_RISK/ 09_Damage_Bridges	
Caracas/GIS/04_RISK/	

10_Damage_WaterSupply	Aed2P03Wasuda.shp Aed2P03Wasuda.avl Aed2P03Wasuda.xls	Water Supply Damage Water Supply Damage – Legend File
Caracas/GIS/04_RISK/ 11_Damage_Telecommunication	Empty	
Caracas/GIS/04_RISK/ 12_Flooding_DebrisFlow	asd2p03houtyp.avl Qam2P03HouTyp.shp Qan2P03HouTyp.shp Qca2P03HouTyp.shp Qch2P03Houtyp.shp Qcr2P03HouTyp.shp Qct2P03HouTyp.shp Qma2P03Houtyp.shp Qsb2P03Houtyp.shp Qse2P03Houtyp.shp Qto2P03Houtyp.shp	Flood and Debris Flow - Legend File Houses affected by debris flow - Stream Agua de Maiz Houses affected by debris flow - Stream Anauco Houses affected by debris flow - Stream Caurimare Houses affected by debris flow - Stream Chacaito Houses affected by debris flow - Stream Caroata Houses affected by debris flow - Stream Catuche Houses affected by debris flow - Stream Mariperez Houses affected by debris flow - Stream Sebuca Houses affected by debris flow - Stream Seca Houses affected by debris flow - Stream Tocome
Caracas/GIS/04_RISK/ 13_Landslide_Slope	aed2p03riskhz.shp Casas.shp int_casas_parroq.shp	Risk Area and Hazard Area Houses in Risk Area and Hazard Area Houses in Risk Area and Hazard Area - Parroquia

05_PLANNING	
Caracas/GIS/05_PLANNING/ 01_Degree_of_Regional_Risk_EQ	Empty
Caracas/GIS/05_PLANNING/ 02_Degree_of_Danger_for_Building_EQ	Empty
Caracas/GIS/05_PLANNING/ 03_Degree_of_Danger_for_Human_Casualty_EQ	Empty
Caracas/GIS/05_PLANNING/ 04_Degree_of_Danger_for_Evacuation_EQ	Empty
Caracas/GIS/05_PLANNING/ 05_Degree_of_Regional_Risk_LSD	Empty
Caracas/GIS/05_PLANNING/ 06_Degree_of_Regional_Risk_for_Flooding	Empty
Caracas/GIS/05_PLANNING/ 07_Degree_of_Risk_for_Industrial_Facilities	Empty
Caracas/GIS/05_PLANNING/ 08_Identification_of_Vulnerable_Areas	Empty
Caracas/GIS/05_PLANNING/ 09_Disaster_Management_Centers	Empty
Caracas/GIS/05_PLANNING/ 10_Evacuation_Place_Regional	Empty
Caracas/GIS/05_PLANNING/ 11_Emergency_Road_Network	Empty
Caracas/GIS/05_PLANNING/ 12_Emergency_Water_Tanks	Empty

**Table S20.1.1.3 List of Views and Layouts**

No.	Directory	Sub-Directory	View
1	01_GENERAL_CONDITIONS	01_Study_Area	01_01_Study_Area_3
2		01_Study_Area	01_01_Study_Area_5
3		02_Working_Map_5000	01_02_Working_Map_5000
4		04_Base_Map_25000	01_04_Base_Map_25000
5		05_Georeferenced_1954_Base_Maps	01_05_Georeferenced_1954_Base_Maps
6		06_Georeferenced_1994_Base_Maps	01_06_Georeferenced_1994_Base_Maps
7		10_Road_Network	01_10_Road_Network
8		11_Hydrologic_Network	01_11_Hydrologic_Network
9		12_Administrative_Boundary	01_12_Administrative_Boundary_Parroquia
10		13_Census_Division	01_13_Census_Division_Census_Track (Segment)
11		13_Census_Division	01_13_Census_Division_Census_Track (Manzana)
12		14_Microzone	01_14_Microzone
13		14_Microzone	01_14_Microzone_UDU
14		15_Georeferenced_Aerial_Photos_BW(2002)	01_15_Georeferenced_Aerial_Photos_BW(2002)
15		16_Satellite_Images	01_16_Satellite_Image_Aster
16		17_Soil_Conditions	01_17_Soil_Conditions_(Boreholes)
17		17_Soil_Conditions	01_17_Soil_Conditions_(Soil_Depth)
18		18_Ground_Water	01_18_Ground_Water
19		19_Geology	01_19_Geology
20		20_Lineaments	01_20_Lineaments
21		23_Landslide	01_23_SlopeClassifications
22		24_Potential_Sediment_Deposits	01_24_Potential_Sediment_Deposits_(Deposited Debris)
23		24_Potential_Sediment_Deposits	01_24_Potential_Sediment_Deposits_(Potential Steep_Slope_Failure)
24		25_Watersheds	01_25_Watersheds_Flood_Sediments_Boundary
25		25_Watersheds	01_25_Watersheds_Potential_Sediments_Boundary



26		33_Infrastructure_Metro_Line	01_33_Infrastructure_Metro_Line
27		35_Lifeline_Water	01_35_Lifeline_Water
28		36_Lifeline_Telecommunication_CANTV	01_36_Lifeline_Telecommunication_CANTV
29		39_Public_Facilities	01_39_Public_Facilities_(Firefighting_Station)
30		39_Facilities	01_39_Facilities_(Gasoline_Station)
31		39_Public_Facilities	01_39_Public_Facilities_(Government_Building)
32		39_Public_Facilities	01_39_Public_Facilities_(Government_Important_Buildings)
33		39_Public_Facilities	01_39_Public_Facilities_(Government_National_Buildings)
34		39_Public_Facilities	01_39_Public_Facilities_(Main_Square)
35		39_Public_Facilities	01_39_Public_Facilities_(Police_Station)
36		39_Public_Facilities	01_39_Public_Facilities_(Sports_Places)
37		40_Health_Facilities	01_40_Health_Facilities
38		41_Educational_Facilities	01_41_Educational_Facilities
39		47_Geotechnical_Condition	01_47_Geotechnical_(Alluvions_Classification)
40		48_Georeferenced_Aerial_Photos_Color(1994)	01_48_Georeferenced_Aerial_Photos_Color(1994)
41		50_Georeferenced_Vargas_Base_Maps	01_50_Georeferenced_Vargas_Base_Maps
42		51_Georeferenced_Landslide_Base_Maps	01_51_Georeferenced_Landslide_Base_Maps
43		52_Notice_Boards	
44		53_StaffGauge	
45		54_building_Distribution	
46		55_Machinery_Distribution	
47		56_Volunteer_Group	
48			
49		01_Scenario_Earthquakes	02_01_Scenario_Faults
50		02_MMI_1812_Earthquake_Model	02_02_MMI_1812_Earthquake_Model
51		03_MMI_1967_Earthquake_Model	02_03_MMI_1967_Earthquake_Model
52		04_MMI_1878_Earthquake_Model	02_04_MMI_1878_Earthquake_Model
53		05_MMI_Avila_Fault_Model	02_05_MMI_Avila_Earthquake_Model
54		06_PGA_1812_Earthquake_Model	02_06_PGA_1812_Earthquake_Model

55			07_PGA_1878_Earthquake_Model	02_07_PGA_1878_Earthquake_Model
56			08_PGA_1967_Earthquake_Model	02_08_PGA_1967_Earthquake_Model
57			09_PGA_Avila_Fault_Model	02_09_PGA_Avila_Fault_Model
58			10_PGV_1812_Earthquake_Model	02_10_PGV_1812_Earthquake_Model
59			11_PGV_1878_Earthquake_Model	02_11_PGV_1878_Earthquake_Model
60			12_PGV_1967_Earthquake_Model	02_12_PGV_1967_Earthquake_Model
61			13_PGV_Avila_Fault_Model	02_13_PGV_Avila_Fault_Model
62			14_Flood_Hazard	02_14_Flood_Hazard (30_Meters_Grid)
63			14_Flood_Hazard	02_14_Flood_Hazard (100_Meters_Grid)
64		03_Vulnerability	02_Social_Vulnerability	03_02_SocialVulnerability_(Community)
65				03_02_SocialVulnerability_(Demographic)
66				03_02_SocialVulnerability_(Economic)
67				03_02_SocialVulnerability_(Facility)
68				03_02_SocialVulnerability_(Knowledge)
69				03_02_SocialVulnerability_(Total)
70				03_02_SocialVulnerability_(Zoning)
71		04_RISK	01_Building_Damage_Ratio_1812_Total	04_01_Building_Damage_Ratio_1812_Total_By_Mesh
72				04_01_Building_Damage_Ratio_1812_Total_By_Microzone
73				04_01_Building_Damage_Ratio_1812_Total_By_Parroquia
74			02_Building_Damage_Ratio_1967_Total	04_02_Building_Damage_Ratio_1967_Total_By_Mesh
75				04_02_Building_Damage_Ratio_1967_Total_By_Microzone
76				04_02_Building_Damage_Ratio_1967_Total_By_Parroquia
77			03_Building_Damage_Ratio_1812_High_Building	04_03_Building_Damage_Ratio_1812_High_Building
78			04_Building_Damage_Ratio_1967_High_Building	04_04_Building_Damage_Ratio_1967_High_Building
79			05_Building_Damage_Ratio_1812_Low_Building	04_05_Building_Damage_Ratio_1812_Low_Building
80			06_Building_Damage_Ratio_1967_Low_Building	04_06_Building_Damage_Ratio_1967_Low_Building
81			07_Human_Casualty_1812	04_07_Human_Casualty_Death_1812
82				04_07_Human_Casualty_Injury_1812

83		08_Human_Casualty_1967	04_08_Human_Casualty_Death_1967
84			04_08_Human_Casualty_Injury_1967
85		10_Damage_WaterSupply	04_07_Human_Casualty_Death_1812
86			04_07_Human_Casualty_Injury_1812
87			04_08_Human_Casualty_Death_1967
88			04_08_Human_Casualty_Injury_1967
89			04_10_Damage_Water_Supply_1812
90			04_10_Damage_Water_Supply_1878
91			04_10_Damage_Water_Supply_1967
92			04_10_Damage_Water_Supply_Avila
93			04_10_Damage_Water_Supply_Potential_Liquefaction_1812
94			04_10_Damage_Water_Supply_Potential_Liquefaction_1878
95			04_10_Damage_Water_Supply_Potential_Liquefaction_1967
96			04_10_Damage_Water_Supply_Potential_Liquefaction_Avila
97			04_12_Flooding_DebrisFlow
98		12_Flooding_DebrisFlow	04_12_Flooding_DebrisFlow
99		13_Landslide_Slope	04_13_LandslideSlope_Risk

**Table S20.1.1.4 Physical Model**

**01\_Study\_Area**

Theme: Study Area – five municipality

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
ENTIDAD2	Character	20		Nombre de la entidad Federal	Federal Entity Name
ENTIDAD1	Character	10		Código de ADMC	Code for ADMC
AREA	Numérico	15	3	Área del municipio en hectáreas	Municipality Area - hectares
PERIMETER	Numérico	15	3	Perímetro del municipio en metros	Municipality Perimeter - meter
POP_AJUS	Numérico	10	3	Población del censo 2001	Census Poblacion 2001

**02\_Working\_Map\_5000**

Theme: Base Map 1:5000 – All Layers

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Hydrology 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Road 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
LENGTH	Numerical	5	3	Longitud	length
DESCRIPTIO	Character	50		Descripción de la capa	Description

## 04\_Base\_Map\_25000

Theme: Base Map 1:25000 – All Layers

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Hydrology 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Road 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
TRANSRED	Character	8		Código único	Code
ID	Character	8		Código del tramo	Span Code
LENGTH	Numerical	8	6	Longitud del tramo	Span Length
NVIA	Character	50		Nombre de la vía	Road Name
TRAMO	Character	50		Nombre del Tramo	Span Name
NMUN	Character	50		Nombre del Municipio	Municipality Name
SECTOR	Character	50		Nombre del Sector	Sector Name
NODOA	Character	6		Nodo de inicio	Start Node
NODOB	Character	6		Nodo final	End Node
CLASE	Character	15		Tipo de vía	Road Type
NIVEL	Character	2		Nivel de jerarquía de la vía	Road Hierarchy Level

SUPERDIST	Character	2		Super distrito	Super district
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## 07\_Contour\_Lines

Theme: Contour Lines of El Avila – 1954 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
DESCRIPTIO	Character	50		Descripción de capa	Description

Theme: Major Contour Lines 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	25		Descripción de la capa	Description

Theme: Minor Contour Lines 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	25		Descripción de la capa	Description

Theme: Contour Lines 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	25		Descripción de la capa	Description

## 10\_Road\_Network

Theme: Bridge 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Center Island of Road 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code

ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Road 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ROAD_NAME	Character	50		Nombre de la vía	Road name
TYPE	Character	50		Tipo de vía	Type
LENGTH	Numerical	5	3	Longitud	length

Theme: Paved Road 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Secondary Road 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Road 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
TRANSRED	Character	8		Código único	Code
ID	Character	8		Código del tramo	Span Code
LENGTH	Numerical	8	6	Longitud del tramo	Span Length
NVIA	Character	50		Nombre de la vía	Road Name
TRAMO	Character	50		Nombre del Tramo	Span Name
NMUN	Character	50		Nombre del Municipio	Municipality Name
SECTOR	Character	50		Nombre del Sector	Sector Name
NODOA	Character	6		Nodo de inicio	Start Node
NODOB	Character	6		Nodo final	End Node
CLASE	Character	15		Tipo de vía	Road Type
NIVEL	Character	2		Nivel de jerarquía de la vía	Road Hierarchy Level
SUPERDIST	Character	2		Super distrito	Super district

Theme: Path Road 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Paved Road 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Secondary Road 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Tunnel 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description
LENGTH	Numerical	5	3	Longitud	length

## 11\_Hydrologic\_Network

Theme: Hydrology 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Stream 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
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LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Channel 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Check Dam 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Coast line 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Lagoon 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Main Rivers and Streams 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description

Theme: Reservoir 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Secondary Rivers and Streams 1:25000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Channel 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description

Theme: Guaire River 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description

Theme: Main Stream 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description

Theme: Lagoon 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de la capa	Layer Description

Theme: Secondary Rivers and Streams 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de capa	Description
LENGTH	Numerical	5	3	Longitud	length

Theme: Stream Order 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	2		Orden de lquebradas	Stream Order
LENGTH	Numerical	5	3	Longitud	length

Theme: Tanks and Pools 1:5000

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	50		Código de la capa	Layer Code
ELEVATION	Numerical	8	3	Elevación en metros	Elevation - meters
DESCRIPTIO	Character	50		Descripción de capa	Layer Description

## 12\_Administrative\_Boundary

Theme: Municipality Boundary

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
ENTIDAD	Character	25		Nombre de Entidad Federal	Province Name
MUNICOD	Character	6		Código de municipio	Municipality Code
MUNICIPAL	Character	2		Identificador de municipio	Municipality Identifier
PERIMETER	Numerical	15	3	Perímetro del municipio en metros	Municipality Perimeter - meter
HECTARES	Numerical	15	3	Área del municipio en hectáreas	Municipality Area - hectares

Theme: Parroquia Boundary

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARROQ	Character	6		Identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
PERIMETER	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter

HECTARES	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
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#### Theme: Parroquia Boundary by Population

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
COD_ENT	Character	2		Código de entidad federal	Province Code
COD_MUN	Character	2		Código de municipio	Municipality Code
COD_PAR	Character	2		Código de parroquia	Parroquia Code
POPULATION	Numerical	8	0	Población	Population
HECTARES	Numerical	15	3	Área del parroquia en hectáreas	Parroquia Area - hectares
DENSITY	Numerical	7	3	Densidad de población	Density

### 13\_Census\_Division

#### Theme: Segments

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
STRING	Character	3		Nombre original de parroquia	Segment Original Name
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
SEGMENT_ID	Character	10		Código del Segmento	Segment Code
HECTARES	Numerical	15	3	Área del Segmento en hectáreas	Segment Area - hectares
POPULATION	Numerical	8	0	Población por parroquia	Population by Parroquia
POP_AJ	Numerical	12	3	Población ajustada	Adjusted Population
POP_DENS	Numerical	7	3	Densidad población	Population Density

### 14\_Microzone

#### Theme: Microzone

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COUNT	Numerical	5	0	Contador	Count
CODE	Character	25		Código de Microzona	Microzone Code
NAME	Character	50		Nombre de Microzona	Microzone Name
USE	Character	25		Use de la tierra	Landuse
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PERIMETER	Numerical	15	3	Perímetro de Microzona en metros	Microzone Perimeter - meter

HECTARES	Numerical	15	3	Área de Microzona en hectáreas	Microzone Area - hectares
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Theme: UDU Inventory

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Numerical	4	0	Identificador	Identifier
UDU_CODE	Character	10		Código de udu	UDU Code
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
CODIGO	Character	6		Código de parroquia	Parroquia Code
MUNICIPIO	Character	2		Código de municipio	Municipality Code
ZONEID	Character	5		Código de zona	Zone Code
PERIMETER	Numerical	15	3	Perímetro de UDU en metros	UDU Perimeter - meter
HECTARES	Numerical	15	3	Área de UDU en hectáreas	UDU Area - hectares

## 17\_Soil\_Conditions

Theme: Alluvium Classification

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ALLUVION	Character	15		Clasificación de aluvión	Alluvium Classification
PERIMETER	Numerical	15	3	Perímetro del municipio en metros	Municipality Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

Theme: Bore Hole

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
BOREHOLE_I	Character	6		Código de perforación	Bore Hole Code
X	Numerical	10	2	Este Loma Quinta	Loma Quinta Easting
Y	Numerical	10	2	Norte Loma Quinta	Loma Quinta Northing
COLUMN	Character	6		Columna del Mallado de perforación	Mesh Column
ROW	Character	6		Fila del Mallado de perforación	Mesh Row
X_LC	Numerical	15	2	UTM Este La Canoa	La Canoa Easting UTM
Y_LC	Numerical	15	2	UTM Norte La Canoa	La Canoa Northing UTM
COLROW	Character	15		Código del mallado	Mesh Code

Theme: Earthquake Mesh

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
MESH_CANOA	Character	8		Código de malla	Mesh Code
ID	Numerical	6	0	Identificador de mapa de pendiente	Slope Map Identifier
SLOPE_DEG	Character	10		Pendiente – Grado	Slope - Degree

Theme: Soil Depth

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LOWER	Numerical	8	3	Profundidad del Fondo	Bottom Depth
UPPER	Numerical	8	3	Profundidad del Tope	Top Depth

## 18\_Ground\_Water

Theme: Ground Depth Classification

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	10		Rango de profundidad	Depth Range

Theme: Static Level

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LEVEL	Numerical	6	0	Nivel Estático	Static Level

Theme: Ground Water Boundary

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
UNDERGROUND	Character	10		Descripción	Description

Theme: Ground Water Contour Lines

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
HIGH	Numerical	6	0	Curvas de Nivel de Agua subterránea	Ground Water Contour Lines

Theme: Ground Water Boundary

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
UNDERGROUND	Character	10		Descripción	Description

## 19\_Geology

Theme: Geology

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
FORMACION	Character	150		Formación Geológica	Geologic Formation
LOCALIDAD	Character	150		Descripción de la ubicación	Location Description
EXTENSION	Character	150		Extensión	Extention
LITOLOGIA	Character	150		Litología	Litology
ESPEJOR	Character	150		Espesor de la formación	Formation Weight
CONTACTO	Character	150		Contacto	Contact
EDAD	Character	150		Edad Geológica	Geologic Age
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter

HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares
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## 20\_Lineaments

Theme: Lineaments

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
TYPE	Character	50		Tipo de lineamiento	Lineament Type
LENGTH	Numerical	5	3	Longitud	length

## 23\_Landslide

Theme: Landslide

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de deslizamiento	Landslide Code
LEVEL	Character	4		Código de deslizamiento	Landslide Code
DESCRIPTIO	Character	6	3	Descripción de deslizamiento	Landslide Description
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

## 24\_Potential\_Sediment\_Deposits

Theme: Active Collapse (Bared Area)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de derrumbe activo	Active Collapse Code
HECTARES	Numerical	15	3	Área del derrumbe activo en hectáreas	Active Collapse Area - hectares
PERIMETER	Numerical	15	3	Perímetro del derrumbe activo en metros	Active Collapse Perimeter - meter

Theme: All Potential Sediment Deposits

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Descripción de depósito de sedimento potencial	Potential Sediment Deposit Description

Theme: New Collapse Covered with Grass

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de nuevo derrumbe cubierto con hierbas	New Collapse Covered with Grass Code
HECTARES	Numerical	15	3	Área de nuevo derrumbe cubierto con hierbas en hectáreas	New Collapse Covered with Grass Area - hectares
PERIMETER	Numerical	15	3	Perímetro de nuevo derrumbe cubierto con hierbas en metros	New Collapse Covered with Grass Perimeter - meter

Theme: New Collapse under Tree

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de nuevo derrumbe debajo del árbol	New Collapse under Tree Code
HECTARES	Numerical	15	3	Área de nuevo derrumbe debajo del árbol en hectáreas	New Collapse under Tree Area - hectares
PERIMETER	Numerical	15	3	Perímetro de nuevo derrumbe debajo del árbol en metros	New Collapse under Tree Perimeter - meter

Theme: Old Collapse Covered with Tree

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de viejo derrumbe cubierto con árbol	Old Collapse Covered with Tree Code
HECTARES	Numerical	15	3	Área de viejo derrumbe cubierto con árbol en hectáreas	Old Collapse Covered with Tree Area - hectares
PERIMETER	Numerical	15	3	Perímetro de viejo derrumbe cubierto con árbol en metros	Old Collapse Covered with Tree Perimeter - meter

Theme: Old Collapse without Tree

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de viejo derrumbe sin árbol	Old Collapse Without Tree Code
HECTARES	Numerical	15	3	Área de viejo derrumbe sin árbol en hectáreas	Old Collapse Without Tree Area - hectares
PERIMETER	Numerical	15	3	Perímetro de viejo derrumbe sin árbol en metros	Old Collapse Without Tree Perimeter - meter

Theme: Unstable Sediment

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de sedimento inestable	Unstable sediment Code
ELEVATION	Numerical	8	3	Elevación sedimento inestable	Unstable sediment elevation, meters
HECTARES	Numerical	15	3	Área de viejo derrumbe sin árbol en hectáreas	Unstable sediment Area - hectares
PERIMETER	Numerical	15	3	Perímetro de viejo derrumbe sin árbol en metros	Unstable sediment Perimeter - meter

## 25\_Watersheds

Theme: Sediment Study Area

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Capa área de estudio de sedimento	Sediment study area layer
PERIMETER	Numerical	15	3	Perímetro de estudio de sedimento en metros	Sediment study Perimeter - meter
HECTARES	Numerical	15	3	Área de estudio de sedimento en hectáreas	Sediment study Area - hectares



Theme: Flood Study Area

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Capa de inundación	Flood layer
ELEVATION	Numerical	8	3	Elevación de área estudio de inundación	Flood Study Area elevation, meters

Theme: Potential Sediment

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Capa de sedimento potencial	Potential sediment layer
ELEVATION	Numerical	8	3	Elevación de sedimento potencial	Potential sediment elevation, meters

Theme: Potential Sediment Subcatchment

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Capa de sub-cuenca de sedimento potencial	Potential sediment Subcatchment layer
PERIMETER	Numerical	15	3	Perímetro de sub-cuenca de sedimento potencial en metros	Potential sediment Subcatchment Perimeter - meter
HECTARES	Numerical	15	3	Área de sub-cuenca de sedimento potencial en hectáreas	Potential sediment Subcatchment - hectares

Theme: Unstable Sediment

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	4		Código de sedimento inestable	Unstable sediment code
ELEVATION	Numerical	8	3	Elevación sedimento inestable	Unstable sediment Elevation, meters

## 32\_Infrastructure\_Bridges

Theme: Viaduct

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	4		Código de viaducto	Viaduct code
NAME	Character	25		Nombre del viaducto	Viaduct name
LENGTH	Numerical	8	3	Longitud de viaducto, metros	Viaduct length, meters

Theme: Bridge

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	4		Código de puente	Bridge code
GROUNTYPE	Numerical	3	1	Tipo de terreno	Ground type
LIQUEFACT	Numerical	3	1	Licuefacción	Liquefaction
GIRDERTYPE	Numerical	3	1	Tipo de viga maestra	Girder type
BERINGTYP	Numerical	3	2	Tipo de soporte	Bearing type

MAXHEIGHT	Numerical	3	2	Máxima altura de estribo o pilar	Maximum height of abutment or pier
NUMBERSPAN	Numerical	3	2	Numero de tramos	Number spans
MINWIDTH	Numerical	3	2	Ancho mínimo del asiento del puente	Minimum bridge seat width
INTENSITY	Numerical	3	1	PGA – Máxima intensidad japonesa	PGA – Japanese earthquake intensity
FNDWORK	Numerical	3	1	Trabajo Fundación	Foundation work
MATERIALS	Numerical	3	1	Materiales de estribo y pilar	Materials of abutment and pier
TOTALSCORE	Numerical	3	1	Puntaje total	Total score

### 33\_Infrastructure\_Metro\_Line

Theme: Metro Line

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	20		Nombre de la línea del metro	Metro line name
LENGTH	Numerical	8	3	Longitud de la línea del metro	Metro line length, meters

Theme: Metro station

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código de la estación del metro	Metro station code
NOMBRE	Character	25		Nombre de la estación del metro	Metro station name
DIRECCION	Character	50		Dirección de la estación del metro	Metro station address

### 35\_Lifeline\_Water

Theme: Water Supply

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	15		Código de la red de acueducto	Water supply code
DIAMETER	Character	15		Código del diámetro de tubería	Diameter code
VALUES	Numerical	5	2	Diámetro en pulgadas	Diameter in inches
LENGTH	Numerical	10	3	Longitud de la tubería	Pipe length
DIAM_MM	Numerical	5	2	Diámetro en milímetros	Diameter in millimeters
DIAM_CL	Character	2		Tipo de diámetro	Diameter Type

Theme: Tank and Pumping Station

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	4		identificador de tanque y estación de bombeo	Tank and pumping station identifier
E_B	Character	4		Código de estación de bombeo	Pumping station code
E	Character	4		Código de tanque	Tank code

HEIGHT	Numerical	10	2	Altura de tanque y estación de bombeo	Tank and pumping station height
STATION_NA	Character	50		Nombre de tanque y estación de bombeo	Tank and pumping station name

### 36\_Lifeline\_Telecommunication\_CANTV

Theme: Service Area CANTV

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	25		Nombre de la área de servicios	Service area code
NUMBER	Character	15		identificador del área de servicios	Service area identifier
SUBT	Numerical	5	2	Red subterránea	Underground network
AEREO	Numerical	10	3	Red aérea	Aerial network
ENTERRADO	Numerical	5	2	Red enterrada	Buried network
CANALIZADO	Character	2		Red canalizada	Diameter Type
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter

### 39\_Public\_Facilities

Theme: Police Station

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código de estación de policía	Police station code
NOMBRE	Character	50		Nombre de estación de policía	Police station Name
DIRECCION	Character	50		Dirección de estación de policía	Police station address
CODE	Character	5		identificador de estación de policía	Police station identifier
TYPE	Character	25		Tipo de estación de policía	Police station type

Theme: Square

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código de plaza	Square code
NOMBRE	Character	50		Nombre de plaza	Square Name
DIRECCION	Character	50		Dirección de plaza	Square address

Theme: Gubernamental building

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address

Theme: Sport building

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address

Theme: Fire Station

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
CODE	Character	5		identificador de estación de bomberos	Fire station identifier

Theme: Main gubernanment building

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
ID	Character	50		identificador	Identifier

Theme: National gubernanment building

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
TYPE	Character	25		Tipo	type
CODE	Character	5		Identificador	Identifier

**40\_Health\_Facilities**

Theme: Health Facilities

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
TYPE	Character	30		Tipo	type

## 41\_Educational\_Facilities

Theme: Basic School Facilities

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address

Theme: Technical and University Facilities

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
TYPE	Character	3		Tipo	Type

## 42\_Open\_Space

Theme: Open Space

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	35		Descripción	Description

## 45\_Hazardous\_Materials\_Facilities

Theme: Gasoline Station

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODIGO	Character	15		Código	Code
NOMBRE	Character	50		Nombre	Name
DIRECCION	Character	50		Dirección	Address
TYPE	Character	3		Tipo	Type

## 46\_LandUse

Theme: Landuse \_ADMC (General)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODE	Character	15		Código	Code
NAME	Character	15		Nombre	Name
USE	Character	25		Uso de la Tierra	Landuse
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code

MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
PERIMETER	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

Theme: Landuse Caracas Valley

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
SOURCE	Character	15		Fuente de información	Source
USE	Character	25		Uso del suelo	Landuse
CLASSIFY	Character	25		Tipo	Type
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter

Theme: Landuse Avila Sector

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COD_USO_GE	Character	15		Código de uso general	General Landuse Code
USO_GENERA	Character	25		Uso general	General Landuse
COD_USO_ES	Character	25		Código de uso específico	Particular Landuse Code
USO_ESPECI	Numerical	15	3	Uso específico	Particular Landuse
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

## 47\_Geotechnical

Theme: Alluvial Boundary

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	4		Identificador	Identifier

Theme: Landslide Address

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	4		Identificador	Identifier

Theme: Alluvium Class

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ALLUVIONS_FC	Character	20		Tipo	Type
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

## 02\_Hazard

### 02\_MMI\_1812\_Earthquake\_Model

Theme: Earthquake Model MMI 1812

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
MMI1812f	Numerical	6	3	Intensidad Modificada de Mercalli 1812	Modified Mercalli Intensity 1812

### 03\_MMI\_1967\_Earthquake\_Model

Theme: Earthquake Model MMI 1967

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
MMI1967o	Numerical	6	3	Intensidad Modificada de Mercalli 1967	Modified Mercalli Intensity 1967

### 04\_MMI\_1878\_Earthquake\_Model

Theme: Earthquake Model MMI 1878

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
MMI1878	Numerical	6	3	Intensidad Modificada de Mercalli 1878	Modified Mercalli Intensity 1878

### 05\_MMI\_Avila\_Fault\_Model

Theme: Earthquake Model MMI Avila Fault Model

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
MMIAVILA2	Numerical	6	3	Intensidad Modificada de Mercalli Modelo de Falla Avila	Modified Mercalli Intensity Avila Fault Model

### 06\_PGA\_1812\_Earthquake\_Model

Theme: Earthquake Model PGA 1812

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGA1812f	Numerical	6	3	Aceleración Pico del suelo en cm/seg <sup>2</sup> 1812	Peak Ground Acceleration in cm/sec <sup>2</sup> 1812
PGA_G	Numerical	3	2	Aceleración Pico del suelo en gravedad "g" 1812	Peak Ground Acceleration in gravity "g" 1812

## 07\_PGA\_1878\_Earthquake\_Model

Theme: Earthquake Model PGA 1878

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGA1878	Numerical	6	3	Aceleración Pico del suelo en cm/seg <sup>2</sup> 1878	Peak Ground Acceleration in cm/sec <sup>2</sup> 1878
PGA_1878_G	Numerical	3	2	Aceleración Pico del suelo en gravedad "g" 1878	Peak Ground Acceleration in gravity "g" 1878

## 08\_PGA\_1967\_Earthquake\_Model

Theme: Earthquake Model PGA 1967

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGA1967O	Numerical	6	3	Aceleración Pico del suelo en cm/seg <sup>2</sup> 1967	Peak Ground Acceleration in cm/sec <sup>2</sup> 1967
PGA_1967_G	Numerical	3	2	Aceleración Pico del suelo en gravedad "g" 1967	Peak Ground Acceleration in gravity "g" 1967

## 09\_PGA\_Avila\_Fault\_Model

Theme: Earthquake Model PGA Avila Fault Model

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGA AVILA2	Numerical	6	3	Aceleración Pico del suelo en cm/seg <sup>2</sup> Modelo de Falla Avila	Peak Ground Acceleration in cm/sec <sup>2</sup> Avila Fault Model
PGA_AVILA	Numerical	3	2	Aceleración Pico del suelo en gravedad "g" Modelo de Falla Avila	Peak Ground Acceleration in gravity "g" Avila Fault Model

## 10\_PGV\_1812\_Earthquake\_Model

Theme: Earthquake Model PGV 1812

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGV1812f	Numerical	6	3	Velocidad Pico del suelo en cm/seg 1812	Peak Ground Velocity in cm/sec 1812

## 11\_PGV\_1878\_Earthquake\_Model

Theme: Earthquake Model PGV 1878

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGV1878F	Numerical	6	3	Velocidad Pico del suelo en cm/seg 1878	Peak Ground Velocity in cm/sec 1878



## 12\_PGV\_1967\_Earthquake\_Model

Theme: Earthquake Model PGA 1967

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGV1967O	Numerical	6	3	Velocidad Pico del suelo en cm/seg 1967	Peak Ground Velocity in cm/sec 1967

## 13\_PGA\_Avila\_Fault\_Model

Theme: Earthquake Model PGV Avila Fault Model

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
PGVAVILA2	Numerical	6	3	Velocidad Pico del suelo en cm/seg Modelo de Falla Avila	Peak Ground Velocity in cm/sec Avila Fault Model

## 14\_Flood\_Hazard

### 100\_Meters\_Grid

Theme: East grid (100 meters)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODE	Character	15		Código del mallado	Mesh Code
X	Numerical	15		UTM Este La Canoa	La Canoa Easting UTM
Y	Numerical	15		UTM Norte La Canoa	La Canoa Northing UTM

Theme: West grid (100 meters)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODE	Character	15		Código del mallado	Mesh Code
X	Numerical	15		UTM Este La Canoa	La Canoa Easting UTM
Y	Numerical	15		UTM Norte La Canoa	La Canoa Northing UTM

### 30\_Meters\_Grid

Theme: Agua Maíz Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth

500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Anauco Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Caurimare Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Chacaíto Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Caroata Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth

100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Catuche Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Mariperez Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Quebrada Seca Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

Theme: Sebucán Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code

10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

#### Theme: Tocomo Stream (Depth and Velocity)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID_NEW	Character	15		Código del mallado	Mesh Code
10YRDEPTH	Numerical	4	2	Profundidad 10 años	10 years Depth
100YRDEPTH	Numerical	4	2	Profundidad 100 años	100 years Depth
500YRDEPTH	Numerical	4	2	Profundidad 500 años	500 years Depth
10YRVEL	Numerical	4	2	Velocidad 10 años	10 years Velocity
100YRVEL	Numerical	4	2	Velocidad 100 años	100 years Velocity
500YRVEL	Numerical	4	2	Velocidad 500 años	500 years Velocity

### 03\_Vulnerability

#### 02\_Social\_Vulnerability

#### Theme: Social Zone (Zone Code, Polygons)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ZONE_CODE	Character	3		Código de la zona	Zone Code

#### Theme: Social Vulnerability (Total)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ZONA	String	8	NA	Zona de vulnerabilidad Social	Social Vuln. Zone
TOTAL	Numeric	5	2	Indice de Vulnerabilidad Total	Total Vulnerability Index
FAMILY	Numeric	5	2	No. de Familias / Vivienda	No. of Family/House
PETS	Numeric	5	2	No. de Mascotas / Vivienda	No. of pets/House
EDAD	Numeric	5	2	Edad y Discapacidad	Age and Disability
EDUCATION	Numeric	5	2	Nivel educativo	Education Level
EMPLOY	Numeric	5	2	Tipo de empleo	Type of Employment
LOC_EMPLOY	Numeric	5	2	Ubicación del empleo	Location of Employment
INCOME	Numeric	5	2	Ingresos Familiares	Family Income
INSURANCE	Numeric	5	2	Seguros contratados	Insurances
NO_STORY	Numeric	5	2	No.de Pisos / Vivienda.o Edif.	No. of Stories/house
NO_EXIT	Numeric	5	2	No. de Salidas / Vivienda.o Edif.	No. of exits/house
PATIO	Numeric	5	2	Patios o Estacionamientos	patio and parking
TYPE_PROP	Numeric	5	2	Tipo de propiedad	type of property
ALERTS	Numeric	5	2	Alertas Comunitarias	Community alerts

COMP_USE1	Numeric	5	2	Uso Complementario Favorable	Favorable complementary use
COMP_USE2	Numeric	5	2	Uso Complementario negativo	Unfavorable complementary use
FACILITY	Numeric	5	2	Equipamiento preventivo	Preventive Facility
EXPERI	Numeric	5	2	Experiencias en desastres	Experience in Disaster
CONS1	Numeric	5	2	Conciencia de Vulnerabilidad	Awareness of Vulnerability
CONS2	Numeric	5	2	Conciencia sobre Causas	Awareness of Causes
INFO	Numeric	5	2	Infomación recibida y frecuencia	Received information and frequency
TRAIN	Numeric	5	2	Entrenamiento recibido	Training Received
WILLING	Numeric	5	2	Disposición a mudanza preventiva	Willingness to move

Theme: Social Zone (Zone Code, Points)

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	3		identificador de la zona	Identifier Code

**04\_RISK**

**01\_Building\_Damage\_Ratio\_1812\_Total**

Theme: Building Damage Ratio 1812 Total by Mesh

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
TOBUBYMESH	Numerical	6	0	Total de edificaciones por mallado	Total Buildings by mesh
BUDAME1812	Numerical	6	0	Daños de edificación 1812	Building Damage 1812
DRME_1812	Numerical	6	3	Proporción de daños 1812	Damage Ratio 1812

Theme: Building Damage Ratio 1812 Total by Microzone

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODE_MZ	Character	25		Código de Microzona	Microzone Code
TOBUMZ	Numerical	6	0	Total de edificaciones por microzona	Total Buildings by microzone
BUDAMZ1812	Numerical	6	0	Daños de edificación 1812	Building Damage 1812
DRMZ_1812	Numerical	6	3	Proporción de daños de edificación 1812	Building Damage Ratio 1812
PERIMET_MZ	Numerical	15	3	Perímetro del Parroquia en metros	Microzone Perimeter - meter
HECTARE_MZ	Numerical	15	3	Área de Microzona en hectáreas	Microzone Area - hectares

Theme: Building Damage Ratio 1812 Total by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code

PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DABUPA1812	Numerical	6	0	Daños de edificación por parroquia -1812	Building Damage by Parroquia - 1812

## 02\_Building\_Damage\_Ratio\_1967\_Total

Theme: Building Damage Ratio 1967 Total by Mesh

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
TOBUBYMESH	Numerical	6	0	Total de edificaciones por mallado	Total Buildings by mesh
BUDAME1967	Numerical	6	0	Daños de edificación 1967	Building Damage 1967
DRME_1967	Numerical	6	3	Proporción de daños 1967	Damage Ratio 1967

Theme: Building Damage Ratio 1967 Total by Microzone

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
CODE_MZ	Character	25		Código de Microzona	Microzone Code
TOBUMZ	Numerical	6	0	Total de edificaciones por microzona	Total Buildings by microzone
BUDAMZ1967	Numerical	6	0	Daños de edificación 1967	Building Damage 1967
DRMZ_1967	Numerical	6	3	Proporción de daños de edificación 1967	Building Damage Ratio 1967
PERIMET_MZ	Numerical	15	3	Perímetro del Parroquia en metros	Microzone Perimeter - meter
HECTARE_MZ	Numerical	15	3	Área de Microzona en hectáreas	Microzone Area - hectares

Theme: Building Damage Ratio 1967 Total by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares

				hectáreas	
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DABUPA1967	Numerical	6	0	Daños de edificación por parroquia -1967	Building Damage by Parroquia - 1967

### 03\_Building\_Damage\_Ratio\_1812\_High\_Building

Theme: High Building Damage Ratio 1812 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DRHBP1812	Numerical	6	0	Proporción alta de daños de edificación por parroquia -1812	High Building Damage by Parroquia - 1812

### 04\_Building\_Damage\_Ratio\_1967\_High\_Building

Theme: High Building Damage Ratio 1967 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		Identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DRHBP1967	Numerical	6	0	Proporción alta de daños	High Building Damage by

				de edificación por parroquia -1812	Parroquia - 1967
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### 05\_Building\_Damage\_Ratio\_1812\_Low\_Building

Theme: Low Building Damage Ratio 1812 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DRLBP1812	Numerical	6	0	Proporción baja de daños de edificación por parroquia -1812	Low Building Damage by Parroquia - 1812

### 06\_Building\_Damage\_Ratio\_1967\_Low\_Building

Theme: Low Building Damage Ratio 1967 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
DRLBP1967	Numerical	6	0	Proporción baja de daños de edificación por parroquia -1967	Low Building Damage by Parroquia - 1967



## 07\_Human\_Casualty\_1812

Theme: Human Casualty 1812 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		Identificador municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
HDEATH1812	Numerical	6	0	Muertos por parroquia - 1812	Death by Parroquia - 1812
HINJUR1812	Numerical	6	0	Heridos por parroquia - 1812	Injuries by Parroquia - 1812

## 08\_Human\_Casualty\_1967

Theme: Human Casualty 1967 by Parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARROQ_ID	Character	6		Código de parroquia	Parroquia Code
PARR_CODE	Character	6		Identificador de parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
MUNI_CODE	Character	2		identificador de municipio	Municipality Identifier
PERIMET_P	Numerical	15	3	Perímetro del Parroquia en metros	Parroquia Perimeter - meter
HECTARES_P	Numerical	15	3	Área del Parroquia en hectáreas	Parroquia Area - hectares
POPULATION	Numerical	8	0	Población	Population
ADJ_POP	Numerical	12	3	Población ajustada	Adjusted Population
TOTBUIL_PA	Numerical	6	0	Total de edificaciones por parroquia	Total Buildings by parroquia
HDEATH1967	Numerical	6	0	Muertos por parroquia - 1967	Death by Parroquia - 1967
HINJUR1967	Numerical	6	0	Heridos por parroquia - 1967	Injuries by Parroquia - 1967

## 10\_Damage\_WaterSupply

Theme: Water Supply Damage

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
COLROW	Character	15		Código del mallado	Mesh Code
C2	Numerical	4	2	Material de tubería	Pipe material
C3	Numerical	4	2	Diámetro de tubería	Pipe diameter
L	Numerical	4	2	Longitud de tubería - Km	Pipe length - Km
R1_1967	Numerical	8	4	Proporción de estándar de daños (puntos dañados/km) 1967	Standard damage ratio (damaged points/km) 1967
R1_1812	Numerical	8	4	Proporción estándar de daños (puntos dañados/km) 1812	Standard damage ratio (damaged points/km) 1812
R1_1878	Numerical	8	4	Proporción estándar de daños (puntos dañados/km) 1967	Standard damage ratio (damaged points/km) 1878
R1_AVILA	Numerical	8	4	Proporción estándar de daños (puntos dañados/km) AVILA	Standard damage ratio (damaged points/km) AVILA
ND_1967	Numerical	8	4	Proporción de daños (puntos dañados/km) 1967	Damage ratio (damaged points/km) 1967
ND_1812	Numerical	8	4	Proporción de daños (puntos dañados/km) 1812	Damage ratio (damaged points/km) 1812
ND_1878	Numerical	8	4	Proporción de daños (puntos dañados/km) 1878	Damage ratio (damaged points/km) 1878
ND_AVILA	Numerical	8	4	Proporción de daños (puntos dañados/km) AVILA	Damage ratio (damaged points/km) AVILA
PL_1967	Numerical	4	2	Potencial de la licuefacción - 1967	Liquefaction potencial - 1967
PL_1812	Numerical	4	2	Potencial de la licuefacción - 1812	Liquefaction potencial - 1812
PL_1878	Numerical	4	2	Potencial de la licuefacción - 1878	Liquefaction potencial - 1878
PL_AVILA	Numerical	4	2	Potencial de la licuefacción - AVILA	Liquefaction potencial - AVILA
C1_1967	Numerical	4	2	Factor de corrección - 1967	Correction factor - 1967
C1_1812	Numerical	4	2	Factor de corrección - 1812	Correction factor - 1812
C1_1878	Numerical	4	2	Factor de corrección - 1878	Correction factor - 1878
C1_AVILA	Numerical	4	2	Factor de corrección - AVILA	Correction factor - AVILA

## 12\_Flooding\_DebrisFlow

Theme: Agua de Maiz Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier

SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Anauco Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Caurimare Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Chacaíto Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Caroata Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Catuche Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code

MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Mariperez Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador del municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Sebucan Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso de la tierra	Landuse Code

Theme: Quebrada Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso tierra	Landuse Code

Theme: Tocomé Stream

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
ID	Character	5		Código de casa	House Code
QUEBRADA_I	Character	3		Código de quebrada	Stream Code
MUNICIPALI	Character	3		Identificador municipio	Municipality Identifier
SECTOR	Character	3		Sector	Sector
LANDUSE	Character	3		Código del uso tierra	Landuse Code

## 13\_Landslide\_Slope

### Theme: Risk and Hazard

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
LAYER	Character	5		Código de casa	House Code
CLASS_1	Character	3		Código de quebrada	Stream Code
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

### Theme: Houses

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
HOUSE_NUMB	Character	5		Código de casa	House Code

### Theme: Intersection house and parroquia

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
HOUSE_NUMB	Character	5		Código de casa	House Code
PARROQUIA	Character	50		Nombre del parroquia	Parroquia Name
PARR_CODE	Character	6		identificador parroquia	Parroquia Identifier
MUNICIPIO	Character	50		Nombre del municipio	Municipality Name
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

### Theme: Intersection house and Risk

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
HOUSE_NUMB	Character	5		Código de casa	House Code
LAYER	Character	5		Código de casa	House Code
CLASS_1	Character	3		Código de quebrada	Stream Code
PERIMETER	Numerical	15	3	Perímetro en metros	Perimeter - meter
HECTARES	Numerical	15	3	Área en hectáreas	Area - hectares

### Theme: Physical Structure and Physical Vulnerability Index

Column	Domain Type	Domain Length	Decimal	Description_Spanish	Description_English
Zone_code	String	8	NA	Zona de vulnerabilidad Social	Social Vuln. Zone
Vi_demo	Numeric	5	2	Índice de Vulnerabilidad por demografico	Demographic Vulnerability Index
Vi_econ	Numeric	5	2	Índice de Vulnerabilidad por economico	Economic Vulnerability Index
Vi_know	Numeric	5	2	Índice de Vulnerabilidad por conocimiento	Knowledge Vulnerability Index
Vi_comm	Numeric	5	2	Índice de Vulnerabilidad por la organizacion comunitaria	Community Organization Vulnerability Index

Vi_faci	Numeric	5	2	Indice de Vulnerabilidad por facilidad	Facility Vulnerability Index
Vi_total	Numeric	5	2	Indice de Vulnerabilidad Total	Total Vulnerability Index
Family	Numeric	5	2	No. de Familias / Vivienda	No. of Family/House
Pets	Numeric	5	2	No. de Mascotas / Vivienda	No. of pets/House
Edad	Numeric	5	2	Edad y Discapacidad	Age and Disability
Education	Numeric	5	2	Nivel educativo	Education Level
Employ	Numeric	5	2	Tipo de empleo	Type of Employment
Loc_employ	Numeric	5	2	Ubicación del empleo	Location of Employment
Income	Numeric	5	2	Ingresos Familiares	Family Income
Insurance	Numeric	5	2	Seguros contratados	Insurances
No_story	Numeric	5	2	No.de Pisos / Vivienda.o Edif.	No. of Stories/house
No_exit	Numeric	5	2	No. de Salidas / Vivienda.o Edif.	No. of exits/house
Patio	Numeric	5	2	Patios o Estacionamientos	patio and parking
Type_prop	Numeric	5	2	Tipo de propiedad	type of property
Alerts	Numeric	5	2	Alertas Comunitarias	Community alerts
Comp_use1	Numeric	5	2	Uso Complementario Favorable	Favorable complementary use
Comp_use2	Numeric	5	2	Uso Complementario negativo	Unfavorable complementary use
Facility	Numeric	5	2	Equipamiento preventivo	Preventive Facility
Experi	Numeric	5	2	Experiencias en desastres	Experience in Disaster
Cons1	Numeric	5	2	Conciencia de Vulnerabilidad	Awareness of Vulnerability
Cons2	Numeric	5	2	Conciencia sobre Causas	Awareness of Causes
Info	Numeric	5	2	Infomación recibida y frecuencia	Received information and frequency
Train	Numeric	5	2	Entrenamiento recibido	Training Received
Willing	Numeric	5	2	Disposición a mudanza preventiva	Willingness to move
Colrow	String	6	NA	Identificador de malla (Unidad de Simulacion de Terremoto)	Earthquake simulation unit grid ID
rank_A	Numeric	1	0	Indice de tasa de daño de edificio (1-5) en el caso de terremoto de 1967	Rate of Damage of buildings (1-5) for earthquake 1967
rank_B	Numeric	1	0	Indice de daño absoluto de edificio (1-5) en el caso de terremoto de 1967	Number of damage buildings (1-5) for earthquake of 1967
Rank_c1	Numeric	1	0	Rango de longitud de vialidad disponible desde 8m de ancho (1-5) en el caso de terremoto de 1967	Classification of disponible roads 8 m wide and more de terremoto de 1967
Rank_c2	Numeric	1	0	Rango de longitud de vialidad disponible desde 15m de ancho (1-5) en el caso de terremoto de 1967	Classification of disponible roads 15 m wide and more caso de terremoto de 1967
rank_D	Numeric	1	0	Rango de cobertura de espacio abiertos (1-5) en el caso de terremoto de 1967	Open spaces coverage rank (1-5) in 1967 earthquake case
rank_E1	Numeric	1	0	Rango de cobertura de evacuacion (1-5) en el caso de terremoto de 1967,caso c1	Evacuation coverage rank (1-5) in 1967 earthquake case, c1 case
rank_E2	Numeric	1	0	Rango de cobertura de	Evacuation coverage rank (1-5)

				evacuacion (1-5) en el caso de terremoto de 1967,caso c2	in 1967 earthquake case, c2 case
rank_F	Numeric	1	0	Rango de cobertura de reubicacion (1-5) en el caso de terremoto de 1967	Relocation coverage rank (1-5) in 1967 earthquake case
rank_G	Numeric	1	0	Vulnerabilidad Fisica (Integracion de Daños de edificaciones, vialidad, evacuacion), caso1	Physical Vulnerability (Building Damage Integration, road network, evacuation) case 1
rank_H	Numeric	1	0	Vulnerabilidad Fisica (Integracion de Daños de edificaciones, vialidad, evacuacion), caso2	Physical Vulnerability (Building Damage Integration, road network, evacuation) case 1
Ir_a	String	1	NA	Clasificacion de daños de edificacion en dos grupos (A, B)	Building Damage rank in two groups (A, B)
Ir_e1	String	1	NA	Clasificacion de cobertura de evacuacion en dos grupos (A, B), caso1	Evacuation Coverage Rank in two groups (A, B) case 1
Ir_e2	String	1	NA	Clasificacion de cobertura de evacuacion en dos grupos (A, B), caso2	Evacuation Coverage Rank in two groups (A, B) case 2
Ir_f	String	1	NA	Clasificacion de reubicacion en dos grupos (A, B)	Relocation rank in two groups (A, B)
Ir_1	String	3	NA	Combinacion de Ir_a + Ir_e1 + Ir_f	Combination of Ir_a + Ir_e1 + Ir_f
Ir_2	String	3	NA	Combinacion de Ir_a + Ir_e2 + Ir_f	Combination of Ir_a + Ir_e2 + Ir_f
Soc_VR	Numeric	1	0	Vulnerabilidad Social reclasificado, tres grupos	Total Social Vulnerability index rank from 1 to 3
Phy_VR	Numeric	1	0	Vulnerabilidad fisica, reclasificado, tres grupos	Total Physical Vulnerability index rank from 1 to 3
Soc_Phy_VR	String	2	NA	Vulnerabilidad Socio fisico integrado	Integrated Sociophysical Vulnerability

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**DISASTER PREVENTION ADMINISTRATION  
/LEGISLATION**

*“Prevention is your duty and our responsibility,  
help us to obtain it”*

*José Fra Rey*



STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S21

DISASTER PREVENTION ADMINISTRATION/LEGISLATION

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## **S21 DISASTER PREVENTION ADMINISTRATION/LEGISLATION**

### **CHAPTER 1. LEGAL AND INSTITUTIONAL BASIS**

#### **1.1 Central Study Phase Issues and Recommendations**

This study and analysis seeks to establish the legal basis for disaster mitigation and preparedness planning in the Metropolitan District of Caracas (DMC). Further we wish to know if the DMC has adequate institutional arrangements to pursue effective actions in order to complete and implement a basic disaster preparedness plan. After examining the legal and institutional basis, some recommendations are made in regards to coordination between government units and specific actions needed to address disaster countermeasures.

The core findings are that sufficient legal basis does exist for disaster preparedness planning, but that the institutional arrangements need strengthening in terms of coordination, professional training, establishing agreements and capacity building with community level groups and public organizations that form the risk reduction and response system in Caracas. There is a growing awareness of disaster mitigation and preparedness as part of a more basic concept of overall societal risk reduction. The lack of plan guidelines from the national office of civil protection and administration of disasters in no way prevents the DMC from completing its own plan effort. The basic recommendation are (1) that more time and effort be spent at coordination as an operative methodology, as defined in this Chapter 2 of this report, and (2) in agreement making, and taking some action on each of the countermeasures presented in Section 6.

#### **1.2 How the Present System of Metropolitan Government Came into Being**

##### **1.2.1. Initial Decentralization: Overview**

The Metropolitan District of Caracas (*Distrito Metropolitano de Caracas* -DMC) began operations in 2000 as a newly formed type of two tiered government - metropolitan and municipal. It is a result of many years of effort at decentralization of government within the country. The decentralization of government functions has been occurring in Venezuela for the past 15 years, with state and local officials becoming directly responsible to their electorates. In 1989, Venezuela changed the system of state governors from a presidential appointment process to election by popular vote. At the same time the Organic Law of the Municipal Regime (15/06/1989) created a new level of government, that of the municipality. The municipal government unit is composed of a mayor, and a municipal council. Prior to the reform, the mayor was the president of the municipal council and not elected by popular vote.

The legal instrument that regulates the decentralization process is the law of Decentralization, Delimitation, and the Transfer of Public Power (LOD), approved in 1989. The LOD establishes the responsibilities of the national and regional governments and the progressive transfer of responsibilities to the regional governments. Transfers are done by agreements between the two levels of government, and the LOD establishes sources of funds to support the decentralization process. In 1996, a special economic funds law was enacted to transfer funds generated by mining and hydrocarbon activities to the regional governments. The new constitution of 1999 (article 167), redefines state level income to include a maximum of 20% of the national budget that can be transferred to the states and the Capital District (Area Del Distrito Metropolitana de Caracas).

The 1986 organic law divided the Federal District of Caracas into two municipalities: Vargas (the north face of the Avila Mountain to the Caribe) and Libertador. The municipality of Vargas became a state in 1998, and in 2000 the Metropolitan District of Caracas was created by a special law (Gaceta Oficial N° 36.906). The basis for this law was the work of a special presidential commission on the reform of the state (COPRE). The district is composed of five municipalities: Libertador (the former Federal District and the largest in population with nearly 2 million inhabitants), Chacao, Sucre, Baruta and El Hatillo. The later three municipalities are located in the State of Miranda. There is a mayor and a council for the entire metropolitan district and for each of the five municipalities.

The metropolitan district has responsibilities for providing gas, electricity, urban roads and regulations of transit, public transportation, civil protection, firefighters, coordination of public health with the municipalities, solid waste treatment and disposal, and the metropolitan parks and open spaces. There are revenue sources for the district, although these are limited. The national government and the metropolitan district government are the revenue sources for large infrastructure projects. These projects are usually funded through intermediary special funds and foundations. The national ministries, and the intermediary fund administrators, are the primary policy makers on how funds are distributed, and thus weakening the decentralization process at the district and municipal levels.

Four years is a short period to establish mature and well tested institutional arrangements between new forms of government. The metropolitan district government itself has undergone reorganization in an effort to establish the most effective administrative system given its fiscal and human resources. Newly formed government arrangements need time to mature and to define their scope of responsibilities and to gain trust from other stakeholder groups within the metropolitan area. Leadership and collective action are key elements in the long term success of this new government form. It will take time to establish a vision that reflects the social and political realities. Positive steps in defining the vision have been taken by the Alcaldia Metropolitana in its 2003 Metropolitan Urban Guidelines ordinance where specific mention of disaster prevention is made; and in the 2004

degree establishing the Metropolitan Disaster Prevention Coordinating Committee. Law by itself however, cannot make the vision happen. Only through building trust and confidence, and taking actions that lead to progress will be benefits of collective action are achieved.

### **1. 2. 2. The New Constitution of 1999**

At the time of the 1999 disaster in Caracas and the State of Vargas, the current legal and institutional framework related to civil protection and disaster mitigation did not exist. There was a Civil Defense Organization, which was closely linked to the Armed Forces. Therefore, in the events occurred in December 1999, the National Guard and the Army took control of emergency operations. An analysis of the response during those events will reflect the institutional framework existent at that time and not the current framework. The constitution of 1999 (article 332) creates an Organization of Civil Protection and Disaster Management. Because of this in November 2001, the decree with rank of law entitled “Law of the National Organization of Civil Protection and Disaster Administration” was promulgated. This new organization located in the Ministry of Interior and Justice, and is to be replicated in general functions in the states, and in the municipalities. It is separate from the military and is in charge of executing the National Policy of Civil Protection and Disaster Management, guarantee the coordination of inter-institutional efforts, the supply of material resources and equipment, the training of civil protection personnel, and develop educational programs, formal or informal, to prepare the citizens for disasters. The decree also calls for similar organizations at the state and municipal levels, with guidance given from the national office. In this manner, concurrency from the national level to the local level is achieved.

### **1. 2. 3. The Urbanization Processes**

The Metropolitan District of Caracas is composed of two spatial sectors: controlled development and uncontrolled development. By local estimates between 50 to 60 % of the housing is built in uncontrolled areas (called *barrios*). Nearly all commercial, industrial and office development occurs in the controlled areas. The uncontrolled housing sector is where the low wage families and most of the urban poor live. *Barrios* have been the traditional first location for illegal immigrants to the country, and therefore have diverse ethnic populations and some urban segregation from the population at large. There is some local retail locations and micro-industry in the *barrios*. The uncontrolled housing is located in areas prone to flood, in drainage basins heavily impacted by debris slides, and on hills where soils are weak, or in forested areas where trees are cut down, and this is causing changes in the watersheds. No local building codes, zoning, density, or land planning regulations are followed in the *Barrios*. Roads are narrow, and difficult to access with emergency vehicles. Most of the earthquake prone buildings are located in the *Barrios*. All of this creates risk in the urban area as a whole. People living in both sectors live are at risk. The risk is shown in the Figure 21-1.2.1.

This risk is socially constructed as the municipalities and the state governments have not stopped this process either through structural or non-structural measures. Being a social reality, the national government, through its ministries and intermediary organizations such as the national housing council (CONAVI), provide urban services to these areas and land titling. These actions, promote consolidation of the *barrios* into the municipal system. Some of these actions relocate families from high risk zones, although this is a very small part of the overall effort. *Barrio* improvement programs, in general, have not designed as risk reduction activities, although this is now changing as the concept of “risk reduction” is talked about at the ministry level. The only way to lower overall risk as a mitigation strategy is to control the expansion of newer and existing *Barrios*.

### **1.3 The Legal System as it Relates to Disaster Mitigation and Preparedness**

#### **1.3.1. Overview**

Public safety and security are guaranteed by the Venezuelan constitution, and municipal governments exercise considerable autonomy in establishing their own civil protection programs including local institutes that govern by ordinance. There are four levels to Venezuela’s legal structure. At the top of the structure is the 1999 constitution is composed of 350 articles that cover far reaching aspects of government structure, peoples’ rights, government obligations, and procedure. Under the constitution are the organic laws that set the framework for a particular subject area established in the constitution. At the same level are organic codes that formulate specific practices. The organic levels establish the guidelines for the ordinary laws that are found at the next level. The organic laws related to territorial management as most relevant to disaster management issues. Decrees with the force of law, which are statements of action taken by a particular government level, are also at the same level as ordinary laws. The bottom level is that of ordinances promulgated by the municipal councils. These are shown in Figure S21-1.3.1.

Each lower level generally conforms to the laws or decrees made at a higher level. It is a hypothetical pyramidal system built in on the concept of concurrency. The legal structure of laws as it relates to disaster mitigation and preparedness is shown in Figure S21-1.3.2 below. Relevant articles in various laws are listed by level. This provides the legal framework concurrency flow. In Figure S21-1.3.2, the main constitutional articles are cited at the national level, and the main articles are cited at the national level. The main articles from the organic laws are highlighted as are the major metropolitan ordinances. The disaster prevention and response responsibility has been clearly decentralized in Venezuela. The Office of the Metropolitan Mayor pointed out that disaster declaration is in the hands of the city councils regardless of the actions of the national assembly.



#### **1.4 The Structure of Laws Related to Citizen Safety and Disaster Management**

There are many articles in the constitution that relate to safety of the person, and the state responsibilities to address citizen security. In this study we have organized the relevant constitutional articles, organic laws and ordinary law into charts that indicates which level of government is impacted by the article and how they relate to which stage of the disaster management process. We asked the question, is the legal structure broad enough to promote disaster prevention for different types of disaster events. The answer is yes. The legal basis is shown in Table S21-1.4.1, Table S21-1.4.2, and Table S21-1.4.3. Table S21-1.4.1 sets down the legal basis for addressing an earthquake event, and provides descriptors for specific laws. Figures S21-1.3.2 and Table S21-1.4.1 organize the legal basis by disaster category and stage in the disaster response cycle, demonstrating that all stages are covered in the law.

The law that created the DMC establishes certain governmental responsibilities including preservation of public order and the security of people and property (Chapter II: 3); and civil protection and security and the preparation for emergency and disaster and providing services of the firefighters (Chapter VII: 6). The ADCM council passed the Urban Guidelines Ordinance, (September 2003) that again establishes the responsibility for efforts in disaster prevention. These actions include: citizen education on subject of the disasters (Art. 74), Early warning systems and attention to mitigation measures (Art 75), information systems for disasters (Art. 76), and disaster prevention, especially in barrio areas (Art. 77). On March 9, 2004, the DMC council issued a degree establishing a metropolitan disaster coordination committee for civil protection and administration of disasters (CCCPAD). The CCCPAD functions are: (1) to plan, coordinate and develop activities with other governmental agencies and (2) to provide and coordinate measures for prevention, education, and administration of disasters. Thus, there is sufficient basis for the departments and agencies of the DMC to proceed with disaster mitigation and prevention activities.

#### **1.5 Institutional Arrangements**

Venezuela has four tiers of government institutions. The higher the government level the broader the coverage, with the municipal levels being the lowest levels and the service provider within their set boundaries. These levels are shown in the Institutional Pyramid, Figure S21-1.5.1.

At the municipal and the MDC levels, the civil protection agencies (institutos de protección civil) are located under a secretariat of citizen security, which usually also supervises the police and firefighters. In the national assembly there is pending legislation of a new law of risk management that could encompass citizen security as part of a broader concept of lowering risk to the people. To implement the existing laws there are many different agencies, ministries, and organizations that have partial

responsibilities. A chart of these agencies and their relationship to the stages of the disaster management process is shown in Table S21-1.5.1.

**Table S21-1.4.1 Constitutional Articles Related to Disaster Mitigation and Prevention Planning**

Disaster Category	Stage	Government Level (Articles)				Main Articles Description
		National	Metropolitan	Municipal	Parroquial	
		<p><b>Mitigation</b></p> <p>2, 55, 127, 129, 134, 140, 156 (9 y 23), 185, 332 (4), 337, 338</p>	<p>168, 171, 178 (4), 182, 184, 185, 332 (4), 337, 338</p>	<p>168, 169, 170, 171, 178 (4), 182, 184, 255, 332</p>	<p>169, 173</p>	
<p><b>Rehabilitation</b></p> <p>2, 55, 115, 127, 128, 129, 140, 156 (9 y 23), 332 (4)</p>	<p>168, 171, 172, 178 (4), 182</p>	<p>168, 171, 173, 174, 178 (4), 182</p>	<p>169, 173, 182</p>			
<p><b>EARTH QUAKE SEDIMENTATION</b></p>	<p><b>Preparation for Response</b></p> <p>2, 55, 58, 102, 107, 108, 128, 131, 132, 143, 236 (7), 281, 283, 332, 337, 338, 339</p>	<p>168, 171, 178 (4), 281</p>	<p>168, 171, 178 (4), 281</p>	<p>169, 173, 182</p>		
	<p><b>Emergency Response</b></p> <p>2, 55, 58, 102, 107, 128, 131, 132, 143, 236 (7), 281, 283, 332 (4), 337, 338, 339</p>	<p>168, 171, 178 (4), 236 (7)</p>	<p>168, 171, 178 (4), 236 (7)</p>	<p>169, 173, 182</p>		

**Table S21-1.4.2 Organic Laws**

ORGANIC LAWS (ARTICLES)									
Disaster Category	Stage	Government Level	Declaration of States of Exception	Environment and Rules	Territorial Order	Municipal Regimen		Urban Order or Planning	National Armed Forces
						Law	Rules		
EARTHQUAKE AND SEDIMENTATION	Mitigation	National	1 2 3 4 5 6 7 8 15 20 21 22	2 3 4 5 9 10 11 15 16 17 18 19	2 3 4 5 30 31 32 34 35 36(13) 37 38	4 5 6 7 8 13 28 29			
		Metropolitan	1 2 6 8 9 10 12	2 3 4 10 15 17 18 19	71 4 5 6 7 8 13 19	1 2 3 4 5 6	1 2 3 6 8 23 24	57	
		Municipal	3 4 6 7 20 21 22	2 3 4 10 4 5 6 7 8 13 36(13) 37	28 36(13) 37 39				
		Parroquial		15 IDEM	84 73 13 32 34 35 37 78 79				
	Rehabilitation	National	1 2 3 4 5 6 7 8 15 20 21 22	2 3 4 10 15 17 18 19	N/A				
		Metropolitan	1 2 6 8 9 10 12	2 3 4 10 15	71 4 5 6 7 8 13 19 28 36(13) 37 39	1 2 3 4 5 6	1 2 3 6 8 23 24	57	
		Municipal	3 4 6 7 20 21 22	2 3 4 10 15	4 5 6 7 8 13 36(13) 37 84				
		Parroquial			73 13 32 34 35 37 78 79				
	Preparation For Response	National	1 2 6 8 9 10 12	1 2 3 4 5 6 7 8 15 20 21 22	2 3 4 5 10 15 18 19	N/A			
		Metropolitan		3 4 6 7	2 3 4 5 10	71 4 5 6 7 8 13 19 28 36(13) 37 39	1 2 3 4 5 6	1 2 3 6 8 23 24	57
		Municipal	N/A			4 5 6 7 8 13 36(13) 37 84			
		Parroquial	IDEM			73 13 32 34 35 37 78 79			
Emergency Response	National	1 2 3 4 5 6 7 8 15 20 21 22	1 2 3 4 5 6 7 8 15 20 21 22	2 3 4 10 15 18 19	N/A				
	Metropolitan	1 2 6 8 9 10 12	3 4 6 7	2 3 4 10 15	71 4 5 6 7 8 13 19 28 36(13) 37 39	1 2 3 4 5 6	1 2 3 6 8 23 24	57	
	Municipal				4 5 6 7 8 13 36(13) 37 84				
	Parroquial				73 13 32 34 35 37 78 79				

N/A: No Application

**Table S21-1.4.3 Ordinary Laws**

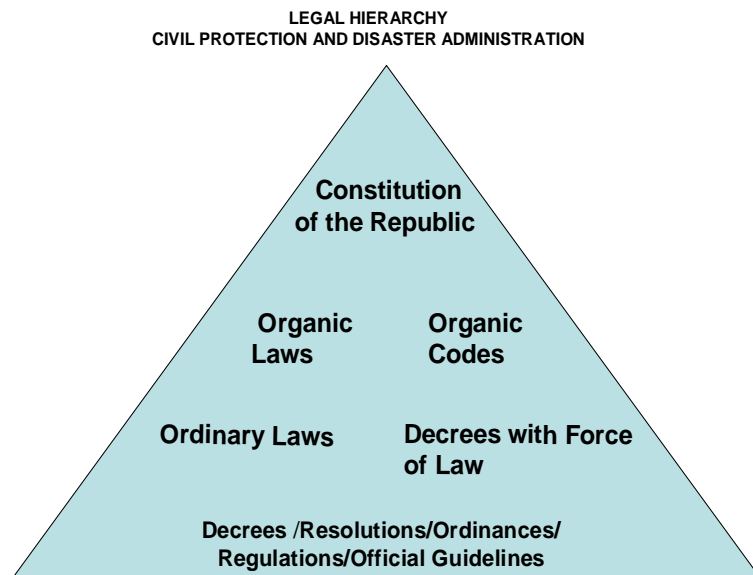
ORDINARY LAWS (ARTICLES)								
Disaster Category	Stage	Government Level	Citizen Security Coordination	National Organization of Civil Protection and Disaster Administration	Fire Brigades and Civil Emergencies Administration	Special Law on the Regimen of the Metropolitan District	Creation of Local Councils of Public Planning	
EARTHQUAKE AND SEDIMENTATION	Mitigation	National	1 2 3 4 5 8 9 14 15 16 18 22 23 26 27 28	1 2 3 4 5 6 7 13 14 18 19 20	1 5 19 24 25 28 29 30 34 35 37			
		Metropolitan		14 15 16 17	1 5 11 19 24 25	11 14	1 2 3 5 6 8 9 10 16 19	
		Municipal Parroquial			1 5 11 14			
	Rehabilitation	National			1 2 3 4 5 6 7			
		Metropolitan					11 14	1 2 3 5 6 8 9 10 16 19
		Municipal Parroquial						
	Preparation For Response	National			1 2 3 4 5 6 7 11 13 14 15 18 19 20 22 23 24 25 26 27	1 5 11 19 24 25 28 29 30 31 34 35 37		
		Metropolitan				1 5 11 19 24 25	11 14	1 2 3 5 6 8 9 10 16 19
		Municipal Parroquial				14		
	Emergency Response	National				1 5 11 15 16 18 19 20 24 25 28 29 30 34 35 37		
		Metropolitan				1 5 11 15 16 18 19 20 24 25	11 14	1 2 3 5 6 8 9 10 16 19
		Municipal Parroquial				14		

**Table S21-1-5.1 Legal – Institutional – Organizational Frameworks for Civil Protection and Disaster Administration**

Disaster Category	Stage	Government Level	Public Authority in Charge	Primary Attention Institutions	Secondary Attention Institutions	Support Institutions and Other Organizations Involved	Community Participation
EARTHQUAKE AND SEDIMENTATION	Mitigation/Prevention	National	MINFRA – MARN – MPD – IGVSBB – ONPCAD	ESP	ONPCAD – MD – MINFRA – MARN – MSDS – ESP	ONG – MD – CR – GR – ODS	ODS – SSAI – SOCSAL
		Metropolitan	ADMC – OMPCAD (DG)	ADM (Secretarías)	ADMC (Secretarías)		CLP – SOCSAL
		Municipal	AM – OMU PCAD (Institutos)	AM (Corporaciones de Servicios)	AM		
		Parroquial					
	Rehabilitation	National	MINFRA – MARN – MPD	ESP	ONPCAD – MD – MINFRA – MARN – MSDS – ESP	ODS – SSAI – SOCSAL	
		Metropolitan	ADMC – OMPCAD (DG)	ADM (Secretarías)	ADMC (Secretarías)		
		Municipal	AM – OMU PCAD (Institutos)	AM	AM	SOCSAL	
		Parroquial					
	Preparation For Response	National	MIJ – ONPCAD	Policía – Bomberos	Instituciones públicas o privadas	ODS – SSAI – SOCSAL	
		Metropolitan	ADMC – OMPCAD (DG)	ADMC – OMPCAD (DG)	ADM (Secretarías)		
		Municipal	AM – OMU PCAD (Institutos)	AM – OMU PCAD (Institutos)	AM	ONG – MD – CR – GR – ODS	
		Parroquial	CAEL	CAEL	CAEL	SOCSAL	
	Emergency Response	National	MIJ – ONPCAD	Policía – Bomberos	Instituciones públicas o privadas	ODS – SSAI – SOCSAL	
		Metropolitan	ADMC – OMPCAD (DG)	ADMC – OMPCAD (DG)	ADMC (Secretarías)		
		Municipal	AM – OMU PCAD (Institutos)	AM – OMU PCAD (Institutos)	AM (Corporaciones)	ONG – MD – CR – GR – ODS	
		Parroquial	CAEL	CAEL	CAEL	SOCSAL	

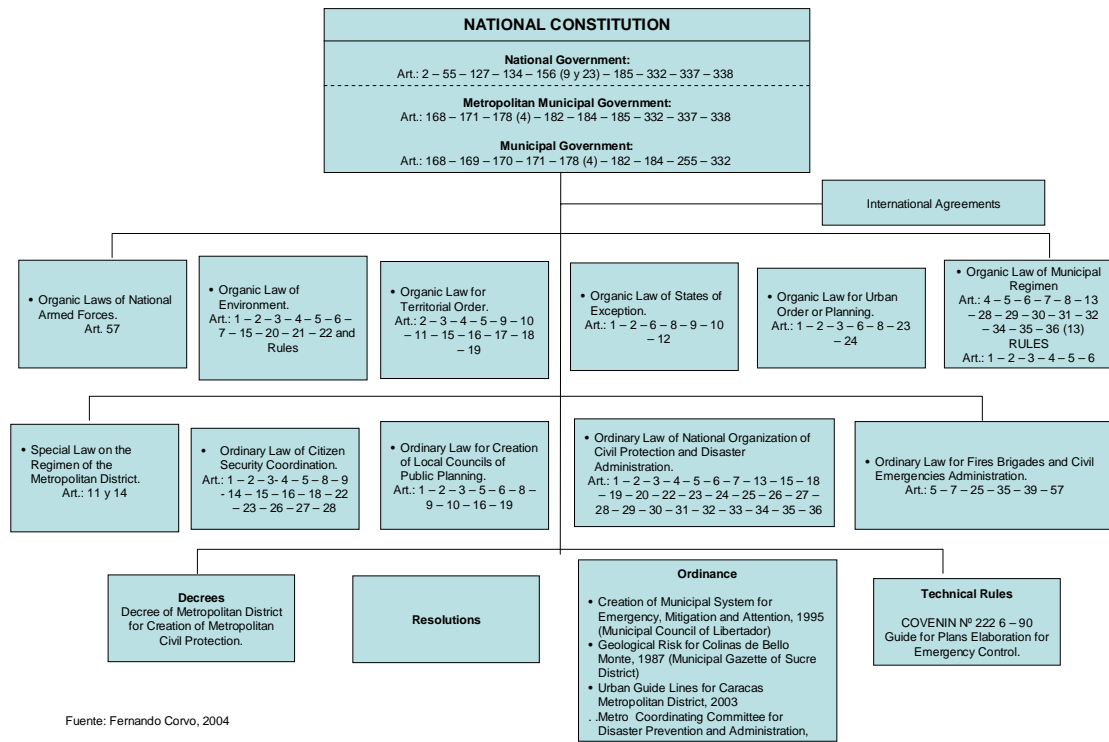


**Figure S21-1.2.1 Caracas Hillside Barrio**



**Figure S21-1.3.1 Legal Hierarchy**

**LEGAL FRAMEWORK  
(CIVIL PROTECTION AND DISASTER ADMINISTRATION)**

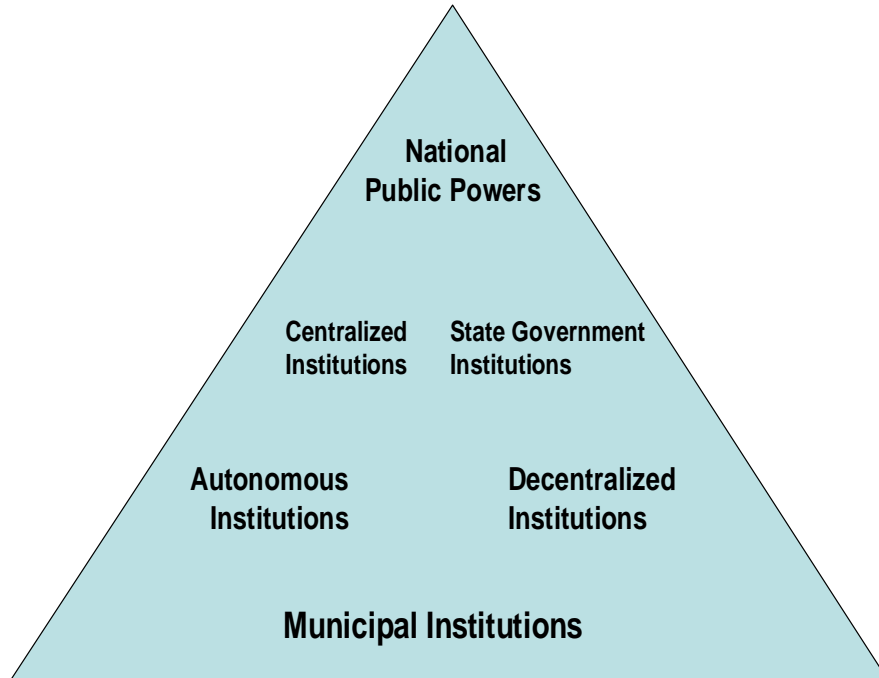


Fuente: Fernando Corvo, 2004

**Figure S21-1.3.2 Legal Framework – Law Level**



## Venezuela's Administrative and Institutional Hierarchy



### Institutional Pyramid

Figure S21-1.5.1 Institutional Pyramid

## **CHAPTER 2. COORDINATION**

In disaster planning and management the coordination of resources (personnel, supplies, and equipment) is an essential tool for saving lives and protecting property. The central aspect of institutional capability is the quality and quantity of coordination procedures among and between government units to accomplish the tasks required of them at any given time. The larger the disaster the greater the number of entities involved in emergency and disaster response at different times. This calls for the use of new resources, and more decisions need to be made by higher government.

In order to understand the process a flowchart of an emergency/disaster event was developed to follow the life cycle and to identify the various institutional actors involved at different stages of the disaster management process. This chart is shown as the figure below. The chart is central to identifying when decisions are made, and by whom. It also allows us to see the broadening of the set of resources used in combating a disaster, and gives us a deeper sense of the need for coordination in the Caracas metropolitan district. The legal framework establishes that when primary attention units cannot control an event that they ask for assistance, and cede control, to secondary units (who have control over greater amounts of resources and operations). The key concept is that more resources are utilized (put into action) to control and manage the emergency/disaster event over time and that upper levels of government officials are brought into the process to make decisions, such as declaring a disaster.

The flow chart Figure S21-2.1.1 shows the response flows in four phases: emergency, disaster, and rehabilitation and mitigation. The Metropolitan Coordinating Committee on Civil Protection and Administration of Disasters will play a major role in all disaster and post disaster activities. This committee serves to fulfill the transversal coordination and communication role set down in the national civil protection and disaster administration law.

### **2.1 Coordination Defined**

Coordination can be defined in many ways. Venezuela's Citizen Security Coordination Law (November 6, 2001) defines coordination as a mechanism to integrate efforts for the execution of actions. Those actions are addressed by principles of reciprocity, information exchange and cooperation in order to guaranty citizen security. This definition and reciprocity shall be utilized at the national, state and local levels. The local and state level actions shall be concurrent with those of the national level. For the plan process now under development we use a definition that is more generic and functional in the context of the Caracas metropolitan district reality. Coordination is defined as working together to obtain the resources and to select the necessary activities to achieve an objective or an agreed upon task.

## **2.2 Application of Coordination in this Project**

### **2.2.1. Generic Application of Coordination**

The core function of coordination occurs to accomplish objectives and tasks. In practice this means that one agency, or individual program, serves as the coordinator for activities that involve more than a single unit of government or agency of government. Thus, any coordination requires that tasks (outcomes) are established, and agreed upon at the outset. This requires some form of agreement that guides that work effort.

### **2.2.2. Horizontal Coordination**

Horizontal coordination occurs between two or more units of government at the same level or two or more units within the same government entity.

### **2.2.3. Vertical Coordination**

Vertical coordination occurs between two or more units of government at different levels. Example: a ministry and a municipal department working on a single project.

## **2.3 Analysis of Institutional Coordination in Caracas**

The metropolitan and governmental units in the Metropolitan District of Caracas area are new (except for Libertador which was the Federal District up to 1999). While there has been civil defense agencies established for many years (dating back to 1958), civil protection as a broader policy of government is new under national law (1999) which directs state and municipal governments to maintain a coordinating committee for civil protection and disaster administration.

Three types of coordination issues are central to the institutional analysis. First, is the strength of horizontal coordination within municipalities at the formal and informal levels. Second, is the strength of horizontal relations between municipal units at the formal and informal levels. Third, is the strength of vertical relations between different levels of government; in this case the municipality, the MDC, and the national ministries that operate programs and services within the metropolitan area (including roads, housing, and parks).

The coordination strength or weakness were determined through interviews with local counterparts, through a review of formal documents that call for coordination in organization charts, etc, and by searching for formal agreements that require coordination to fulfill the terms of the agreements. Under the reality of present political period of the country, it is informal coordination that works best. Informal coordination is based on personal friendships and professional respect rather than institutional arrangements. The coordination within municipal units is the strongest, mostly coming

from years of personal contact. Thus it is fragile and can be easily interrupted by political interests. Personal coordination requires that local cultural norms are followed, such as who calls who, and who is invited to a meeting and how. This is acceptable, as it is customary. The institutional problem is that there is no consistency in the process over time and no clear forms of reciprocity established.

Horizontal coordination between municipal units on a formal basis does not appear to exist. No signed agreements that establish or promote coordination were found. In part this is due to the newness of the PCAD effort under this government form. No consistent types of joint exercises between units were found. This is not positive for disaster preparedness because integration of effort requires practice.

Vertical coordination between different levels of government does exist at the formal and informal levels. The linkages however are weak, and mostly top-down from the national to the state/metropolitan level. The top-down linkages are part of the historical way institutions are organized in the country. For this project, the metropolitan government provides overall fire and police services for the district.

There are no written formal agreements on a service or a project level between the metropolitan and the municipal governments. Linkages for joint efforts at civil protection appear in reports and documents, but these linkages (through committees) have not been implemented on a consistent basis. The lack of consistency makes coordination difficult to achieve, and limits the ability of the metropolitan district to properly manage multiple resources requirements during a disaster or a catastrophic event. One working example of vertical coordination that appears to function well is conducted by the police. There is a committee established at the national level of the Vice Minister of Interior and Justice that coordinates criminal issues with the Metropolitan District of Caracas police, the municipal police and with the State of Miranda (where Chacao, Sucre are located). This committee meets on a regular basis on task related to crime reduction in the area.

The existence of the *Barrios* creates special coordination challenges. The uncontrolled areas are constructed without regulations, proper roads, and lack of adequate water. They are, by definition, risk areas for many natural hazard events and are socially vulnerable. The ministries at the national government level operate housing improvement programs with municipalities directly, and not with the metropolitan district. The ministries make the policy and provide the resources, making municipalities dependent national directives. There is no integrated effort for the ministries to coordinate with the DMC, and there are weak incentives to coordinate. Table S21-2.3.1 is a summary chart of the horizontal and vertical coordination levels presently understood to exist. More effort is required to strengthen coordination as a functional PCAD concept.

## **2.4 Tools for Coordination**

Formal tools for formal coordination efforts exist under the law. These tools include: *actas convenio*, *acuerdos mutuos* and *mancomunidades*.

### **2.4.1. Convenio (contract)**

This is a legal agreement to achieve some objective and obligates both parties to perform. It is very useful when different units and levels of government are involved in delivery of a complex program, such as an Early Warning System where the collector of information (MARN) may not be the final user of information (civil protection) or the maintainer of the data system.

### **2.4.2. Mancomunidad**

This is an agreement to conduct an activity between two or more municipalities units. It has been used in the garbage collection system where the electrical utility company collects the local garbage fees along with the electric fees and then rebates these to the municipalities to pay the private collection companies. These agreements carry less legal support than the *convenio*. It is mentioned separately in the national constitution.

### **2.4.3. Acuerdo Mutuo**

These are agreements to provide support and services or activities. They can cover as many issues as the parties want, and are based on voluntary participation. These can be used to bring together various public and private agencies and groups to address common problems and can be time limited.

## **2.5 Coordination for the Alcaldia Mayor**

For mitigation and prevention counter measures that require coordination between two different government organizations (horizontal or vertical) the Alcaldia Mayor is the most appropriate institutional actor to serve as the coordinator. Different offices within the Alcaldia Mayor can act as coordinator depending on the objective or task. For example, for preparation of an evacuation plan, the DMC IPC would serve as coordinator. For upgrading of ordinances related to urban planning, the Office of Urban Planning and Environment could coordinate this work. For projects that require many years to complete, consistent coordination is needed. Therefore, the use of the strongest written agreement possible is recommended for long term efforts.

The DMC Coordinating PCAD Committee should be the main entity to manage the process and strengthen both horizontal and vertical coordination. Through the use of coordination many of the counter measures in the plan can be implemented if a general principle is followed. That principle states that the implementing agencies and managing agencies do not have to be the same as

coordinating agencies. Groups, or sets of agencies, can be involved in one project under a general coordination process. For example, building reinforcement will take place in all municipalities, but may require a standard set of field review procedures, and building stabilization techniques. Coordination of this project could be done by the Metropolitan District of Caracas's Engineering Office, but the guidelines developed by private contract and the field work conducted by municipal departments.

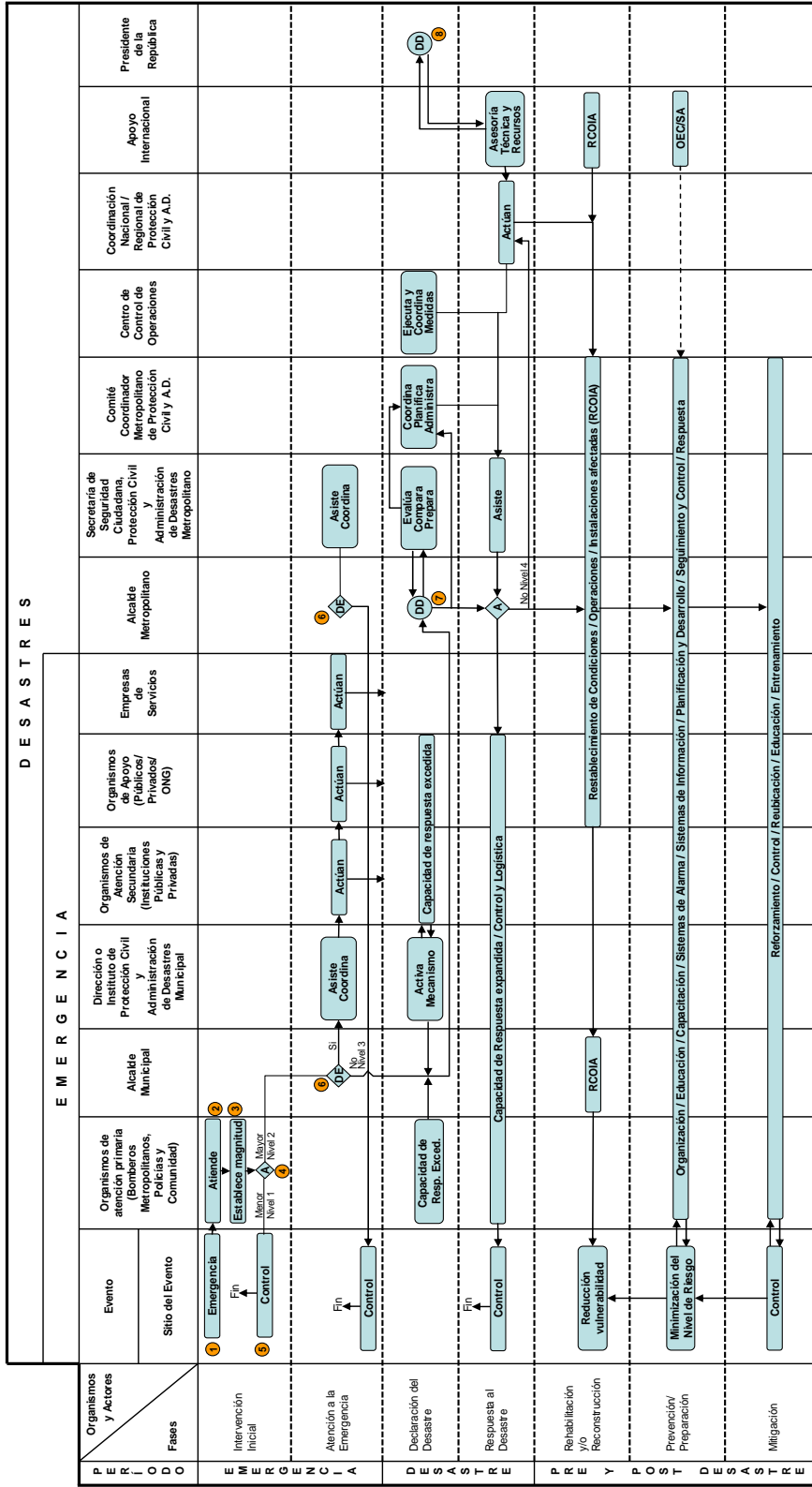
Many counter measure operations extend to multiple municipalities, and require the participation of many agencies. To be effective the process requires collective efforts. This is a fundamental reality that must be accepted by all the participating actors. During a disaster there many of the actors are not part of the formal response process. This is because in the *Barrios* the first respondents and most likely, the rescuers will be people at the incident (site) level; that is the residents. Working collectively can mean that traditional role and level of control over a project is shared with others in order to achieve an agreed upon objective. This administrative principle needs to be agreed upon from the upper level of administration at all levels of government and supported by the administrative leadership. An annual review of all coordination efforts should be made by the MDC PCAD Coordinating Committee to determine what progress has been made to expand the network of potential actors, and ways to continue to improve the coordination system.

**Table S21-2.3.1 Coordination For Disaster Mitigation & Preparedness**

	INFORMAL COORDINATION	FORMAL	SUGGESTED IMPROVEMENTS
HORIZONTAL Within Unit	Strong	Weak	Adopt ordinances for integration of effort
HORIZONTAL Between Unit	Moderate	Weak	Use contracts, and formal service agreements, common model ordinances
VERTICAL Between Units	Weak	Weak	Use contracts, and formal service agreements, joint exercises, model ordinances

Source: JICA Study Team

FLUJOGRAMA MULTISECTORIAL PARA EL MANEJO DE EMERGENCIAS Y DESASTRES EN EL DISTRITO METROPOLITANO DE CARACAS



← Flujo de Retroalimentación  
 A = Activa  
 DC = Decreto de Emergencia  
 DD = Decreto de Desastre

Figure S21 - 2.1.1 Multi-Sectorial Flow Diagram For Disaster & Emergency Management

## **CHAPTER 3. SELECTING AND DESIGNING DISASTER THREAT COUNTER MEASURES**

Once a disaster threat event is identified the task is to design a series of counter measures that can to prevent the event from occurring, mitigate the impact, or prepare the community to respond to the event once it had occurred. These counter measures fall into two broad categories: structural and non-structural. Structural measures address physical aspects of the natural or built environment such as floodplains, drainage ways (creeks, streams, and ravines), earthquake faults, and bridge and building condition against a natural hazard event. Non-structural relates to processes such as where buildings are permitted to locate, training firefighters for response, and lowering of risk through community education.

### **3.1 Ranking Survey**

In order to understand the importance of various counter-measures a structured survey was designed and administered to the Venezuelan counterparts. They were asked to rank the seven most important elements of a disaster mitigation and preparedness plan. The survey was administered over a three week period, and 58 counterparts participated. The leading plan elements chosen are: early warning systems, community education and risk maps. The results of the survey are shown in Table S21-3.1.1. It should be noted that the counterparts who completed the survey were mostly from the response and recovery sectors of disaster management systems. Very few had extensive experience with mitigation or prevention. The results however, do provide a sense of priority and need among the civil protection and citizen security community in the metropolitan district of Caracas as to their perceptions and choices. It is recommended that the ranking survey be administrated annually in order to gauge the needs of local agency personnel involved in disaster planning and administration.

### **3.2 Institutional Framework for Countermeasures**

The United Nations Development Program's important report *Reducing Disaster Risk: A Challenge for Development* (2004) states that "legislation can set standards and boundaries for action...but on its own cannot induce people to follow these rules. Monitoring and enforcement are needed." It goes on to state that "legislation has its strength in societies where most activities take place in the formal sector and are visible to administrative oversight." It continues by saying that in high-risk nations, where resource constraints or informality exist, the capacity for monitoring and enforcement is diminished and legislation, by itself, is not enough. The UNDP general statements have some validity in the Caracas plan making process.



This section is an extension of the legal framework related to institutional responsibilities and public administration procedures for a series of structural and non-structural measures. In order to effectively manage the proposed counter measures listed below a variety of institutional mechanisms need to be put in place. The institutional proposals rests on the legal basis for disaster prevention set down in the DMC national and local legislation.

### **3. 2. 1. Early Warning System (EWS) for Rainfall**

EWS is a priority project in this plan; however, no specific legal framework exists that considers specific aspects related to early warning systems for rain fall. The recommendation for implementing the EWS is to assign the project to the Civil Protection Office (PC-DMC) at the level of the Metropolitan District of Caracas. The PC-DMC shall form a project group to coordinate installation, operation and maintenance of the proposed early warning rainfall system. A technical committee from PC-DMC, MARN and firefighters will write an initial agreement of work on specific issues of installation, costs, and operations. A larger project group will then formed to establish protocols for what constitutes levels of early warning rainfall measures and how the information will be disseminated to public agency groups and to community groups.

Among the project group organizations working together will be decision makers of the following institutions:

- Metropolitan Direction of Civil Protection and Disaster Administration, at the Secretary of Citizen Security of Metropolitan District of Caracas. This office will be responsible of general coordination and will be in charged of call meetings, work agendas, minutes and agreement monitoring.
- Metropolitan Direction Of Environment and Sustainable Development at the Secretary of Urban Planning and Environmental Management of the DMC.
- Metropolitan Firefighter Brigade
- Office of Technology, at the Secretary of Finance of the DMC
- Office of Public Works and Services (Maintenance Coordination), at the Secretary of Infrastructure of ADMC
- The National Parks Institute (INPARQUES)
- General Office of Hydrology, Meteorology and Oceanology, at the Vice Ministry of Water of the Ministry of Environment and Natural Resources (MARN).

## - Local Community and Civil Organizations

The EWS project group will consult those governmental offices with experience and research data in sediment control. Some of these are described below. The Office of Hydrology, Meteorology and Oceanology at the General Direction of Watershed of the Vice Ministry of Water has data beginning in 1976. In the mid 1990s the VENEHMET (Venezuela meteorology project) began. It is coordinated by MARN, in association to the Venezuelan Air Force (Division of Meteorology), Venezuelan Army (Office of Hydrography), National Institute of Canalizations, the Venezuelan Foundation for Seismic Research (FUNVISIS), HIDROCAPITAL (The Water Service Company), the Guayana Venezuelan Corporation (CVG), la Corporación Andina de Fomento (CAF) and the Ministries of Infrastructure (Communications), Technology and Science, Mines and Energy (INGEOMIN), Justice and Interior (National Civil Protection and Disaster Administration), and Development and Planning. The VENEHMET project created the basis for meteorological stations and warning systems at national level.

At the local level, institutions potentially related to installation, operation and maintenance of early warning systems for rainfall are the Office of Hydrology, Meteorology and Oceanology at MARN, the Venezuelan Air Force (Direction of Meteorology), the Office of Civil Protection and Disaster Administration, the Metropolitan Fire Brigade and the Army (Direction of Hydrography, Cajigal Observatory).

Research and Development Institutes can provide technological or service support. These located in the School of Hydro-Meteorological Engineering at Central University of Venezuela (UCV), Department of System Engineering and Environmental Studies at Simón Bolívar University (USB), and the Engineering Foundation Institute (Fundación Instituto de Ingeniería) at the Ministry of Technology and Science. The Engineering Foundation Institute has developed portable remote and computer systems for monitoring air quality areas close to refineries, for the Venezuelan Petroleum Institute of Technology. Neighborhood associations could be useful partners near the collection sites for protection of the instruments.

### **3. 2. 2. Sediment Prevention and Control**

Landslides and rockslides are major dangers in the areas as they are close to the main arroyos of the Avila mountain. Structural counters measures in the form of 'sabo dams' would address this problem. These are expensive countermeasures requiring significant coordination between and among ministries and the ADMC. For sediment prevention and control measures the Alcaldía Metropolitana, represented by the Secretary's of Urban Planning and Environmental Management (Office of Environment and Sustainable Development), and of Infrastructure, Roads and Transport (Office of Public Works and Services) should create a Technical Commission for the coordination, support and

control of procedures needed. This commission will lead by a Technical Secretariat of the Alcaldia Metropolitana who can make recommendations for a stages program of improvement along with the following entities:

- The Ministry of Environment and Natural Resources (MARN) through the Vice minister for Water, the General Office of Environmental Works, the Office of Environmental Engineering related to water resources that are in charge of developing, executing and maintaining hydrologic projects at the national level.
- The University Central de Venezuela through the Institute for Fluid Mechanics.
- Technical consultant experts: CALTEC, CGR Consulting Engineers, Caura Engineering, and the Interamerican Center for Development, and Environmental and Territorial Research of Merida (CIDIAT) among others. CIDIAT has a long history of projects for the prevention and control of sediments in Venezuela.
- The mayor of each municipality in which the project is located.

### **3. 2. 3. Building Reinforcement**

Building reinforcement is a priority project for this plan. It should be coordinated by the Alcaldia Metropolitana through a Special Technical Commission. The commission shall coordinate a group of technical representatives with the authority to take action. The commission shall be composed of the Offices of Municipal Engineering (Libertador, Chacao, Sucre, Baruta and El Hatillo) as they are charged in the Organic Municipal law with inspection and application of technical methods related to buildings.

Among the national public agencies whose headquarters are in the region are the Ministry of Infrastructure, and the intermediate entities consisting of the Urban Development Fund (FONDUR), the National Housing Institute (INAVI), the National Housing Council (CONAVI), the Community Development Foundation (FUNDACOMUN), and the unique social fund (FUS). All of these institutions have the competencies and can offer technical support and bring in financial resources to participate in urban renovation programs that consider building reinforcement.

Between the public metropolitan agencies, Alcaldia Metropolitana's Housing Foundation (FUNVI) has a housing construction program that can participate in reinforcement and urban renovation activities. Technical support organizations within the metropolitan district include the Institute of Materials and Structural Models (IMME) and the Urban Planning Institute at the Central University of Venezuela (UCV), the Center for Engineering Materials Technology, the Foundation for Research and Development at Simon Bolivar University (USB) and the Center for Urban Design at the

Metropolitan University (UM). There are also distinct private engineering-architecture firms and building contractors that can provide the services to formulate and execute inspection and reinforcement measures. The local construction chamber will be a valuable organization to support counter measures of building reinforcement. A union of barrio contractors exists and should participate and receive training in retrofit and reinforcement techniques.

#### **3. 2. 4. Bridge Reinforcement**

Bridges in the metropolitan district cross roadways controlled by three different levels of government. Implementing a bridge reinforcement measure requires a Bridge Reinforcement Coordinating Committee (BRCC) with a technical secretary appointed by the Alcaldía Metropolitana. This requires vertical coordination based on a signed written agreement of joint cooperation on creating a reinforcement plan. The BRCC shall be composed of representatives (with decision making authority) from the national, district and municipal levels who have bridges located on the autopistas, major arterial roadways, and major avenues. The coordination objective is to establish a reinforcement program for those bridges most vital to disaster response and recovery efforts. When the bridges are located on the autopistas, the Minister of Infrastructure shall reinforce and maintain the bridges. In the case of major arterial roadways such as the Avenida Libertador, for example, the responsibility for reinforcement is the ADMC Secretary of Infrastructure, Roads and Transport who has taken over the roads from MINFRA as is called for under the decentralization policies. Last, for major local avenues it is the municipal government who has reinforcement responsibilities. Assistance in design of reinforcement efforts can be provided by public entities such the Institute for Materials and Structural Models at UCV and the Center for Materials Technology at the Institute for Engineering.

#### **3. 2. 5. Maintenance and Operations of the Data Base and the Geographic Information System (GIS)**

The disaster prevention data base maintenance function needs a permanent technical team and the technical equipment and software to update and disseminate information on a timely basis. For this system, the Alcalde Metropolitano should designate an agency such as the Information Systems Office as the central manager. All functions of the data management system do not have to occur in a single agency, and it is recommended that existing expertise be utilized whenever possible. The actual operations however can be assigned, and contracted to other units such as the Simon Bolivar Institute for Geography, as well as the Institute of Engineering for specific services.

All users shall be required to sign an operations agreement specifying their participation, requirements, sources of financial and information support to the data base. The key components of any arrangement are that main information users, such as the firefighters, police, and civil protection

obtain required information in the time periods they need it. The national geographic, cartographic and cadastre law establish requirements for managing information and providing the Simon Bolivar Institute copies of data bases and information produced.

### **3. 2. 6. Relocation of Families from High Risk Areas**

The relocation counter measure has its foundation in the national constitution, where the right to life is established, as well as protection from the state, health and to enjoy a secure environment. In its territorial order policy, the constitution provides incentive to locate the population and to improve environmental quality and life of the people.

The constitution and the organic municipal law requires, for relocation, the obligation of the state to expropriate occupied lands. When there is an expropriation of private lands and buildings the value of both is paid to the occupants by the state. When public lands and buildings are expropriated, only the value of the buildings is to be repaid.

All relocation actions need to have the relevant urban and environmental studies conducted and plans made as required by the law. All relocation plans must be specific to the risk areas, and new relocation sites for those affected shall be identified in the plan process. The relocation plan process requires coordination between three levels of government: municipal, metropolitan and national. Because relocation funds are usually provided through a national agency fund, the national housing ministry needs to be included.

While relocation occurs within a municipal boundary, there is a need for a metropolitan wide plan for relocation. The DMC Coordinating PCAD Committee should appoint a technical secretary from an existing office to coordinate the inter-institutional requirements of the overall plan. Funds for relocation are available through CONAVI. New relocation sites should be located in areas where adequate public services can be provided and are in job expansion areas of the metropolitan district. Special attention should be given to creating a land bank of sites nearby the expansion of the metro lines. This will allow transportation access to job centers within the metropolitan area. Also, each municipality shall be required to keep all high risk areas as open space, with no new development permitted.

### **3. 2. 7. Education for Disaster Prevention**

Education and training is in demand for all sectors involved in disaster mitigation and prevention. Professional training and development, communications between grassroots organizations, and establishing linkages between environmental and operational elements of government continues to be a priority for counterparts. Community Education and training ranked first overall in the *Survey of Venezuelan Counterparts*. This ranking stems from an understanding that all people involved need

more information and that the local communities will be the “first responders” in many events; especially those in *barrio* areas. The education effort can be divided into three sectors: *Professional and High Education, Primary, Middle and High School Education Programs, and Community Education and Operational Training*. Each of these sectors has its own institutional arrangement and requirements. A summary of the programmatic effort can be seen in the Table S21-3.2.1 below.

The primary implementation agencies for these counter measures are the Ministerio de Educación, Fundación para Edificaciones y Dotaciones Escolares, Alcaldía Metropolitana, Depto. Educación de Alcaldías Chacao, Libertador, and Sucre.

### 3. 2. 8. Community Organizations for Disaster Prevention

The Metropolitan District of Caracas lacks policy definitions and planning for people’s preparedness for disasters (Chaverri, Phase II Report- Peoples Organizations). The lack of an in place policy in to organize people on how to take the appropriate measures is confirmed in the Social Vulnerability Survey, with 82.4% of respondents not having received training in organization for disaster prevention. This training deficit is also recognized by the municipal and metropolitan preparation entities. Seventy one percent of leaders surveyed in 15 communities stressed that they did not know if their community had a Local Emergency Plan. There is sufficient legal framework for participation in the prevention process. Municipal Law requires city councils to develop civil protection and citizens safety programs. The Local Public Planning Councils are permitted to establish security plans, develop safe local urban plans and to establish an emergency fund for disasters. Neighborhood associations permitted to take care of people’s security and protection. One needed non-structural countermeasure is the Design and Adoption of a Strategy for People’s Organization in Disaster Prevention (see list below). To accomplish this, the DMC Mayor needs to establish a Technical Team, composed by professional organizers, community experts and disaster preparedness experts, but also with highly effective advocates and achievers of institutional engagements.

<p><b>Principles for People’s Organization Program</b></p> <ol style="list-style-type: none"> <li>1. Significance and urgency</li> <li>2. Bottom Up Capacity Building</li> <li>3. Optimizing existing resources</li> </ol>
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<p><b>Target for People’s Organization</b></p> <p>People in most risky areas, defined as the resultant of the following criteria:</p> <ul style="list-style-type: none"> <li>- Communities with greater building damage for Earthquake.</li> </ul>
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Source: JICA Study Team

### **3. 2. 9. Rescue Operations**

Rescue operations are conducted by the PC-DMC, the firefighters (and their specialized sub-groups), community assistance, and volunteer specialized rescue groups. For large disasters occurring in *Barrios* more than half of the rescue operations will be community based and the rescue operations will initially take place at the block level with the community themselves coordinating the efforts. This makes education and training a central component of rescue preparation planning.

The PC-DMC is the appropriate coordinating agency for rescue as a generic activity. Since the largest part of rescue effort will occur in the *Barrios*, a parallel sets of rescues committees are needed for each *Barrio*. The PC-DMC should coordinate the work of these committees. A rescue technical committee needs to be established that provides coordination and training for rescue operations for disasters. The committee should have official representatives from the following organizations.

- The PC-DMC shall serve as the technical secretary responsible for calling the meetings, preparing the agendas, minutes, agreements, and coordinating the work and requesting the needed recourses.
- All of the municipal civil protection institutes.
- Firefighters-metro
- Volunteer rescue organizations
- A representative from each *Barrio*
- Parroquia committees.

### **3. 2. 10. Evacuation Plans**

The metropolitan area needs an overall evacuation plan. This is a task requiring strong horizontal and vertical coordination as there are many issues to address such as where to place people, which roads to use, how to provide logistics, and how to establish social balance in evacuation areas. The DMC Coordinating Committee for PCAD needs to make Evacuation Plans (CEP) an initial part of their work program. An evacuation working committee is needed with representatives from the following institutions:

- Office of Civil Protection and Administration of Disasters (PCAD) of the ADMC who serves as the technical secretariat for the development of the plan and its implementation strategies.
- Civil protection institutes from all the municipalities.
- Firefighters

- Major volunteer organizations
- Linked non governmental organizations (NGOs)
- Park agencies
- Central University of Venezuela
- Private Communications Companies
- Municipal road maintenance agencies
- Police
- Barrio group representative
- Medical sector

Evacuation simulation exercises need to be conducted with citizens to promote preparedness among the participating agencies. These simulations should be done frequently with the medical sector and the education sector. Special attention shall be given to the highest risk areas in the city, and how they will be evacuated.

The development of the evacuation plans should respond to probable scenarios of emergency and disaster considering the key factors of location, geography, type of land use, population density, building age, and location of industrial uses where toxic and dangerous materials are located. The social vulnerability map (developed as part of this project) can be used, and updated, in building the scenarios and the response levels to disasters. Evacuation planning is a task that addresses multiple organization participation because there are many sectors involved (health, rescue, security, communications, water, temporary shelter, food, transport, trauma and relocation).

### **3. 2. 11. Emergency Command Center (ECC)**

The Metropolitan District of Caracas holds special importance for the country. It is the legislative, cultural, financial, and commercial center of the country, as well as its largest urban area. It is the most complex of the non-ministerial governmental units. A major disaster event would mean extensive national disruption. Therefore it is critical that the district develop the highest level of disaster mitigation and prevention practices in the country. To do so, it needs a very high quality command and control center. This center would provide the hub for coordination training of the top decisions makers for disaster management. It would also allow for simulation exercise to be hold where coordination can be practiced, skills developed, and confidence built in the various operating



units. The present facility and its location are not adequate for a major disaster event, or to pursue the needed building of coordination experiences. A project proposal for a new center is found in Appendix A.

A new command and control operations center operations is needed to coordinate disaster/emergency and assistance resources and provide logistic support during a disaster events. It users will be the Caracas Metropolitan District and the National Civil Protection Office. It will serve to establish the coordination and decision making sequencing required for a disaster event. All senior staff of the municipal alcaldes and the alcaldia mayor shall participate as well as the major NGO's, and the major utility (infrastructure) companies .

The ECC objectives are as follow: (1) To centralize emergency and disaster information functions in one location (171, early warning systems, and data base management), (2) Training of public personnel, NGOs, and community groups in disaster response through simulations and improvement in overall capacity, and (3) To provide coordination of activities for emergency and disaster: operations, planning/intelligence, logistics, financial administration, and command. These are shown in the chart below.

During disaster events the ECC would have a command group headed by someone with high expertise in the particular type of disaster event. This means, the person in charge would change during the period of the immediate disaster. The basic functions are: command, operations, logistics, intelligence/planning, and fiscal administration. The ADMC Secretary of Citizen Security of the ADMC is responsible for the ECC operations.

SURVEY OF VENEZUELAN COUNTERPARTS-JICA STUDY

This survey chart reports the counterpart ranking of the seven (7) most important elements of a mitigation & prevention system for the Caracas Metropolitan area. A list of twelve choices was given to the respondents. Survey administered over a three week period. N= 58 (as of 2/13/2004), #1=highest, #2 second highest, etc.

**Table S21-3.1.1 Ranking Mitigation Plan Elements**

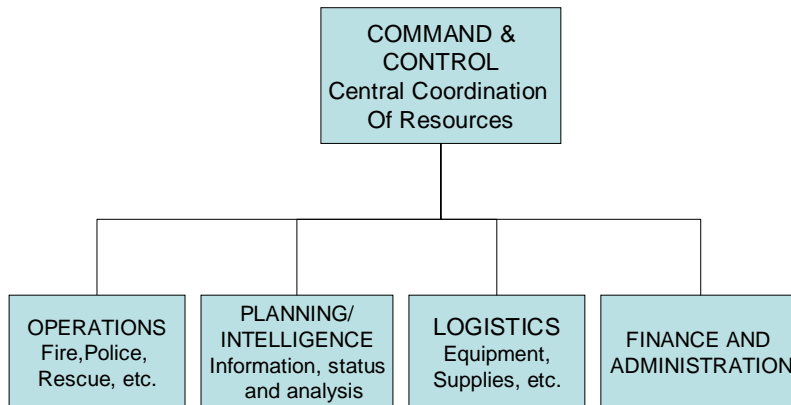
RANK

#1 Count	# 2 Count	#3 Count	#4 Count	#5 Count	#6 Count	#7 Count	Total Count	Category/element Description
10	10	8	4	9	7	4	52	Early Alert System
8	11	8	11	4	4	7	53	Community Education and Training
12	4	11	8	7	6	2	50	Risk Maps
8	7	6	7	4	10	4	46	Coordination Between Levels of Government
3	8	6	9	1	5	4	36	Risk Management Training for Public Employees
5	5	3	6	5	7	7	38	Integrated System to Manage Disaster Information
7	2	1	4	4	5	6	29	Relocation of Families In the Highest Risk Zones
3	5	4	2	5	1	2	15	Dam systems of the “sabo” type
0	3	6	3	7	4	4	27	More Clarity of the Responsibilities of the Public Agencies Involved During A Disaster
1	2	3	2	5	4	2	19	Establish Sufficient “life lines” in Case of a Disaster in Caracas.
1	1	1	1	5	1	5	15	Building and House Reinforcement Against Earthquake Danger
0	2	1	1	2	3	6	15	Evacuation System
0	1	1	1	2	1	6	12	Strengthening of Public Security

**Table S21-3.2.1 Education Program**

Program	Outline	Target Population	Measure
<b>1. Professional and High Education</b>			
1. 1. Professional Program to Certify by Competence	Reinforce and complete professional skills for currently hired Protection Civil Staff and Managers	- Staff from Protection Civil offices (100-150) -300 persons survey interested in Disaster Management Careers	i. Certification Program Establishment. ii. Establishment of Higher Technicians in Emergencies and Disasters Program
1.2. Refreshment Programs and Curricula Enhancement with risk reduction approach for university professional careers	1. Provide experiences to improve skills for professionals in charge of forming new professionals 2. Inclusion of Technical Courses and Topics into curriculum for key university professions	-Professionals -High Ed Teachers -Academics -Decision makers	i. Exchange programs, internships and national level seminars ii. Study, lobby and reform curricula in professional careers like engineering, architecture, social communication, medical and social work to include risk reduction approach
1.3. Mainstreaming disaster education in teachers education	Raise awareness and promote mainstreaming of disaster approach for future teachers	All University Institutes and Pedagogical Universities	i. Study and proposal for program revision and improvement
<b>2. Primary, Middle and High School Education Programs</b>			
2. 1. Inserting risk and disaster programs in official school curriculum	1. Methodological and topic training in risks and disasters 2. Agreements among MECD, FEDE, ADMC, Municipal Mayors	Teachers in most risky areas	i. Curriculum review and proposal ii. Institutional approval and engagement iii. Training modules for teachers ( Pilot, implementation, review )
2.2. Education materials for teachers and students	Production of methodological tools for teachers and students for classroom, home and community	20,000 teachers 500,000 students in Study Area	i. Training materials for teachers and students
<b>3. Community Education and Operational Training</b>			
3.1. Community Education Strategy	Policy strategizing and establishment for Protection Civil and related agencies	All agents involved in disaster education, as well as community groups	i. Study, production and implementation of educational strategy
3.2. Training Courses for creating multipliers and community facilitators in communities	Establish permanent educational modules for community persons, leaders, and groups	28 Parroquias, community groups and institutions, starting with those located in most risky areas	i. Modules on Operational Techniques, Pedagogy, Leadership and Community Development, Planning.
4. Media Programs	Create and disseminate information to general public	All City Population	i. Production and distribution of multimedia educational programs ii. TV spots and radio programs

Source: JICA Study Team.



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**Figure S21-3.2.1 Emergency Command Center Organization**

## **CHAPTER 4. DISASTER PREVENTION ADMINISTRATION IN JAPAN**

In this chapter, a brief introduction of disaster prevention administration in Japan is made.

### **4.1 Disaster Prevention Laws in Japan**

#### **4.1.1. Disaster Prevention Basic Law**

##### **(1) Background**

Japan has been suffering from various natural disasters for a long time. It had been proposed to establish basic policy on disaster prevention administration since the Tokachioki Earthquake in 1952, Kanogawa Typhoon in 1958 and other large natural disasters. In 1959, a large scale disaster caused by Ise Bay Typhoon, occurred. By taking this occasion for a pivot, the establishment of systematic and integrated disaster management administration had been studied and in November 1961, “Disaster Prevention Basic Law” was promulgated. The national organizations in charge of this law are the Cabinet Office and Fire Fighting Agency.

##### **(2) Brief Description of Disaster Prevention Basic Law**

###### **① Clear Definition of Responsibilities on Disaster Prevention Administration**

In Chapter 1 “General”, the responsibilities of the national government, the provincial governments and municipalities, designated public entities, designated local public entities and residents are defined.

###### **② Promotion of Integrated Disaster Prevention Administration**

In Chapter 2, “Organizations for Disaster Prevention”, the Central Disaster Prevention Commission headed by the prime minister is established, which will act as an overall coordinating agency in order to plan and to organize various disaster prevention activities. In the provinces, the Provincial Disaster Prevention Commissions headed by provincial governors are established. When a disaster breaks out, in order to accomplish integrated and effective emergency response, the National Emergency Response Task Force (or the National Urgent Response Task Force) is called in the central government while in provinces, the Provincial Disaster Response Task Forces are called.

###### **③ Promotion of Disaster Prevention Administration based on Long Term Plan**

In Chapter 3; “Disaster Prevention Plan” defines that the Central Disaster Prevention Commission has function of preparing the disaster prevention basic plan, in which integrated and long term plan of disaster prevention is described. At the same time, in Chapter 3, the items to be emphasized in the

disaster prevention action plans prepared by the designated government organizations and the local designated public organization or in the local disaster prevention plans.

#### ④ Financial Assistance for Large Scale Disasters

In Chapter 7; “financial sources for disaster prevention”, it is stated that the disaster prevention activities should be basically financed by the relevant agencies. However, in the case of a large scale disasters, the central government should give special financial assistance for the local government and at the same time for the victims of the disasters. Based on this idea, “Law on Special Financial Assistance in Large Scale Disasters”(1962) was installed.

#### ⑤ Special measures to be take in an emergency

In Chapter 8, it says that the prime minister can declare “state of emergency” when a large scale disaster occurs such that it will affect the maintenance of social order. At the same time, the Cabinet can take necessary actions by their own discretion in order to maintain public welfare and national economy when the national assembly is not open.

### **4. 1. 2. Disaster Prevention Organizations in Japan**

#### **I. Central Disaster Prevention Commission (Chapter 11 of Disaster Prevention Basic Law)**

##### Responsibilities of the Commission

○Preparation and promotion for implementation of the National Disaster Prevention Basic Plan and National Earthquake Disaster Prevention Basic Plan.

○Preparation and promotion for implementation of emergency operation during large scale disasters.

○ According to the questions from the prime minister and the minister for disaster prevention, discussion on important items of disaster prevention, such as basic policy, general coordination of policies and declaration of “emergency situation”.

○Proposal of opinions on important items of disaster prevention to the prime minister and the minister for disaster prevention.

#### **II. “Designated Government Organizations” (Chapter 2 Disaster Prevention Basic Law)**

The following 23 government organizations are designated as national disaster prevention organizations and they are obliged to prepare their own disaster prevention action plans based on the Disaster Prevention Basic Plan.

Cabinet Office, National Watch Committee, Metropolitan Police, Defense Agency, Financial Service Agency, Management and Coordination Agency, Fire Defense Agency, Justice Ministry, Foreign Ministry, Finance Ministry, Ministry of Education, Culture, Sports, Science and Technology, Agency for Cultural Affairs, Health, Labor and Welfare Ministry, Agriculture, Forestry and Fishery Ministry, Ministry of Economy, Trade and Industry, Agency of Natural Resources and Energy, Nuclear Safety Commission, Small and Medium Enterprise Agency, Ministry of Land, Infrastructure and Transport, Geographical Survey Institute, Meteorological Office, Japan Coast Guard, Ministry of Environment

### **III. Designated Public Organizations (Chapter 2 of Disaster Prevention Basic Law)**

As the public organizations for disaster prevention, the following 61 organizations are designated and they are obliged to prepare their own disaster prevention action program based on the Disaster Prevention Basic Plan.

Various Independent Administrative Agencies (Fire Research Institute, National Research Institute of Disaster Prevention, National Institute of Radiological Sciences, National Research Institute of Agricultural Engineering, Forestry and Forest Products Research Institute, Fisheries Research Agency, Public Works Research Institute, Building Research Institute, Research Institute of Marine Safety Technology, Research Institute of Coastal and Airport Technology, Hokkaido Research Institute for Development and Civil Engineering), Bank of Japan, Japan Postal Service Public Cooperation, Japan Red Cross, Japan Broadcasting Corporation, Water Resources Development Public Corporation, Japan Highway Public Corporation, Metropolitan Expressway Public Corporation, Hanshin Expressway Public Corporation, New Tokyo International Airport Authority, Kansai International Airport Corporation, Honshu-Shikoku Bridge Authority, Japan Nuclear Cycle Development Institute, Electric Power Development Corporation, Japan Railways (Hokkaido, East Japan, Tokai, West Japan, Shikoku, Kyushu, Cargo), Nippon Telegraph and Telephone Corporation, Nippon Telegraph and Telephone East Japan, Nippon Telegraph and Telephone West Japan, Tokyo Gas Corporation, Osaka Gas Corporation, Toho Gas Corporation, Nippon Express Corporation, Hokkaido Electric Power Corporation, Tohoku Electric Power Corporation, Tokyo Electric Power Corporation, Hokuriku Electric Power Corporation, Chubu Electric Power Corporation, Kansai Electric Power Corporation, Chugoku Electric Power Corporation, Shikoku Electric Power Corporation, Kyushu Electric Power Corporation, Okinawa Electric Power Corporation, Japan Atomic Power Corporation, DDI Corporation, NTT DOCOMO Corporation, NTT DOCOMO Regional Corporation (Hokkaido, Tohoku, Hokuriku, Tokai, Kansai, Chugoku, Shikoku, Kyushu), NTT Communications Corporation

### **IV. Provincial Disaster Prevention Commissions (Article 14 and 16 of Disaster Prevention Basic Law)**

As the same as the coordination function of the Central Disaster Prevention Commission at the central level, Provincial Disaster Prevention Commission is to be placed at provincial level. Their functions are to coordinate the activities of provincial government organizations, regional offices of national government and designated regional public organizations in order to attain integrated and well planned disaster prevention activities. The Provincial Disaster Prevention Commissions are composed of the heads and designated personnel from provincial governments, provincial designated government organizations, police, fire fighters office, designated public organizations.

At the same time, municipal disaster prevention commissions are to be placed according as the provincial disaster prevention commissions.

## **4.2 Disaster Prevention Plans in Japan**

### **I . National Disaster Prevention Basic Plan**

National Disaster Prevention Basic Plan is the base of the disaster prevention plan of Japan. The Central Disaster Prevention Commission prepares the plan based on the Disaster Prevention Basic Law. Based on this plan, the designated government organizations and designated public organizations are to prepare their own disaster prevention action plans while the regional governments are to prepare their own regional disaster prevention plans.

#### **① Structure of the Plan according to the Type of Disasters**

The plan is described according to the type of disasters so that they can refer the appropriate measures according to the type of disasters. The plan for natural disasters is composed of “earthquake disaster prevention plan”, “wind and water related disaster prevention plan”, and “volcanic disaster prevention plan”. The common plan for any disasters is described in the chapter of “common plan”.

#### **② Description of the Plan considering the time sequences**

The Plan is described according to the sequence of time, such as “disaster mitigation and preparation plan”, “emergency response plan” and “rehabilitation and re-development plan”.

#### **③ Description of concrete measures**

The plan clarifies the responsibilities of the national government, the local governments and the residents. It also describes the measures to be taken by each party.

#### **④ Description of disaster prevention activities to be taken by the people**



Not only the activities to be taken by the national and the local governments (public assistance), it describes self assistance or mutual assistance such as storage of food and water at home, community disaster prevention and promotion of volunteer activities.

⑤ Consideration of changes in social and economic structures

The plan aims to take appropriate actions considering the recent urbanization, aging of the society, internationalization, and computerization of the society.

⑥ Emphasis on measures for man made hazards

Considering the recent trend of mass transport, utilization of nuclear energy, utilization of various hazardous materials, development of high-rise buildings and under ground cities, eight measures were added, namely “ocean disaster prevention plan”, “aviation disaster prevention plan”, “railroad disaster prevention plan”, “road disaster prevention plan”, “nuclear disaster prevention plan”, “large scale fire disaster prevention plan” and “forest fire disaster prevention plan”.

## **II. Disaster Prevention Action Plan**

Disaster Prevention Action Plans are to be prepared by the designated government organizations as well as by the designated public organizations based on the National Disaster Prevention Basic Plan. The plans should be reviewed annually and they should be revised if it is necessary. When a plan is prepared by one organization, they have to coordinate with other related organizations so that their plans are consistent each other.

## **III. Regional Disaster Prevention Plan**

Regional Disaster Prevention Plans are prepared by the Regional Disaster Prevention Commission or regional governments based on the National Disaster Prevention Basic Plan in order to prevent regional disasters. The plans should be reviewed annually and be revised if it is necessary.

The regional disaster prevention plan includes items for disaster preparation (disaster prevention facilities, disaster prevention education, training, early warning and evacuation system), items for emergency response (information gathering, information transmission, evacuation, fire fighting, rescue operation, medical treatment, provision of necessary goods, transportation measures, quick rehabilitation of utilities), items for rehabilitation and re-development (life recovering of victims, resume of social and economic activities, prevention of another disasters) and other necessary items for disaster prevention. The plan should describe the measures to be taken by the related organizations as concretely as possible.

While, the Disaster Prevention Action Plans cover whole nation but in particular field, the Regional Disaster Prevention Plans cover only particular region but include all the field of related organizations.

Provincial Disaster Prevention Plan covers measures to be taken by related agencies in the province in order to integrate their activities, while Municipal Disaster Prevention Plans aim to implement effective and concrete actions to be take in a particular municipality.

## APPENDIX A

### EMERGENCY COMMAND CENTER PROJECT

**Name:** Emergency Command Center (ECC)

**Function:** To coordinate all of the emergency and assistance resources, and provide logistic support during a disaster event. Coordination means using available resources to accomplish a common task.

**Users:** Caracas Metropolitan District (Secretary of Citizen Security in charge) and the National Civil Protection Office.

**Training Operations.** The purpose is to establish the coordination and decision making sequencing required during a disaster event. These simulations will become increasingly more complex, and thus require participants to confront new coordination schemes and logistics requirements. All senior staff of the municipal alcaldes and the alcaldia mayor shall participate in the simulation training, and the major NGO's in the region, and the major utility (infrastructure companies).

**Equipment:** all electronic and telecommunications equipment, and mapping systems needed to support logistic coordination. Provision of self sustaining electrical generation and air filtration systems within the building. Ability to receive satellite images and to link with the military agencies and national ministries, and major utility (infrastructure companies).

**Programs:** Program on an annual basis, a minimum of two disaster coordination simulation exercises with the key decisions makers at the municipal, district and national levels. At a minimum these simulations will cover earthquake, landslide/flood events..

**Location:** Main criteria are high accessibility for coordinating agencies and public officials, and away from a fault line. For example, close to a metro station.

**Size:** Size in square meters: to be determined, but at least 4,000 square meters. Designed with ability to hold simultaneous meetings with different sized groups. Space for telecommunications, data base management and meetings should be separated

An agreement of cooperation will be signed by the Alcaldia Mayor and the municipal alcalde for participation in Center operations.

**Operations and maintenance:** joint effort through written agreement between the Alcalde Mayor and the National Office of Civil Protection.

**S22**

**EDUCATION FOR DISASTER PREVENTION**

*“Today's prevention is tomorrow's life”*

*José Rafael Quintero*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S22

EDUCATION FOR DISASTER PREVENTION

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## **S22 EDUCATION FOR DISASTERS PREVENTION**

### **CHAPTER 1. CURRENT SITUATION**

People living in Caracas Metropolitan District require proper information, education and training on how to self prepare themselves for disasters affecting the city. Most of the information in need is referred to the risks they are exposed to while living and/or working in the Metropolitan District.

While city dwellers in Caracas share a general similar level of exposure to adverse event, specific geographical sectors of population in Caracas have greater exposure depending on the type of adverse event, and according to particularities such as and physical location of their homes and conditions on their built environment. Within the neighborhoods, sectors and urbanizations distinguish themselves in features and in needs. People in the city have different backgrounds and conditions such as nationality and abilities, which makes distinct the procedures to reach out for them. The way to approach youngsters to motivate them on ways to best protect themselves differs from the method to reach out for elder, women, or population with special needs. During crisis times, the ideas, perceptions and knowledge possessed about risks, disasters and preparedness become crucial for the best decisions during fragments of time such as in the case of earthquakes.

Information and education has to hold accuracy, reliability and the appropriate frequency to make self protection efforts functional. To motivate to act properly and to become informed is a task pertinent to disaster and risk educators, containing a high level of responsibility to avoid human loss during emergencies and disasters.

It was found in the Social Vulnerability Study conducted within this study that 8% of the respondents did not to know where to go in case of earthquake disaster. Fifteen percent responded similarly in case of flood and 26.7% in an event of a mudslide<sup>1</sup>. Only 7.5% of the surveyed citizens claimed knowing the Civil Protection agencies close to where they live (Municipal), comparatively lower than other entities such as Rescue Groups (14 %) or Neighborhood Associations (15 %). Better known are national entities such as Protection Civil -National level (32.6%), or the Firefighters with 80% of responses.

The sources by which citizens of Caracas inform themselves about disasters, according to the survey are TV and radio. Commonly, the information covered by the media tends to refer to during or post events. Little is informed on how to act before or during disasters. The information is almost inexistent regarding how disasters are a consequence of nature dynamics applied to human built environment. Risk is built in the daily basis. Actions taken to understand and reduce risk, are a key

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<sup>1</sup> Social Vulnerability Study. Quantitative Report. JICA Study Team, BL Consultants. November 2003.

part of the education every person should receive in their process of growth and learning their roles and responsibilities as citizenship.

Women are found to be more present in their homes and to occupy most of their efforts in solving community problems in comparison with men. Nevertheless, the training efforts have not reached them properly. Understanding the unequal access to information, the particular perceptions Caracas dwellers on their levels of exposure, the skills and experience they carry are key starting points for developing education for disaster prevention policies.

Public government institutions lack of information on how to approach communities and general public, partly because little studies have been done on how people think, what ways do they currently use to protect their cared ones and values -if they do, and which are their own opinions on how to best protect and prevent themselves from disasters. While the fire department is well known (80%), only 15% of the respondents said they were familiar with Civil Protection. Professional disaster administrators require proper information and skills to be able to develop the effective methods on the face of disasters, in better ways than so far.

## **CHAPTER 2. EDUCATION NEEDS ON DISASTER PREVENTION FOR POPULATION GROUPS**

The present sections summarize the findings from the point of view of the sectors of population subject to education, information and training requirements<sup>2</sup>. The participants of the Education Counterpart Work Group identified by consensus the following areas where a better understanding and policies were required<sup>3</sup>. a) higher education and professional involvement in risk management and disaster, b) risk education in basic, middle and diversified/vocational formal education (grades 1 through 11<sup>th</sup>), c) training programs and methodologies in non formal education for risk management and disaster preparation, d) education in capacity building, f) mass communication systems, and g) educational mechanisms to introduce risk variables into public policies.

### **2.1 University Students and Professionals**

By looking at the opinions of surveyed population, it is clearly revealed the presence of gaps in the programs in charge of delivering professionals and practitioners for disaster preparedness to the city of Caracas. The technical, vocational and high education entities reproduce knowledge and practices

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<sup>2</sup> Opinions belong to responses from Social Surveys, interviews with local consultants and Education Counterparts.

<sup>3</sup> Education Counterpart Work Group - ECWG: During project time, JICA Study Team provided ground settings for the Education Departments Representatives of Civil Protection to meet regularly. This working group is named as ECWG.

under paradigms that require some revision, particularly the approaches to society, education practice and methods, and evaluation of performance.

In higher and professional education, the needs apply fundamentally for students as future professionals. The majority of the students are exposed to programs that concentrate the learning process in academic modalities and less in practical experience and learning processes targeting how to reduce risk in their professions, for themselves and surroundings. Practical first aid training courses in medical school, for example, is extremely short in time and practice exposure. A number of courses in Engineering and Architecture Departments have not been subject to revision and update in terms of risk reduction to improve quality of buildings. Students from several Departments in Social Sciences are not exposed to curricula that helps understand the human behavior and interactions in the context of disasters to improve their social interventions. Most of the learning processes have little practical learning opportunities. Pedagogical degrees for professional educators do not learn about disasters as a curriculum topic, nor how to teach disaster preparation at schools.

Specialized technical careers in disaster administration are not present in the Metropolitan District. The existing programs have tended to emphasize on the technical operation contents, and less in human planning to reduce themselves from hazardous conditions. Fire Workers Institutes focus the learning experience on techniques of rescuing, attending emergencies effectively, but little on participant methodologies to interact in daily lives for community preparedness. The development of continued community-based risk reduction programs are not topics taught in their professional profile. A professional profile that integrates disasters intervention with a social emphasize, would allow to improve an understanding of the city life in Caracas, where risk is built -or reduced. Effective management of the human organization, on the aftermath of disasters as well as planning and rehabilitation are also notorious gaps, highly discussed during and after Vargas 1999 disaster.

There is a clear demand in the country for disaster administrators. In a recent career screening, it was revealed that at least 300 people expressed great interest in specializing in disaster management<sup>4</sup>. University professors also require refreshment courses and in service trainings, especially to integrate the social and physical aspects into improved applications of disaster programs. Students have little exposed to look at good practices and examples. Little encouraged to expand, explore and propose, but more into analyze critically the problems. The academic role tends to.

Regarding methods, the learning process tends to focus its attention on the content and technical ways to construct it, but less in the understanding of the task to support the emergence of changes from itself. People and communities tend to be “objects for study” versus human beings from which to exchange, learn and build new knowledge. Research skills emphasize in how to study, scan, asses

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<sup>4</sup> Raven, Elizabeth. Higher Education Ministry. Interview on February 27<sup>th</sup>, 2004.

communities and their surroundings. Communities become labeled lacking of their own references. Public accountability is a transversal aspect lacking. Risk and disaster management should be taught as studying the extreme indicators of the lack of attention to the increasing disruption between humans and nature. Disasters and development are the same equation. Therefore education processes must establish the links, and stimulate knowledge and creativeness to diminish disruptions in society due to this un balance.

## **2.2 School Children, Youngsters, Future Citizens**

Entities involved in education in the Formal School System are composed by levels from Primary School - 1 to 6<sup>th</sup> Grade, to High and Diversified School (7 to 11<sup>th</sup> Grade), and Technical Vocational Education, for both middle and college degrees.

Despite the fact that policies introducing disaster content into public education curricula have been adopted in previous years, these have not yielded the expected outputs. Only 15.2% of surveyed people reported to have learned about disasters at school, according to the Social Vulnerability Study carried out within this Master Plan Study. For school teachers, the formal education program requires them to teach disaster related topics for some grades, but the reality is that they lack of techniques on how to proceed. They have not been prepared in how to transform the programmatic educational goals and principles into activities for students in classrooms, homes and neighborhoods.

School students are not fully exposed to education and information on the social construction of risks in daily lives. Strategies to reduce risks usually go beyond the school settings and merge directly into community daily lives. There is a need to link disaster preparedness with risk reduction in the school educations.

## **2.3 General Population**

Forty per cent (40.9%) of the surveyed people in Caracas claimed never receiving information related to disasters, as revealed in the social survey sample<sup>5</sup>. Disaggregated by types of disaster, the responses specifically evidence lack of information on respondents about earthquakes by 44%, landslides 70.8%, and floods (68.9 %). More than half of respondents (57.3%) receive information about disasters by mass media: TV and radio (38.7%) and from newspapers and magazines (18.6%). But this information received does not come from Civil Protection since there is not a coordinated system of public dissemination. Consequently the information presented by the media is mostly related to events from other countries, or about seasonal emergencies and events such as floods. People in Caracas lack of informational programs guiding them to proper action -preparing

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<sup>5</sup> Information on Disasters received by community and frequency. Social Vulnerability Study. Quantitative Report. JICA Study Team, BL Consultants. November 2003.

themselves- from large scale events disasters such as earthquakes, or preventing the conditions that creates the vulnerability.

### **Community self protection needs**

The social survey suggested that disaster preparedness should be introduced with the focus on more information, raising sensitivity and training programs<sup>6</sup>. Activities to improve community preparedness from leaders across 15 communities of Caracas are summarized below in which education processes take place are:

- Raising awareness
- Informing and orientation without a panic approach
- Forums & workgroups
- TV, radio, news programs
- Adequate preparation techniques
- Learn how to organize ourselves
- Public offices learn from community experiences
- Include disasters in popular culture

The Social Survey revealed the willingness of surveyed people to learn and be trained in specific areas such as first aid and telecommunications. Table S22-2.3.1 and S22-2.3.2 presents these facts and the lacks of the training currently received by citizens.

Further disaggregation of data will allow learning about the needs of particular sectors of population interests, such as women, youth, and elders in the communities. Deeper studies should be able to show particular interests in specific topics of the disaster preparedness such as rescue activities, community campaign or improving the emergency plans. The study is particularly useful in learning about the particularities of the social texture of representative niches of high, middle and low-income sectors.

## **2.4 Government Officials and Administrators**

Officials, administrators and professionals are unaware about the peoples' opinion, needs, conditions, and levels of preparation in Caracas. There is no program to evaluate the results and impacts of

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<sup>6</sup> Ethnographic Study Section Social Survey. Jica Study Team. November 2003.

yearly programmatic educational programs delivered by disaster administrators, educators and trainers.

There is no program to reach the public through the media. Protection Civil does not have any particular arrangement with media. It is up to the latter to inform or not on citizen responsibilities on self protection. Disasters are not a topic covered in a regular basis on their communication agenda, except when unexpected events directly affect the city.

On the other hand, current disaster managers and staff in Protection Civil offices of all the Metropolitan District offices, require specialization courses to fill their particular gaps on technical skills in an individual basis. Since most of the staff has extensive experience gained over years, the program being discussed is to focus on recognizing skills in place, and encouraging staff to update missing knowledge required to improve their work.

The trainers require to replicate their skills, training new responders, attracting new protection civil volunteers, as a strategy to cope with the condition of being understaffed; The core education topic of effective response in communities (technical skills in response) require to include preparation programs to manage optimally the administration and to plan programs for greater disasters, and not only emergencies.

Finally, it was not known of any official space or arrangements with media directors to give space to these topics. Journalists do not receive formal or non formal training from Civil Protection to better understand disaster phenomena.

**Table S22-2.3.1 Suggestions for Risk Perspective Inclusion for First and Second Grade**

Class	Topic	Content	Suggestions to be Included
First Grade	Family group and housing School community	Cleanliness and housing in food condition What is it? Staff chores	Add “located in a safe place” Include the existence of committees and squads
Social Science	Environmental conservation	Ways for human intervention and environmental conservation	Include the concept of threat
Physical Education	Outings	Things to take to the beach	Include emergency supplies
Second Grade  Social Science	The community where I live Community Institutions Road education Environmental conservation Risk situations	Community problems Red Cross, Civil Defense, police, firefighters, signals, type of signals, stoplights, conservation, recycling. Natural disasters, causes, floods, forest fires	Include risks Correct Civil Protection Include the concept of threat Include landslides in barrio areas Include earthquakes, others

**Table S22-2.3.2 Current Approaches on Basic Disasters Including Landslides for Eleventh Graders, Under Pre Military Instruction and Economic Geography (Diversified Second Grade )**

Subject	Topic	Content
Pre-military Instruction	Civil Defense	How does it perform, who performs it, where does it get done Civil Defense organization Concepts of emergency, disaster, causes, civil defense role
	First Aid	Importance, basic measures, cases where first aid applies, respiratory revival, hemorrhages and cuts, burns, fractures, poisoning by venomous snakes, drowning, electric shock, poisoning by carbon monoxide, transportation for the wounded
Economic Geography	Environmental impact and economic activities	Ecological imbalance caused by human activities Actively participate in the identification and solution of environmental problems directed towards the improvement of the quality of life Environmental education, environmental preservation, contamination factors, solutions Official action on programs and effective political development Proclamation of environmental protection laws Educational type measures

## **CHAPTER 3. PROBLEMS, LIMITATIONS AND POTENTIALS**

The current sections explain the problems on the supply side, the entities that deliver education programs, training and activities on disaster prevention for the Metropolitan District population. Sets of matrixes were built during the study period, to summarize the array of agents, goals, activities, contents and products involved in education for disaster prevention. (See Matrixes 1,2,3,5)

### **3.1 Higher and Professional Education**

With respect to higher and professional education, the institutions intervening directly in program development are four universities in the Metropolitan Area, as identified: Universidad Central de Venezuela (UCV), la Universidad Simón Bolívar (USB), the Universidad Pedagógica Experimental Libertador (UPEL). The Instituto Universitario de Tecnología Bomberil (IUTB) under the Metropolitan Fire Department of Caracas, is the only institution in Venezuela offering a Major for Technician in Fire Fighting Technology. Two more institutions participate located in Merida State (namely, the Instituto Universitario de Tecnología de Ejido and the Universidad de los Andes (ULA), and are the only programs offering Metropolitan District citizens a professional degree in Emergency and Disaster Management. Two key entities were identified at the central government level, at the Ministry of Higher Education (Ministerio de Educación Superior –MES): the National Council of Universities –Consejo Nacional de Universidades CNU) the ministry’s office handling the task of mainstreaming risk variable in the agenda of the MES<sup>7</sup>. The other institution identified is the Planning Office of University Sector –(Oficina de Planificación del Sector Universitario (OPSU).

#### **Limitations.**

During the Education and People’s Organization Workshop held on October 10<sup>th</sup> 2003, the Work Group #1 addressing Higher and Professional Education concluded that efforts made by universities to include risk variables in their agendas have been taking place with little coordination, resulting in relative small impact. The policy of university’s legal autonomy was identified as a constraint –from top down policy making- limiting the enforcement in the programs in favor of mainstream risk concepts and policies.

The Education and Peoples Organization Workshop on October 10<sup>th</sup> gathered three sets of working recommendation. With respect to higher and professional education, needs were expressed for follow up on the current and diverse initiatives carried by the Higher Education Ministry, such as the promotion within the City of Caracas and in Oriente (west side of the country); of College Degrees similar to existing in the Technological Institute of Ejido; establishing a professional degree in Risk

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<sup>7</sup> Ms Elizabeth Raven serves as chairperson on the topic under MES.



and Disaster Management; the inclusion of IUTB in projects linked with risk management, since it is a key actor in emergency training and administration of disasters; and to include the participation of private universities forming teachers which will help expand the current efforts (for example: Universidad Católica Andrés Bello, Universidad José María Vargas, Universidad Simon Rodríguez).

Adding to the above, recommendations addressed establishing written agreements among universities to include the risk and disaster management in various professions, parallel to the technical professions already in place, and the creation of specialized university professions on both undergraduate and graduate levels.

Other suggestions pointed to the creation of “Committees of Experts” by specialization as technical advisory groups in each institution. These Committees to promote and advocate for the creation of Regional Committees and a National Committee of Experts, in which higher education institutions can obtain support to advance relevant decision making, such as the revision of the Program in the field of disaster prevention; to include Metropolitan District institutions in the programs and activities to validate and revise the programs of the TSU in disaster risk management, which the Ministry of Higher Education is currently implementing. Finally, continuation to keep permanent meetings and closer the communication among institutions of higher education linked with the management of emergencies and disasters was stressed. The tasks in standardizing professional programs and possibly adopting related fields would lay the groundwork to make possible academic equivalences for validation purposes among each other entities. Final need suggested was geared to promote the links among the University Offices of Extension and the non formal training areas on risk management.

### **Potentials.**

Two legal instruments are currently being developed (the Law of Risk Management and the National Plan of Risk Management), and both are seen as key required mechanisms for the Ministry of Higher Education to request the National Council of Universities –(Consejo Nacional Universitario/CNU) for the inclusion of risk variables in the Universities. The programs directed to include risk variables in the Pedagogical University UPEL, as well as the ones carried by the Commission of Risk Mitigation / COMIR at UCV,<sup>8</sup> are both permanent and recognized as successful, which can be used as experience to stimulate similar initiatives in other institutes and universities, public or private.

Meanwhile, the National Direction of Civil Protection is studying possible profiles for civil protection job positions, which can contribute to hiring policies directed to guarantee appropriate levels for professionals in their own institutions. Another initiative from the National Direction is a project to

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<sup>8</sup> PROGRAMA COMIR. Comisión para la Mitigación de Riesgos. Approved by University Council. UCV Dean’s Office. Resolution No 857, 07/11/2001.

create a Venezuelan and Ibero American Academy to teach disaster and emergency management, a project to be further strengthened in 2004 and 2005. The Ministry of Higher Education offices is promoting the mainstreaming of risk management in all universities as an institutional policy, consequently implying an increase in inter institutional meetings to discuss possible agreements. Another effort being developed is the process of validation of contents of the University Superior Technician / TSU in Disaster Management, and the accreditation process by competencies.

### **3.2 Basic, Middle and Diversified Education**

The educational programs and contents for basic middle and diversified/vocational education fall under the responsibility of MECD – Ministry of Education, Culture and Sports- for all levels of formal education, as a task which corresponds to the Division of Curricula Development. This Ministry is also responsible for security inside the educational facilities, a task done through the Foundation for School Buildings and Facilities –(Fundación de Edificaciones y Dotaciones Educativas – FEDE).

In the Metropolitan District the jurisdictions two entities have responsibility in the education sector: the Educational Zone of Capital District, from Alcaldía of Libertador, and the Secretariat of Education of the Alcaldía of the Metropolitan District of Caracas, in charge of the Technical School of Civil Protection / Jorge Murad, unique in its style in Venezuela until now, as well as of metropolitan administrated schools.

Some initiatives have been carried out towards modifying the syllabus for first and second phases of basic education (grades 1-6), but in terms of introducing concepts related to risks and disasters, the level of advance for third and diversified levels (9-11 grades) is still unknown. The Education Counterpart Work Group analyzed the educational programs and textbooks for basic, middle and diversified levels, extracting the sections where risk variables were included or tangentially mentioned, and proposing some suggestions of improvement for inclusion of activities and specific themes to be developed during class.

The Ministry of Environment and Natural Resources (MARN) through the State and District Office for Metro and Vargas, as well as the General Department of Environmental Education and Community Participation, appear to be important actors due to their influence on aspects of conservation awareness and appropriate use of resources, topics on which environmental training programs for teachers have been established successfully.

#### **Limitations.**

With regards to basic, middle and diversified formal education, there are at least four types of administrations within the school system in charge of youngsters and adolescents in school age in the

Metropolitan District: National, Metropolitan, Municipal, Private and Autonomous administrations. The following are such the main administrators of primary, middle and high school education in interaction with the topic of disaster preparedness:

- Curricular Development Department (Dirección de Desarrollo Curricular) / MECD
- Educational Zone Capital District. Science, technology and environmental education (Zona Educativa Distrito Capital. Ciencia, tecnología y educación ambiental) / MECD
- Civil Protection Technical School (Escuela Técnica de Protección Civil) / Jorge Murad
- Ministry of Education in the Metropolitan Dist. of Caracas (Secretaría de Educación del Distrito Metropolitano de Caracas)
- State and District Dir. of the Capital and Vargas Region. Environmental Conservation Coordination (Dir. Estatal y Distrital de la Región Capital y Vargas. Coord. de Conservación Ambiental). / MARN
- FUNDAMIENTE / MARN
- Civil Defense. Health (Defensa Civil. Salud) / Health and Social Development Ministry
- Fundación para las Edificaciones y Dotaciones Escolares, Ministry of Education. FEDE.

The fragmentation among institutions and among department offices inside the ministries is evident. This fact requires the development of transversal policies setting ground rules to allow improved collaboration. The coordination should focus both on risk management and disaster preparation efforts to reach out for teachers and schools under all jurisdictions<sup>9</sup>.

A concern expressed by Civil Protection from the ADMC is their little contact about the curricula of the Mid-Level Technical School Jorge Murad, education entity that trains vocational youngsters in Civil Protection that enter to serve as volunteers in Protection Civil, and later as staff. Along with this condition, the lack of a formal procedure for registering and recruiting professionals in the Metropolitan Alcaldía has been identified as a problem inhibiting the staff to refresh and upgrade their knowledge with better trained and skilled professionals.

As mentioned earlier, the inclusion of disaster topics into the official school curricula done in previous years was not accompanied by in service training programs for teachers regarding the development of the topic at school.

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<sup>9</sup> Statistic data referred to number of schools, students, education facilities and teachers in the Metropolitan District were not available.

## **Potentials**

The Direction of Civil Protection of the Metropolitan District is proposing to involve the Secretary of Education of the Alcaldía Metropolitana, stressing a closer relationship with their efforts on preparation of schools under the Alcaldía's jurisdiction. The risk perspective is part of the mission and vision of FEDE, the institution engaged in risk management at all levels of the Ministry of Education. The Civil Protection offices with responsibility within the Metropolitan District has established agreements to provide students from the Technical Middle School of Civil Protection / Jorge Murad, to effectively coordinate the internship requirements before the students graduate.

The Work Group # 2 at the October 10<sup>th</sup> 2003 Workshop, analyzing the topic of Formal Basic, Middle and Diversified education, recommended to establish closer links between the Direction of Civil Protection and the Secretariat of Education of the ADMC with the purpose of studying possible agreements of job acceptance among the different offices of Civil Protection at the municipal level within the Metropolitan District and the Technical Mid Level School. These efforts are considered very important and must continue in the line with mainstreaming the risk perspective into formal education.

### **3.3 Preparedness and Response Agencies**

The population covered by the courses, according to data given by response entities about training within the Metropolitan District, does not reach 2% (actually 1.72%) for the three municipalities of the Area Study<sup>10</sup>.

With respect to non formal training, the relevant actors with legal involvement due to their sphere of activity within the ADMC are Metropolitan Civil Protection, the Metropolitan Fire Department, through the Office of Community Preparation / PRECOM, and the three municipal level Civil Protection (namely, Libertador, Chacao and Sucre); however, Baruta and Hatillo Municipalities lack civil protection institutions. Additionally, new actors present in the Metropolitan District as part of their responsibility assigned by law, which have joined the Educational Counterpart Work Group are the Institute of Emergency Attention of Miranda State (IAEM) and the Committee for Contingencies and Emergency Situations of Miranda State (CCSIEM), both belong to Miranda State, which covers two of the three municipalities of the study area: namely, Chacao and Sucre.

Institutions mentioned which have made contributions in training matters related to disaster prevention are the National Institute of Parks (INPARQUES) through the program of prevention and extinguishing of forest fires; FEDE through its program of maintenance of education facilities named Escuela Segura; the National Office of Civil Protection, which traditionally has taught courses to

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<sup>10</sup> Figure below the natural growth rate for the city, a rate calculated as 1.93% in 1993.

communities and continues with this task under CAPCOME program; the National Institute of Educational Cooperation (INCE) through a program of Forming Instructors for Business (FIE-30) and Teaching Induction; the Ministry of Environment and Natural Resources (MARN) through their programs of environmental and conservation education; and the Venezuelan Foundation for Seismological Investigations (FUNVISIS) through their Project of Aula Sísmica, Seismic Classroom.

Training directed to teach community preparedness is currently attended by Civil Protection of Metropolitan District, and at Municipal level Civil Protection (at Libertador, Chacao and Sucre). Also initiatives from non governmental organizations such as CESAP, Red Cross, Volunteer Groups of Civil Protection and Metropolitan Fire Department / PRECOM Office. Government institutions intervening in this arena are the Health and Social Development Ministry (MSDS) and the MARN.

At the community level, six experience were identified. Representatives were invited to be part of the initial discussions of the Education Counterpart Work Group for JICA Study. These communities include representatives of Catuche, Anauco, La Trilla, from Libertador Municipality; 19 de Marzo and El Llanito from Sucre; and La Floresta from Chacao. Their contributions are considered substantial since these communities are known to have some levels of awareness and experience in preparation for emergency and disasters. Several communities are supported by multiple institutions, with similar programs, but not necessarily with awareness of the needs of collaboration on the contents of these programs. There is a lack of written documentation on persons attended or trained, such as is the case of Los Anaucos. The courses taught in these communities have been mostly geared to disaster response and almost none regarding to prevention and mitigation.

The collected materials of supporting documents and data on the educational efforts utilized by agents involved differ in description and methodological parameters, but innovative educational material directed to communities are lacking. Their perspective tends to be replication of the traditional styles and topics in disaster preparedness. Interesting attempts identified, such as the publication produced by non governmental organizations<sup>11</sup> of booklets on risk reduction practices inside neighborhoods, are attempts to create a practical, readable tool with the inclusion of prevention perspectives from a bottom-up perspective.

Information on result or evaluation of the courses is little. When existing, the level of generality does not allow for further analysis on impacts by gender, age or geographical area. A systematic mechanism to collect, monitor or control the training processes carried out by all these entities is inexistent.

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<sup>11</sup> "How to reduce socio natural risks in urban barrios with community participation" Geografía Viva. IPCA Chacao uses media clips at the theaters; Catuche Association has produced a relocation project with appropriate understanding of the

## **Limitations**

In terms of training and methodologies for non formal education, there has been a lack of unified criteria on the systems for follow up and monitoring of the courses taught, as mentioned earlier. Only a few entities address the prevention and mitigation emphasis. Mainly, these are implemented by the Ministry of Environment and Natural Resources, and the Offices of Environment and Civil Protection both belonging to ADMC. In most cases, prevention is limited solely to the preparation of risk maps, and little is done to modify the conditions and behaviors that determine the risk.

The methodology to detect felt needs of the training efforts directed towards community organizing, among the agencies responsible for this topic, was a quick survey. It was found that no evaluations have been made to learn about the real needs of the community. It is unknown to most of the entities, how to work successfully with communities, despite diverse initiatives with different levels of success. The lack of supporting evidence and documents has made the process difficult to analyze in terms of variables to measure success or failings of these experiences.

Duplication of efforts, lack of indicators of effectiveness, use of uni-directional informational techniques as the training or preparation methodology, over emphasis of some topics and great demand of other capacities, are some of the most important challenges to be revised.

## **Potentials.**

The National Direction of Civil Protection has worked jointly with the National Office of Protection Civil and six other regional offices, in developing the project “Train Communities in Self Protection, Prevention, Mitigation and Attention to Adverse Events” (CAPCOMEIA) to be implemented in Metropolitan District and five other States. National Protection Civil Office, legally in charge of generating plans and guidelines, has been working on the development of this pilot project, with the goal of achieving unified languages, criterion, contents and methodological strategies for disaster preparation and training after validation to spread the program extensively at the national level.

During the Study period, the Educational Counterpart Work Group has made an effort to continue its regular working meetings at its own pace and agenda. A well directed institutional assessment will contribute to progressive improvement of the coordinated efforts. While a permanent space for discussion has been established, this has allowed raising particular needs, the base ground for facilitation to find common grounds and common goals.

JICA Study Team developed field research in 15 areas of Caracas to analyze the existing elements of social vulnerability, as well as three successful community experiences in the study area. These results reflect extremely useful information for all education and training agents of the Metropolitan District,

The training needs of the communities and to provide relevant information for course design and methodologies, and future training strategies as well. The complete list of Topics taught by one particular agent is presented in Table S22-3.3.1.

The following list of contents was found to be taught by two or more training agencies.

- Landslides and behaviour during an earthquake
- Risk prevention and mitigation
- Damage evaluation and analysis of requirements (EDAN-OFDA)
- Elaboration of local risk maps
- Basic course for the civil protection volunteers
- Family plan and local emergency plan
- Risk management and disaster prevention
- Citizen's self protection
- Search and rescue
- Civil Protection and Disaster Management Law
- Education on environment and hygiene

Topics that have high impact in disaster preparedness, such as leadership development, are taught by only one agency, with little demand. Non formal training must establish mutual cooperation to pursue topics in which gaps were identified, possibly to be filled by other national entities.

A task group analysis should work to produce the proper allocation of more in dept needs assessments in particular topics, methodologies and approaches, to identify the gaps on resources impossible to be covered with national resources. Efforts for common contents for the technical courses should be agreed upon. Management, effectiveness and impact indicators should be shared for common training courses and processes. This would allow to integrate and identify strengths, weaknesses, and to better assess the coverage of the programs in place, including the ones that train volunteers for civil protection. Other recommendations stressed the need to have evaluation mechanisms on the scope of the programs through periodic surveys to communities; to unify the parameters of registering students on courses, utilized by the different actors, helping to monitor and do follow up on the training

programs. Also, the need to establish mechanisms of training multipliers was indicated, to increase the pool of trainers and the extent of the programs, investing less resources and time.

The Educational Counterpart Work Group recognized the importance of the meetings, proposing to have additional exchange sessions to address topics like implementation methodologies, management indicators, measurement mechanisms used in training programs, and sharing and building a syllabus for courses common to all agents. Other training needs mentioned, and could possibly be covered by other entities, include topics such as cartography, communication, development of leadership, disaster administration, hazard materials emergencies and hospital evacuations.

Strategies for disaster agencies about training within the communities composing organized structures, include utilizing indirect training strategies (forming trainers) and in those non organized, to continue the direct training strategy.

To strengthen within the educational syllabus, the topic of community organization for prevention and preparation for disaster events, not only composed at the social level, but also in its dimension as an organizing process.

Training for community organization for disaster prevention and preparation, has to supported on the results of all Social Studies produced, the Vulnerability Study, the Successful Cases Study as well as the Study in Community Organization, to determine the gaps between needs and supply on training communities.

Communities, particularly those less contact with the topic of risk and maintenance of risk reduction activities could in Contacts with mass media is highly recommended to inform communities on the risks they are exposed to and the options to reduce them, a crucial topic for discussion to be included in the future.

### **3.4 Voluntary Group and NGOs**

After the Vargas State emergency in 1999, organizations traditionally dedicated solely to social development projects, have included risk management topics in their agendas, and have been training community and primary and secondary attention entities since then. One example of this is the case of SOCSAL, with a project funded by Mercy Corp and CESAP. OFDA/USAID have contributed during the last 13 years in the non formal training through different courses developed for Latin America, using an Interactive Teaching Method, directed mostly to adults, through the creation of multipliers, a strategy that has proven effective in replicating the courses offered through the establishment of local training structures. Under this scheme, several courses and workshops modalities were developed such as Training Instructors Course, Damage Evaluation and Needs



Assessment, Disaster Administration Course, First Response in Incidents with Hazard Materials, among other courses<sup>12</sup>.

A particularly important role is played by Volunteer Groups of Civil Protection, with respect to non formal training in emergency and disaster attention. Despite the lack of competency assigned by the Civil Protection law, this educational function is established in their statutes. Volunteer Groups are included as one of the five components of the National Organization of Civil Protection. The Metropolitan District has identified and registered 79 groups. Venezuelan Red Cross, with 100 years of experience in the country, and Volunteer Fire Department of the Universidad Central of Venezuela, founded in 1961, have also made substantial contributions, as exemplified in the program “Community Education for Preparation and Prevention of Disasters” from the Red Cross.

Civil Protection of ADMC currently is studying a training syllabus proposal as a result of the consensus among Voluntary Groups of ADMC. Voluntary Groups are eager to obtain approval of the “Course for Civil Protection Operations Auxiliary”, as a basic course required for all volunteers registered with the Direction of Civil Protection. Currently this proposal is being studied by the Metropolitan Office of Training.

Two mechanisms of training (direct and indirect) were recognized by the training agents themselves. Direct training includes all courses and programs directly developed and taught to communities, organized groups or other primary or secondary attention entities. Indirect training is related to training of multipliers or trainers, with the purpose of widening the training base and the coverage of the programs. Four topics were found to be taught by all agents: First Aid, Evacuations (plans and drills), School Brigades, and Fire Control and Extinction. The overlapping contents of training courses taught by all agencies can be classified into four main aspects: management, social aspects, methodologies and emergency attention. Under the aspect of “methodologies” is included: community intervention, community training, supporting and working with volunteers, and training trainers. Training initiatives developed by third parties (such as Red Cross and Volunteer Groups representatives) are required to be included in the Education Counterpart Work Group.

Non governmental groups can play a key role if in their interventions certain conditions are followed. These entities require skills to train trainers, to cope with continuity factor minimizing the “loss” factor, and to have great adaptability.

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<sup>12</sup> OFDA has a course (CPI, Course for Instructors) which trains instructors with interactive methods. Office for Disaster Administration is under USAID.

**Table S22-3.3.1 Courses Taught by Trainers Directly to Population**

Courses Taught by Trainers directly to population	Times course was mentioned
Primeros auxilios Evacuación (Planes y Simulacros) Brigadas escolares Control y extinción de Incendios	52
Other Topics on Response Terremotos y sismos, prevención y mitigación de riesgos, EDAN, etc.	15
Human Development Fortalecimiento personal Liderazgos compartidos	2

## **CHAPTER 4. POLICIES FOR EDUCATION**

- (1) Existing education and training institutions must reach out to search and apply effective mechanisms of coordination to bridge the educational gaps in disaster prevention identified in this Study for all sectors of society in Caracas. Strengthening and building upon local capacity, rather than creating new entities, helps to guarantee the stability and sustainability of the institutional and citizen's responsibilities on self protection.
- (2) Disaster prevention includes both short term education for optimal preparation towards unexpected events, and also mid and long term education and awareness efforts to reduce the existing conditions of risk affecting the majority of Caracas' population.
- (3) Education for disaster prevention is not a new or separate topic for the city of Caracas. It must be approached as an everyday concern and attitude integrated into the Metropolitan's development of Caracas. Life preservation as the base concept must be present in all facets of city life. Education on prevention of risk situations must be a transversal principle both city and countrywide.
- (4) Existing efforts and resources must be optimized. Multiplication of the current capacity for its continuation is a required strategy in all the disaster prevention education policies and programs.
- (5) Education programs must be framed under a five item approach: Technical education for preparedness; technical preparation for reducing the built risks; pedagogical and multiplying techniques; capacity and community building; and educational planning and programming skills. Disaster attention agencies, community leaders, government personnel, NGO staff and voluntary personnel must have access to this integrated educational approach.

## **CHAPTER 5. EDUCATION STRATEGY**

The education program's overall purpose is to provide knowledge, information, tools and procedures for citizens of Metropolitan District of Caracas to prepare to protect their lives, families and assets from disaster events in Caracas. One of the main non structural measures to protect human lives and assets is to change people's perception, attitudes and actions when facing disasters. By increasing the knowledge of hazards upon buildings, social and physical vulnerability can be reduced substantially. Educating decision makers, professionals, leaders and general public about the risk factors can help develop better understanding of changes required to buildings to minimize or eliminate possible risks. Also, by understanding the nature of the impacts and the associated consequences, disaster managers

as well as citizens can adopt measures to protect themselves and their families at the crucial time. All this assumes that society has the ability to acquire adequate knowledge and transform it into a series of actions for preparedness and reduction of impact in a timely manner.

The Educational Programs follows closely the broad framework, which Figure S22-5.1.1 summarizes, but can be implemented in the smaller units. For example, raising awareness programs should be considered inside the larger strategy rather than a single program. Raising awareness through public dissemination is intended to be linked into actions that provide options for self protection and preparation of people by local and metropolitan wide programs. Ideas of how to take social responsibility for citizens themselves, families, communities should be the key message along with demanding actions from designated authorities to reduce risks and collaboratively set protection measures and actions.

### **5.1 High Level Education**

Three subsets of projects are introduced, directed to a range of professionals related to buildings, policy decision making, disaster managers, professionals with emphasis in social components, and particularly professionals that form future teachers – educators of educators.

#### 1) Sponsoring current initiatives of Disaster Manager Degrees

In Caracas Metropolitan District, the Ministry of Higher Education has adopted as one of its priorities, the topic of professional development of disaster management. One of its interests is to establish a program in the city of Caracas to offer a technical professional degree for Disaster Managers. Currently the Ministry of Higher Education is conducting a curriculum evaluation of a successful program (the Technical University Institute of Ejido –IUTE) extensively established in Mérida State with the intention to open a similar version in the Metropolitan District, adapted to fit the profile and needs of professional disaster managers in Caracas area. The program being discussed is called “Certification by Competency.” At the end of two years, an important number of Protection Civil professionals and staff would have a common basis, knowledge and background for the betterment of disaster related planning and actions.

#### 2) Development and refreshment programs for current academics, trainers, teachers and decision makers

There is a need to provide periodic updating and refresher courses for current trainers, teachers, disaster administrators, heads and technical staff from office departments in municipal, metropolitan and central government offices, in at least three directions:

##### a) Updated applied teaching techniques:

Professional teachers on disaster topics need to be exposed to most innovative and applied teaching techniques to adapt their academic syllabus and pedagogical approach to more “hands on” knowledge-transfer approaches for disaster managers. Exchanges and in-service training are useful methods to quickly and efficiently learn from other countries successful technologies and innovations, as well as optimal pedagogical methodologies for decision makers and practitioners.

b) Periodical city wide seminars:

Periodical city wide seminars for decision makers are useful tools to summarize best practices and knowledge to a wide range of disaster managers, academics, practitioners, and general public and decision makers.

c) Curricula revision:

Most important, curricula revision and risk reduction mainstreaming of Study Programs and specific key courses into key careers such as engineering, architecture, social science, and journalism are key policies which universities and Higher Education Ministry are open and willing to discuss. For example within the UCV, the efforts of COMIR (Commission of Risk Mitigation) have been key in the inclusion of disaster and risk related agenda, linking professional ethics and responsibility towards built environment. Curriculum revision teams in all engineering, social sciences and society administration professions are proposed to study and deliver ways to mainstream the disaster agenda into professional academic programs.

3) Mainstreaming Disaster Prevention into Public Education Policies through Higher Education

The study has identified two mechanisms to introduce Disaster Prevention into Basic, Middle and Diversified Education for youngsters and adolescents: through the formation of teachers at Universities and Institutes. In Higher Education, programs more adapted to current needs must be introduced. The education and training that primary, middle and high school teachers receive in their Education Professions is a highly effective strategy to advise school administrators and staff of the responsibilities for disaster preparedness, risk management and mechanisms to mitigate impacts. There has been initial contact with one of the teacher training institutions, the Instituto Pedagógico, during October’s Workshop on Education sponsored by the Study Team. The concern needs to be introduced into the Commission of Teacher Training (Comisión de Formación de Formadores, Ministerio de Educación Superior) This Commission oversees the curricula of technical institutes as well as pedagogical universities. A second strategy of including disaster and risk approach into schools is described below.

## 5.2 Formal Education

Proposed programs include school program revisions, training programs for teachers, training guidebooks for teachers as well as for student handbooks. Procedures have to be discussed and formulated to set into place a task group for establishing communication among entities involved in the Metropolitan District School System.

### 1) Key entities coordination in public education

Several entities are the key actors to be involved in the curricula revision, not only because of their relation to the topic (such as environment or health), but also because of the jurisdictional nature of the Metropolitan District, with around 2000 schools existing under different types of administrations including Metropolitan, State, Municipal National and Private.

### 2) Disaster related training for teachers and students

A systematic effort to include disasters reduction topics into formal education has to offer training for teachers with the production of teacher's guide books as well as student workbooks and support materials.

### 3) Curricula revision and update

The official education curricula itself also needs to be revised and updated to strengthen the disaster approach as well as to include topics that are missing (such as education on earthquakes for second graders shown in Table S22-5.2.1 or expanding the paradigm of disasters as currently located under "Pre-military Education" in eleventh grade), including a consensus building approach for community preparedness and community problem solving for the same grades, in Table S22-5.2.2.

### 4) Risk prevention and disaster prevention joint approach.

The disaster prevention approach that professionals receive currently includes mostly disaster information, less on preparation and little in reducing risks information and educational tools. The existing fragmentation of a risk-reduction focus and a disaster prevention approach should be looked carefully and eliminated. Activities inside the Education Ministry should be integrated into one single effort, established from the higher degrees of decision making institutional policies. This task might include a revision of the organic structure of the ministry, the curricula programs, the training and updating programs for current and future teachers. It also includes to look at the roles for the administrative personnel, the mid level hierarchies, as well as the institutional planning process including budgets and expenditures. Currently the

only structure taking on the responsibility of the risk reduction programs of the Educational Infrastructure is FEDE. Their program reaches only the “national schools” in a progressive approach. For the Metropolitan District, this administrative boundary means municipal or metropolitan schools are excluded of the programs carried out by FEDE which supports building assessments, strengthening and education programs coordinated with Bomberos Metropolitanos.

### **5.3 Community Education**

Effective educational policies set by the responsible agencies such as Protection Civil require adopting a Strategy to Promote Education for Public, Community Promoters and Trainers Multipliers in order to increase population coverage, particularly in the most risky areas identified in the present study. Educational strategies should stress raising awareness of the potential hazards and current risks; urging the population to be prepared, targeting distinct population groups; techniques on how to act before, during and after events; and last but not least, how to reduce risk.

A Community Training Program taking place under the framework of the Master Plan requires an Integrated Approach, as presented in Figure S22-5.3.1 grouped in the following five main areas: 1) Preparedness Training, 2) Risk Reduction Training, 3) Pedagogical skills, 4) Capacity building, and 5) Community planning and accountability.

A brief elaboration of each one is described below.

#### **a) Technical/Operational**

All counterpart agents acknowledged the need to teach four topics to communities (first aid, evacuation, school brigades and firefighting, and control). Several agents, not all, include in their training syllabus topics like earthquake and seismic topics, prevention and mitigation, and needs assessments.

The recommendation is to enrich and expand the curricula, according to the local and combined teaching capacity, the manifested needs including community needs, combined in a disaster prevention approach that reinforces risk reduction topics, to strengthen local capacities in both the short and the long term aspects of the disaster management.

#### **b) Education for reducing exposure to risk**

Education programs must include collaborative processes and for education plans for social agents within communities, such as neighborhood associations, housing programs and municipal offices in order to coordinate educational programs addressing particular community

issues to provide tools for risk reduction. Entities such as CONAVI, Planning Departments of the Alcaldías, and Non Governmental Organizations do have a key role in sharing, training and building up the curricula that educates in reduction of risks in each municipal jurisdiction of the Metropolitan District, particularly related to prevention for earthquakes, debris flow and floods.

c) Pedagogical and multiplier effect training skills

Most courses are taught in a lectured-based manner. Key topics and issues such as vulnerability and risks are introduced only as theoretically general concepts with little reference to particular local situations. Learning tools such as workshops (understood as “learning by doing”) field practices, Stakeholder Analysis, Disaster Imagination Games, and demonstrations are educational tools that help reduce distance between theoretic knowledge and action, bridging the gap between learning and action to transform reality. Courses should not be individual units, but continuous education programs with constant development.

d) Community promotion (facilitation, networking, and advocacy)

Community training programs focusing on developing operational skills and risk reduction must include one of the most important approaches, focus on leadership and motivation development for capacity building.

e) Programming and planning skills (program evaluation, monitoring, and upgrading)

The counterparts of education sector agreed upon the need of indicators to appropriately evaluate and improve their work. The topic was highlighted as a crucial need, and a first brainstorming list of utilized and suggested indicators was drafted for further analysis by the counterparts.

Trainers learn and acquire more knowledge as one of the first steps to promote these types of skills. These areas are in agreement with skills that the Education Counterpart Work Group discussed and require for their own improvement, as shown in Table S22-5.3.1.

#### **5.4 Education for Government Personnel**

The Education and Training Program specified as Community Programs in the previous section also applies for the personnel of Civil Protection, Firefighters and the counterparts participating during the discussions. The holistic approach explained previously in FIG.S22-5.3.1 has to be included as well in the curricula of government workers related to disaster prevention. Summarily the five areas are: 1) Preparedness Training, 2) Risk Reduction Problem Solving, 3) Pedagogical skills, 4) Capacity building, and 5) Planning and accountability.



The institutional strengthening of education for disaster prevention requires careful building of a collaborative agenda. This can take various forms and setting different task groups by shared concerns or issues is a good way to keep the organizations involved. Some meetings can include discussions with university and technical institute's representatives. Others meetings and/or task groups can discuss the formal school programs at municipal and ministry level education departments, to broaden the analysis and adoption of measures for education planning.

### **Capacity Building Process with Education Counterparts Work Group**

The Training Department from Protection Civil Metropolitan, -Education Counterpart Work Group point person<sup>13</sup> for the Study- plays a crucial role in setting the agenda towards building a multi stakeholder approach for disaster education. The Metropolitan PC Training Department has lead the work of the a Group of staff and trainers, mostly from Civil Protection keeping regular meetings and discussions related to training curriculum for disaster preparation. Since Education for Disaster Prevention goes beyond training for preparedness, the Education Counterpart Work Group, now under the Commission of Early Warning has to focus into the challenges of including the four other components for fully strengthening their capacities. This should be done by:

- Assuring an inclusive institutional process. A large number of agents in Metropolitan District, identified by the Study have been playing key roles in training and preparation. Figure S22-5.4.1 lists and shows the current dimensions of training capacity of around twenty different institutions, most of them local. Many of these are non-government agencies with notorious technical capabilities.
- Collaborative methodology. The continuity of attendance to the Counterpart discussions is a difficult task. Irregular attendance can be explained by external contextual difficulties such as jurisdictional boundaries, institutional particularities or work load. But internal conditions such as careful monitoring of invitation process, personal phone calls to motivate about the importance of the topics discussed during meetings, an inclusive agenda reflecting shared needs, as well as meeting settings (such as clear and consensus based- agendas, optimal use of time and space for participatory discussions) can make a difference. For the relevance and impact of the work produced by the Counterpart Group in setting of common grounds, it must be kept in mind that every effort counts, considering the coverage needs at city level. As a reminder some of the key actors that need to ensure participation are FUNVISIS Seismic Classroom, Voluntary Groups, Miranda State groups (Emergencias Miranda and CCSIEM), FEDE/MECD, and other Ngos identified during the study period such as SOCSAL and Centro Gumilla. Particularly the latter,

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<sup>13</sup> Clementina Massiani, Training Coordinator of Civil Protection, Metropolitan District

has done specialized work in creating training programs in communities, related to risk reduction and relocation process.

- Support for the Voluntary Groups. The Federation of Voluntary Groups have produced a National Curriculum for all Volunteer individuals and Groups currently under study by Protection Civil administrators. Expedite approval for their educational program will speed the entering in action of an important support group and greater number of human power for disaster preparation.
- Sharing Information. The information collected and listed in the following sections should be available to all stakeholders. The same should be said about the Social Studies produced during the Study period offering to all personnel, trainers, educators and education policy makers a unique opportunity to explore the minds of 4800 inhabitants of the Metropolitan District regarding disaster perception, social conditions, and capacities at place, willingness to collaborate, and applicable suggestions. Sharing information among all stakeholders should be widely stimulated.
- Implementation procedures of the Master Plan. All educational entities contributed to produce a framework for action for the Master Plan. Leading agencies, identified in each Program shall take initiative to develop mechanisms to implement the proposed programs.

Summarily, the Study Counterpart methodology has contributed to build communication and strengthen networks in the Education component. The identification of stakeholders allowed to bring together the Metropolitan District agents, as a response to the request urged by Education Official Counterparts. The point persons in each Alcaldía, at Metropolitan and National spheres among Protección Civil and Bomberos Metropolitanos, were identified and settings for continued meetings to build capacity by sharing strenghts and challenges. The discussions yielded willingness, mistic, capacity to produce informational material, hability to work collaboratively and engage in wider programs.

## **5.5 Public and Mass Media Dissemination**

The production of information for public distribution shall adopt specific means: 1) Mass media spots for TV and radio announcements for raising awareness to the whole population. 2) Multimedia, such as setting up websites, topic specific videos or power point presentations for the use of community leaders to disseminate education within their neighborhoods. 3) Community booklets with suggestions on activities, tools & resources, best practices and course announcements are among the most recommended written tools to raise awareness to broader public. Suggested topics are:

- Techniques to identify and reduce risk such as building rapid inspection, and simple tools to improve physical building conditions in barrios.

- Memory refreshing icons of past events (both for earthquake and sediment disasters) in most vulnerable areas or sites.
- Community-built risk maps placed in public places, with regularly updated plans.

## **5.6 Cross Cutting Paradigm Shift**

Program interventions in broad terms require revisions. Some paradigms, current and proposed shifts are shown in the Table S22-5.6.1, particularly when target population is population at risk. A cross cutting approach to training and teaching efforts require to look at limitations on the paradigms about the learning process and the target groups to be trained. There are perception and practices about how to understand and work with communities that limit the quality of the training efforts. Difficulties about looking beyond appearances are not allowing trainers, teachers or consultants for gaining deeper understanding of the social construction of risk, particularly for those neighborhoods at most risk. Training personnel are not bias-proof. These need to be exposed to self analysis to understand counter transferences of their interactions. Self participant observation is required to be included in education programs.

**Table S22-5.2.1 People's Willingness to Collaborate and Training Received**

<b>In case of disaster, people are willing to collaborate in:</b>			<b>Received training in:</b>		
First Aid	3617	75.32%	First Aid	1282	26.70%
House eviction	2519	52.46%	House eviction	471	9.81%
Fire control	1475	30.72%	Fire control	404	8.41%
Psychological support	2537	52.83%	Psychological support	548	11.41%
Rescue	2266	47.19%	Rescue	569	11.85%
Radio use	1556	32.40%	Radio use	453	9.43%
Organizational support	2623	54.62%	Organizational support	531	11.06%
Management of food, medicine, etc.	3149	65.58%	Management of food, medicine, etc.	593	12.35%
None	424	8.83%	None	3224	67.14%

**Table S22-5.2.2 Number of Persons Trained in 2002 (According to Each Institution)**

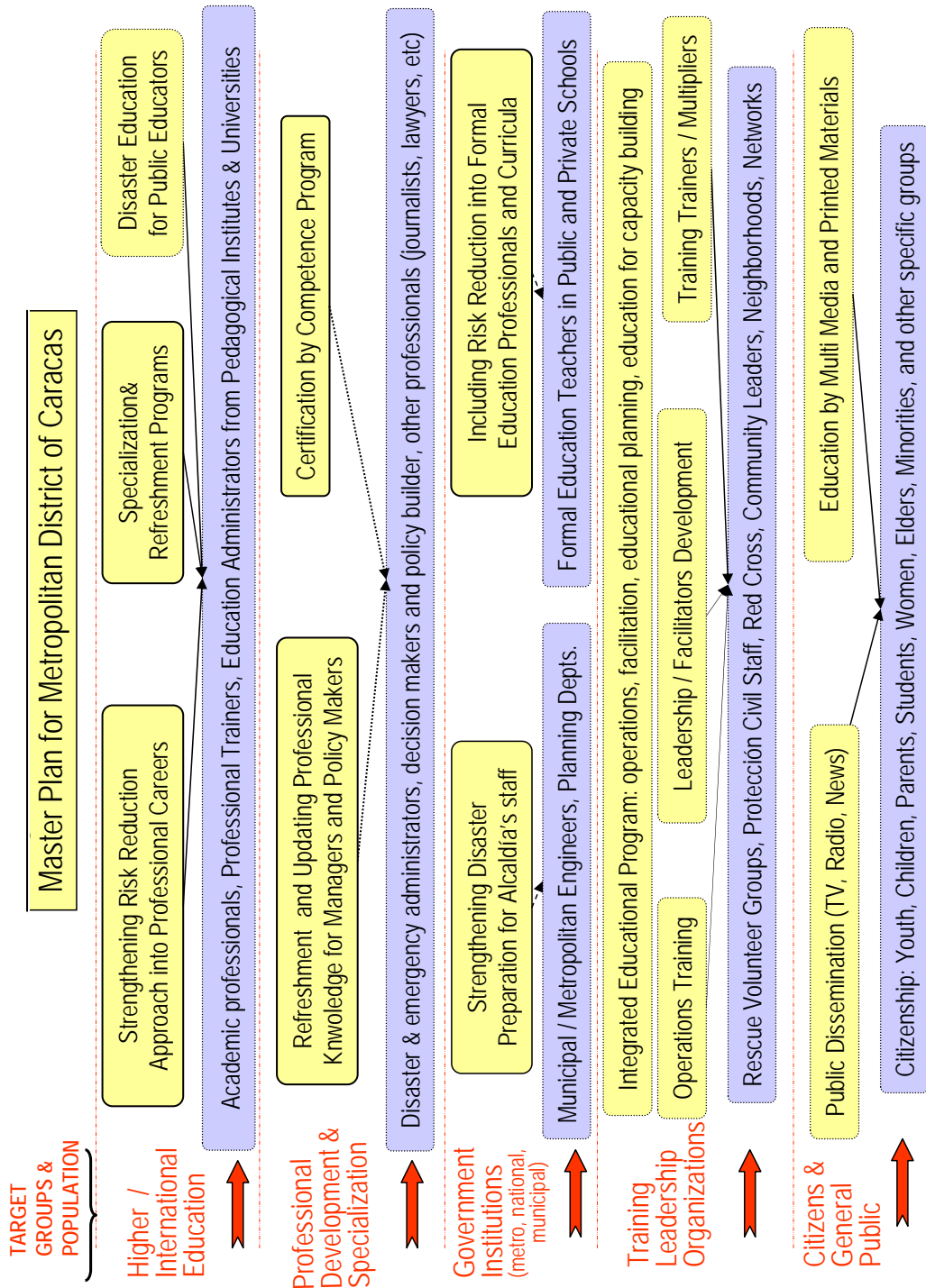
Institutions / Department Delivering Training	Number of Trained People (approx.)
Civil Protection ADMC	20,000
Metropolitan Firefighters	6,800
Civil Protection of Chacao	10,700
Civil Protection of Sucre	6,300
Emergencies of Miranda	4,000
Local Support Services, A. C. (SOCSAL)	100
<b>TOTAL</b>	<b>48,900</b>

**Table S22-5.3.1 Training Needs from the Education Counterparts WorkGroup**

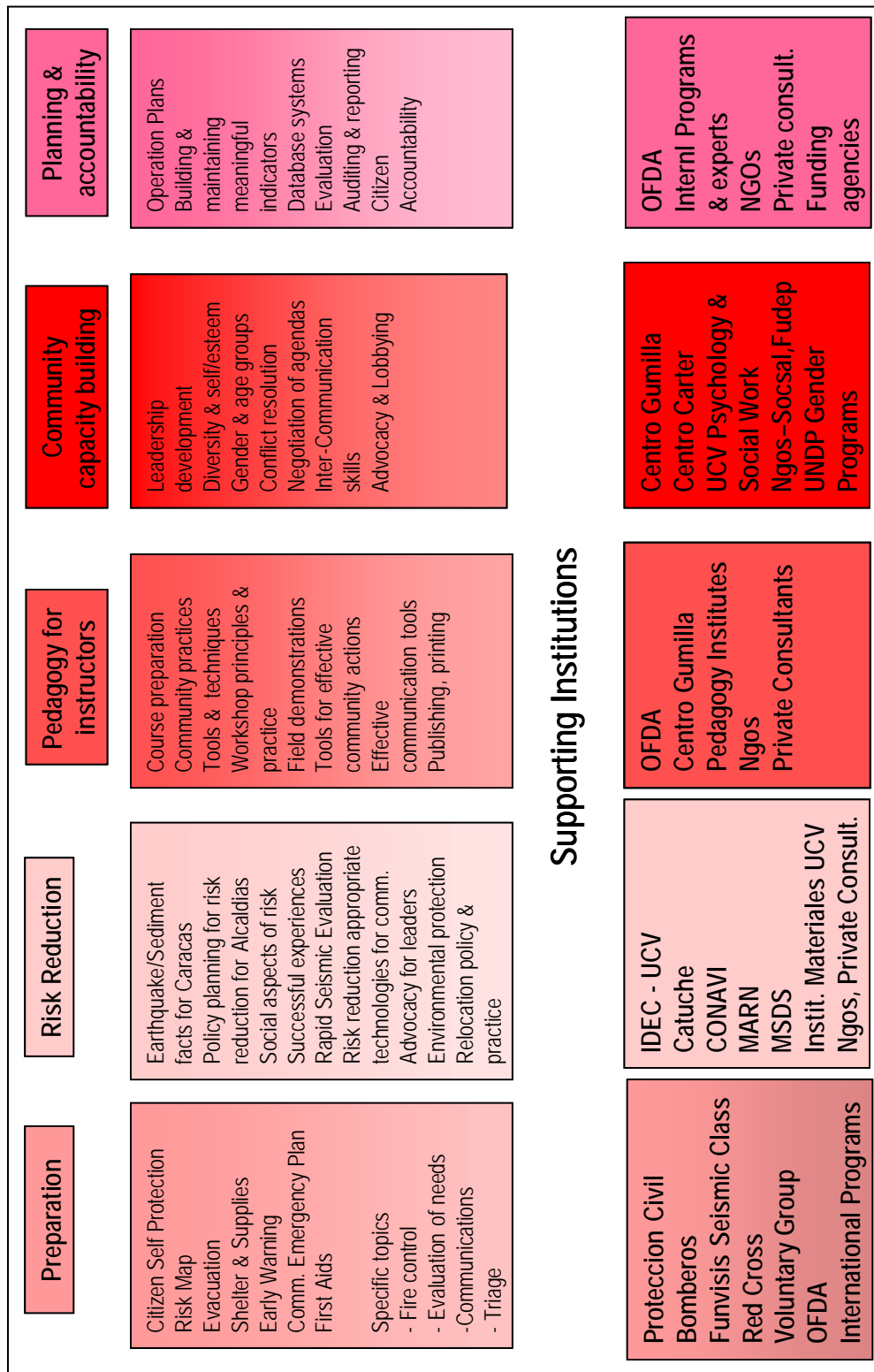
Training Needs Mentioned	
<u>Management</u> Planning, Supervision Project/Proposal Elaboration Prevention plans, disaster administration (APD) Organizational Development Effective Coordination (with NGOs, private and public organizations) English Language Skills	<u>Preparation and Response</u> Emergencies by hazardous materials Shelter management Telecommunication Rescue: canine, confined areas Hospital eviction Drainage in the case of disaster Order of command
<u>Social and Community Aspects</u> Communication Leadership development Personal growth Disaster psychology Social intervention	<u>Methodology</u> Community intervention Community training Training of the trainers Attention to volunteers

**Table S22-5.6.1 The Educator in the Community**

Paradigm	Current	Shift to
Role of “intervenor” (teacher, trainer, consultant)	To make people change their perception of reality. Knowledge of risk tends to be over simplified in training and courses. Community are “objects” to be studied, transformed.	Reality IS part of people’s lives. People already are coping with risks. Solutions are combined according to their background. Community is a subject, with which to build together
Methodologies	One way flow Information remains in the arena of capture, comes and go with trainer Audience settings, and presentation methods	Two way and multi flow Information sharing, adopted by communities for use and improvement Circular, inclusive and building methods
Action plans	Facilitator’s role stops after training or intervention One way interventions	Training as starting point Bi directional interventions Multi stakeholder construction of alternatives
Approaches to change	Look for and start from traditional leaders Problem based, what is wrong Wishful thinking	Development, multi stakeholder approach Proposal focused, assets are, founding blocks of capacity building Stimulate brainstorming and applying the steps suggested

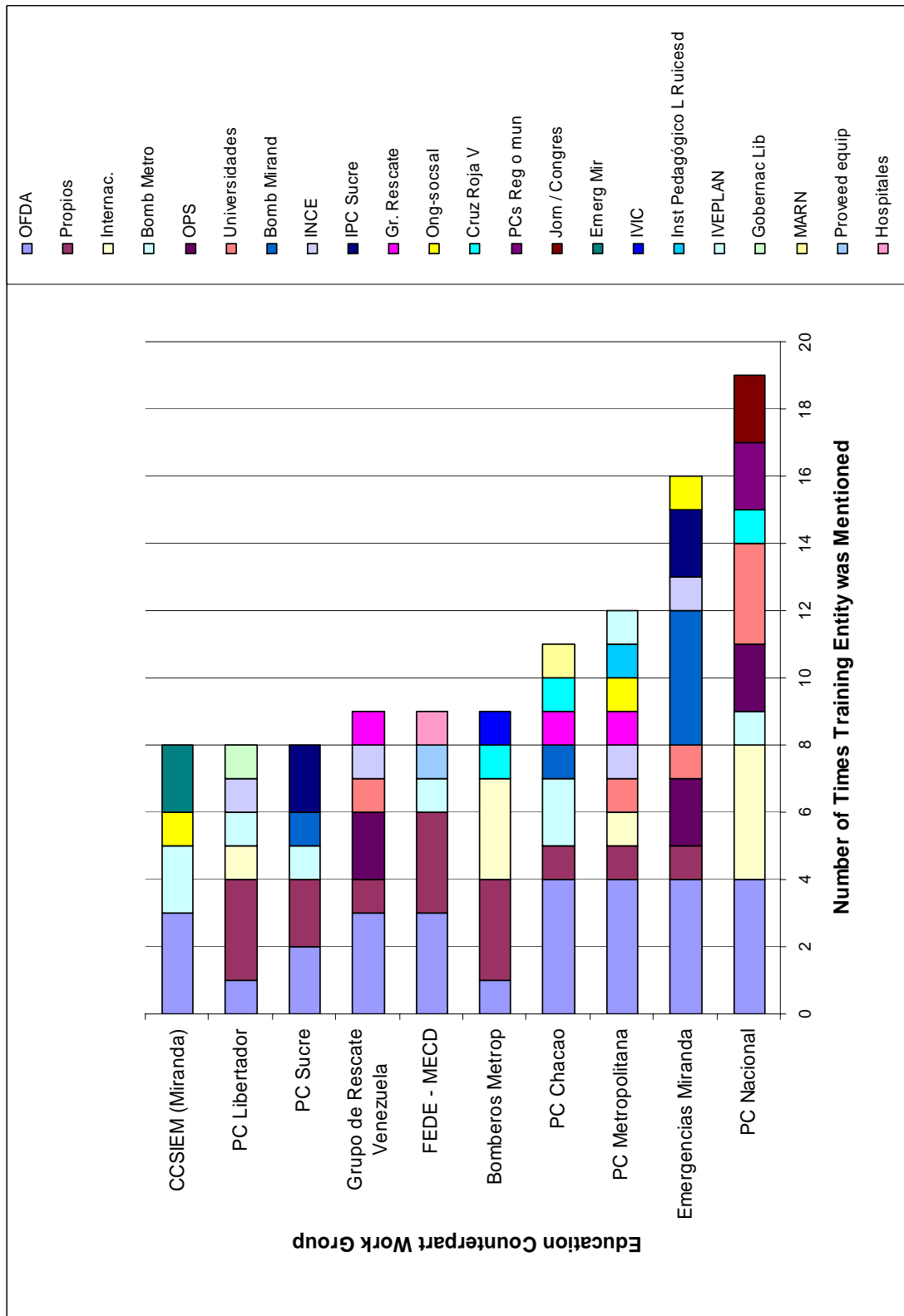


**Figure S22-5.1.1 Education Programs**



**Supporting Institutions**

**Figure S22-5.3.1 Holistic Approach to Community Training Programs**



**Figure S22-5.4.1 Sources of Training Utilized by Counterparts**



## **CHAPTER 6. EDUCATION PLAN**

- 1) Criteria for Education Projects
  - Significance and urgency
  - Effective social impact
  - Sustainable capacity
  - Multiplying capacity
  - Broader coverage
  - Optimize existing structures
  
- 2) Target Population for Education Projects
  - Disaster Managers
  - Teachers and trainers of teachers and trainers
  - Risk reducer professions
  - Youth and children
  - Community leaders, particularly women
  - Institutional staff and decision makers

### **Implementation Policy**

The Study identifies the legal and administrative responsibilities of entities in charge of disaster prevention education and educating the population on how to identify and be aware of existing risks; and act individual and collectively in coordination with the respective agencies. These agencies, most of them involved actively during the process of the Study, must take the responsibility in executing the Plan.

**Table S22-6.1.1 Education Programs and Measures**

Program	Strategy	Target Population	Measure
<b>1. Professional and High Education</b>			
1. 1. Professional Program to Certify by Competence	Reinforce and complete professional skills for currently hired Protection Civil Staff and Managers	- Staff from Protection Civil offices (100-150) -300 persons survey interested in Disaster Management Careers	i. Certification Program Establishment ii. Establishment of Higher Technicians in Emergencies and Disasters Program
1.2. Refreshment Programs and Curricula Enhancement with risk reduction approach for university professional careers	1. Provide experiences to improve skills for professionals in charge of forming new professionals 2. Inclusion of Technical Courses and Topics into curriculum for key university professions	-Professionals -High Ed Teachers -Academics -Decision makers	i. Exchange programs, internships and national level seminars ii. Study, lobby and reform curricula in professional careers like engineering, architecture, social communication, medical and social work to include risk reduction approach
1.3. Mainstreaming disaster education in teachers education	Raise awareness and promote mainstreaming of disaster approach for future teachers	All University Institutes and Pedagogical Universities	i. Study and proposal for program revision and improvement
<b>2. Primary, Middle and High School Education Programs</b>			
2. 1. Inserting risk and disaster programs in official school curriculum	1. Methodological and topic training in risks and disasters 2. Agreements among MECD, FEDE, ADMC, Municipal Alcaldias	Teachers in most risky areas	i. Curriculum review and proposal ii. Institutional approval and engagement iii. Training modules for teachers (Pilot, implementation, review)
2.2. Education materials for teachers and students	Production of methodological tools for teachers and students for classroom, home and community	20,000 teachers 500,000 students in Study Area	i. Training materials for teachers and students
<b>3. Community Education and Operational Training</b>			
3.1. Community Education Strategy	Policy strategizing and establishment for Protection Civil and related agencies	All agents involved in disaster education, as well as community groups	i. Study, production and implementation of educational strategy
3.2. Training Courses for creating multipliers and community facilitators in communities	Establish permanent educational modules for community persons, leaders, and groups	28 parroquias community groups and institutions, starting with those located in most risky areas	i. Modules on Operational Techniques, Pedagogy, Leadership and Community Development, Planning.
4. Media Programs for Disaster Preparat. & Risk Reduction	Create and disseminate information to general public	All City Population	i. Production and distribution of multimedia educational programs ii. TV spots and radio programs

**Table S22-6.1.2 Budget for Education Programs**

EDUCATION PROGRAMS TIME TABLE AND BUDGET		1	2	3	4	20 yrs	
1. Professional and High Education							
Program	Target Population	Measure					
1. 1. Professionalization of Disaster Management	PC office staff (100-150) 300 persons survey interested in Disaster Management	1.1.1.Certification Program Establishment. 1.1.2.Disaster Program	2,600,000 900,000 600,000	2,200,000 - 800,000	1,100,000 - 200,000	1,100,000 - 200,000	7,000,000 900,000 1,800,000
1.2.Risk Reduction Curricula Enhancement	Professionals, decision academics, decision makers,	1.2.1.Exchange programs, internships and national seminars 1.2.2.Curricula with risk reduction approach	200,000 300,000	200,000 600,000	200,000 700,000	200,000 700,000	800,000 2,300,000
1.3. Disaster/risk approach educational professionals	Institutes/Pedagog Universities	1.3.Program revision, enhancement & implement	600,000	600,000	-	-	1,200,000
2. Primary, Middle and High School Education Programs							
Program	Target Population	Measure					
2. 1. Inserting risk and disaster programs in official school curricula	20 000 teachers & students	2.1.2.Curriculum review and lobby 2.1.2. Training Teachers	300,000 400,000	- 1,000,000	- 400,000	- -	300,000 1,800,000

2.2. Education materials		2.2. Training materials	1,000,000	500,000	200,000	200,000	200,000	1,900,000
3. Community Education and Operational Training								
Program	Target Population	Measure	2,000,000	500,000	500,000	-	-	3,000,000
3.1. Community Education Strategy	Agencies & community groups	3.1. Production, implementation of strategy	500,000	-	-	-	-	500,000
3.2. Training Multipliers & Community facilitators	28 parroquias community groups and institutions	3.2. Modules Operations, Pedagogy, Comm Dev, Planning.	1,000,000	-	-	-	-	1,000,000
4. Multi Media Programs								
4. Public Programs for Disaster Preparation and Risk Reduction	All City Population	4.1.1. Production and distribution of multimedia educational programs	500,000	500,000	500,000	-	-	1,500,000
		4.1.2. TV & radio programs	1,000,000	1,000,000	1,000,000	-	-	3,000,000
Total Education Program Cost							\$	17,000,000

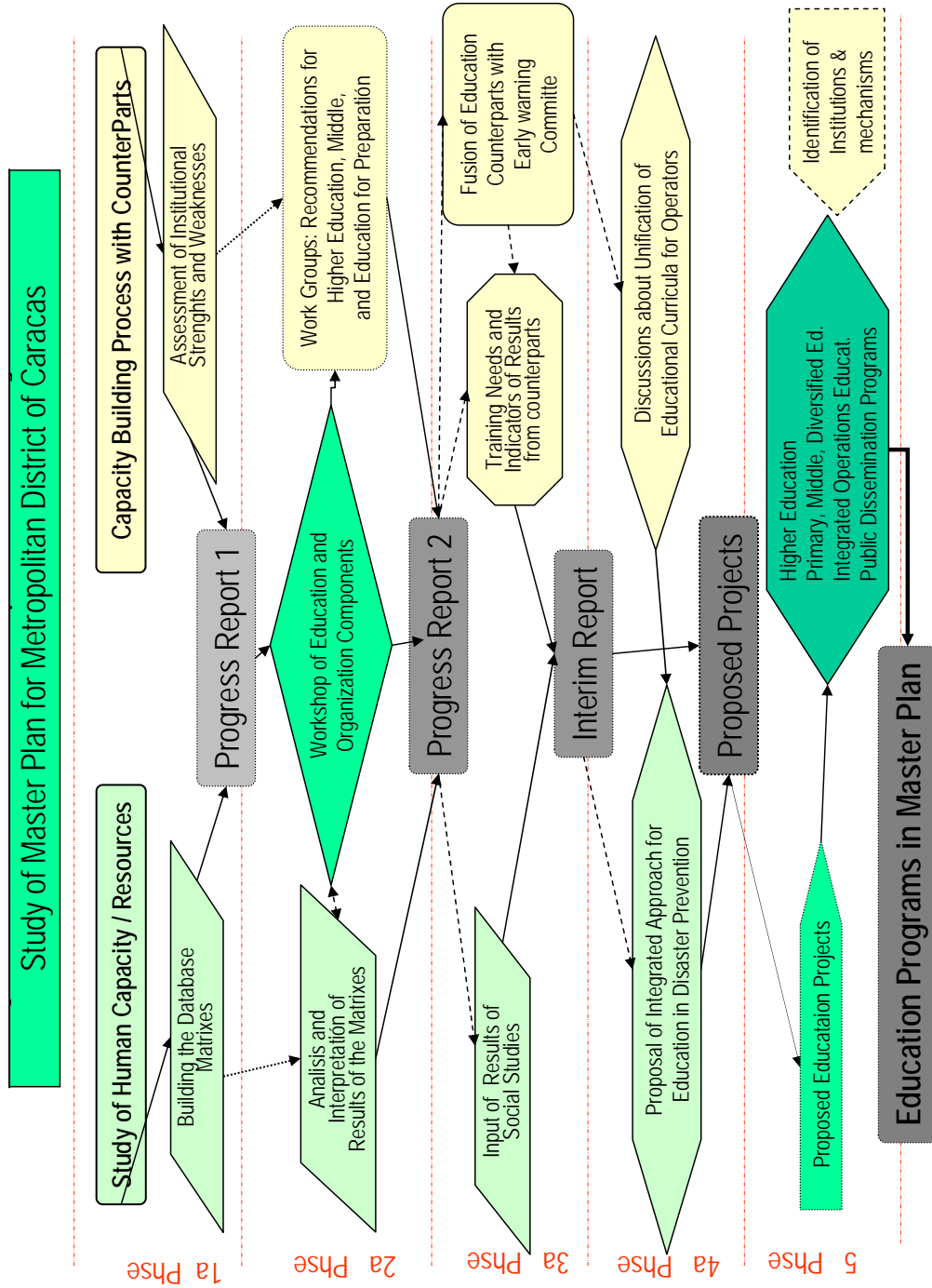


Figure S22-6.1.1 Education Component – Study Process

## **CHAPTER 7. SUPPORTING INFORMATION**

The information collected during the Study period is supporting material for the education in disaster prevention, as well as for the preparation of people in face of disasters and in the reducing the emergence of new risky conditions. The Study collected documents, booklets, CDs, videos, developed interviews, and generated minute meetings and power point presentations, all useful tools for analysis preparation, action and policy building. The advance reports include observations, recommendations and measures as guidelines for the implementation of the Master Plan.

Phase 1 of the study produced the largest section of documents, reports and inventory of current capacities. A set of Matrixes (1-8) were built to reflect the existing institutions, programs, activities and results in disaster prevention education by agent type. Phase 2 produced analysis, findings and conclusions from the data gathered. It also provided space for the largest congregation of educational counterparts, ranging from higher education entities, formal education officers, community groups, operational groups and municipal civil protection agencies. Discussions allowed to verify, complete and triangulate findings, the basis for the proposal of measures.

Phase 3 included the findings of the Social Studies to produce preliminary policy proposals and programs, reshaped into the broader context of the Master Plan.

### **Appendix A Progress Report 1. July 2003. Chapter D5. Education and People's Organization**

Tables D5.1. Summary Sheet for Interviewing	(From PROGRESS REPORT 1)
D5.2. List of Interviews	(From PROGRESS REPORT 1)
D5. 7. Vulnerability Typology	(From PROGRESS REPORT 1)
D5.8. Progression Model of Vulnerability	(From PROGRESS REPORT 1)

Matrixes

Summary List of Matrixes

Matrix 1. Organizations involved with Education for Disaster Prevention

Matrix 2. Objectives, Achievements and Products of Education Programs

Matrix 3. Educational Activities and Contents

Matrix 4. Institutional Strengths and Weaknesses of Education Counterpart Work Group.

Matrix 5. Risk Management Activities and Education in Universities

Matrix 6. Education Strategies by Type of Entity

Matrix 7. Results of the Education Programs In Disaster Prevention

Matrix 8. Training Sources and Institutions Table of Data Collection in Education and People's Organization

Tables from Progress Report 2. October 2003. 5.3 Education and Training.

Include all Tables as Annexes.

Summary of Recommendations from Workshop on October 10<sup>th</sup>, 2003.

Presentation prepared for Workshop on October 10<sup>th</sup>, 2003 on Education and People's Organization  
(PPT Presentation)

**S23**

**PEOPLE'S ORGANIZATION FOR DISASTER  
PREVENTION**

*“Some people are saved luckily,  
others know what to do, Prevent”*

*Francisco Layrisse*



STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S23

PEOPLE'S ORGANIZATION FOR DISASTER PREVENTION

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## **S23 PEOPLE'S ORGANIZATION FOR DISASTER PREVENTION**

### **CHAPTER 1. CURRENT SITUATION**

How to prepare the population for disaster prevention is one of the greatest challenges the city administrators of Caracas face, given the fact that risks are continuously increased by the number people living in unsafe housing conditions by the growth of barrio phenomenon. People of Caracas require to have the capacity to organize and save themselves from unexpected events such as earthquakes, debris flow and floods. People's organization for disaster prevention is a result of a combination of several conditions: 1. proper awareness, 2. understanding of the means or strategies for organizing, 3. having the required resources (human, technical, social) and 4. having the capacity to work effectively with others to prevent exposure and harm for themselves and their loved ones, and their surroundings.

The Metropolitan District of Caracas lacks of definitions and planning for people's preparedness framework towards adverse events. Much of the efforts of preparedness are currently occurring through education and training strategies. The assumption behind is that by using courses, trainings and experiencing drills, the communities on their own will find ways to best prepare themselves. Most of the times, teaching *how to set the Local Emergency Plan* is the last step of an intervention from Civil Protection or Firefighters towards community leaders, hoping the local awareness will grow and expand into future actions by this teaching effort. More often than not, the expected outcome is quite different after six month or year. Communities have not found the proper ways to expand the knowledge learned, or have not been successful in their efforts to include or sensitize other neighbors and/or impact local officials. The reasons for this fact are explained in the following sections.

### **CHAPTER 2. PEOPLE OF CARACAS' SITUATION IN ORGANIZING FOR DISASTER**

According to the Social Vulnerability Survey, close to half of people surveyed in Caracas, have experienced a disaster, mostly earthquake (80% of affirmative responses) and floods (24%). Seventy three per cent of the respondents recognized their communities and neighborhoods could experience a disaster any time, and eighty five percent (4121 persons of a total lo 4802 surveyed) that these disasters could affect them directly.

However, a great majority of respondents believe that factors out of their control are the reasons that cause their communities to experience damages, such as nature or the force of the event (77%) along

with God and destiny (19.64%). The concept of “disaster” as a function of “hazard” (as natural fact) and “risk”(as social or human built factor) is not present in the average citizen. Less than 23% of respondents of the sample surveyed considered that factors such as lack of community organization, information and training; or location (14.5 %) and urban development without considering nature (22%) were reasons affecting the level exposure to damage by adverse events. In Caracas, such as in Latin American experiences –as well as the latest literature on disasters- the greater risks are created by ongoing development practices with little consideration of the physical conditions surrounding the communities and cities. These policies do not consider deepening the understanding about the social factors, looking into the structural problems affecting the population towards greater risks.

There seems to be a large gap on the understanding of the dynamics and the role of the organizing efforts in communities for disaster prevention. In one hand the analysis of suggestions on how to cope with disasters by leaders interviewed, organizing was not found to important. Rather they stressed awareness level by emphasizing on information, awareness and educational activities<sup>1</sup>. However, organized communities when asked to give recommendations to “other communities” from their own experience, they strongly suggested that the organizing activity itself is more than half (57%) of the effort; training is 30% of the efforts, and individual responsibilities and actions are relatively less significant (13%)<sup>2</sup>. Therefore, a framework on how to prepare collectively for greater events is one of the most urgent responsibilities, to move forward from the present condition. While technical knowledge and skills are necessary for communities, the organizing experience, (understood as process-driven programs and plans) are the key challenges to increase continuity after training is achieved. Interestingly, 71% of leaders surveyed in 15 communities stressed not knowing if their community had organizing tools such as Local Emergency Plans. The same percentage of leaders’ opinions (from a total of 75 in dept interviews) explained that no specific entities were presently working in their own communities on disasters or emergencies.

It seems as one of the most difficult tasks to develop sustainable and sound community-based preparedness programs. This fact was found to be true for community groups and disaster administrators as well, both recognizing the difficulty of the task to organize the metropolitan communities. The desirable procedures are still in the midst of discussions. The conceptual overlap in words such as “organization”, “preparation”, “education”, “awareness raising”- used in a surprisingly interchangeable way- are evidence of this condition<sup>3</sup>. Table S23-2.1.1 shows some distinctions between two of the concepts discussed in this chapter: preparation and organization.

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<sup>1</sup> Ethnography Study JICA Study Team /BL. November 2003.

<sup>2</sup> Successful Experiences Case Study. JICA Study Team-Socsal. November 2003.

<sup>3</sup> The lack of policies in place to organize people on how to take the appropriate measures is evident with the fact that 82.4% of respondents of the confirmed in the Social Vulnerability Survey stressed not have been exposed to training in organization for disaster prevention.

Official actions towards people's prevention for disasters begin from acquiring an open mindset to gain understanding on the human conditions and social texture of those exposed at high risk. This first disposition of openness is a key starting point in the effectiveness of the organizing policies for disasters. The Social Vulnerability Survey showed that specific sectors of population expressed different interests and needs in the ways they perceived their inclusion into the disaster's agenda. For example, women expressed the greatest interest in learning about organizing skills, although they had been exposed less to training experiences than men. Most of the time, the existing community groups at each Parroquia or sector have developed particular organizing settings on their own, which makes the IPC and Alcaldia's task one of coordination of efforts, planning, resource identification and allocation, and process facilitation. Again, the preferred strategies from successful experiences in Caracas shows that keeping the organization ongoing and the unity of people, is the most effective way to deal with disasters. Table S23-2.1.2 presents a set of elements of success proposed by the Study to consider in disaster organization.

The complexity of disaster preparation topics are magnified when findings on the Social Survey reveals that 81.3%, 3904 of all respondents are willing to move out if they were told that they were living in high risk sites. While this figure seems to contradict common expectation among institutional officers, the quantitative survey findings were consistent with the ethnographic sections of the Study. Both in leaders opinion (64% of leaders expressing willingness to move) and in several narratives and interviews, it was strongly stressed for some communities, that the only way to avoid greater damage and loss was to move entire sectors to a safer place<sup>4</sup>.

The elements for success proposed by the Successful Social Study to consider in disaster organization are summarized as follows:

- Minimize affectation and loss; keep the memory of events in daily lives
- Include risk reduction in community development agenda
- Minimize institutional vulnerability: client relations (reduce dependency or waiting)
- Knowledge and preparation for events without vulnerability reduction lead to de-legitimization and "wearing-out" of community efforts in eyes of citizens
- Minimize conditions of vulnerability – long term process
- Organizational process needs to be continuous and innovative
- Good communication is a key aspect as well as motivation, positive attitude, and hope

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<sup>4</sup> Ethnographic Study Section Social Survey and Quantitative Survey. Jica Study Team. November 2003.

- Key roles of leaders: recognition, credibility, legitimacy, confidence

The need for good examples and successful models that people can recognize by themselves are a high demand. Findings of Successful Cases Study. A successful case for internal community, is quite different from foreign actors. Interpretations on the rationale of success acquires particular meanings and expectations, according to different sectors. For civil protection agencies, the existence of an early warning system is an optimal indicator, but not necessarily for those exposed to risk. This is particularly true when exposure delays are due to the inevitable reliance on institutional paperwork for the delivery of programs of relocation or investment long time awaited.

**Table S23-2.1.1 Preparation and Organization - Conceptual Continuum**

Category	Community Preparation	Community Organization
Purpose	Reduce effects (save lives) specific to particular expected events. Strengthen preparedness and response	Improve current and structural conditions (quality of life) Strengthen internal leadership, community identity, community capacity.
Agenda	Focused to adverse events. Day to day community maintenance. Also tends to focus towards seasonal events	Linked to community development (social investment, zoning, collective health and environment programs)
Time Frame	Short / Medium	Medium / Long Term
Agents involved	Civil Protection, Firefighters, Neighborhood Associations, Health committees	Civil Protection, Neighborhood Associations, Health committees, co-management community investments, housing and infrastructure authorities
Organizing structure	Ad hoc specific for preparedness, communication networks, education and preparation entities	Ad hoc and also within existing community network or social structures, consensus building, multi sectoral
Resources required	Evacuation skills, rescue equipment, food stocks, shelters, emergency funds, hazard and risk maps, community assets and social capital, appreciative approach	Community planning, sustainable development programs, facilitation and horizontal leadership, social capital, lobbying government resources, hazard and risk maps, community assets and social capital, appreciative approach
Environment agenda	Maintenance of water streams clean of trash. Improvement of open and green areas,	Improvement of open and green areas. Protection of soil loss, reforestation.

**Table S23-2.1.2 Outline of People’s Organization Projects**

Concepts/Components People’s Organization for Disaster Prevention Concepts
<p>Support to Civil Protection System</p> <ul style="list-style-type: none"> <li>• Organization of appropriate structures or networks in most vulnerable areas</li> <li>• Technical and Institutional Support</li> <li>• Community Preliminary Diagnostic</li> <li>• Identification of initial motors</li> <li>• Inter-institutional coordination</li> <li>• Capacity building and transference</li> <li>• Standardized training modules with specific methodologies and approaches according to characteristics of target population</li> </ul> <p>Support to Civil Society</p> <ul style="list-style-type: none"> <li>• Support directly work with populations through social organizations</li> <li>• Identification of capacities in the organizations</li> <li>• Direct support for civil organizations inserting risk factors into their development plans</li> <li>• Identifying development needs and their relation with risk management</li> <li>• Sustaining disaster prevention over time by facilitation and multiplying effect</li> </ul> <p>Holistic Perspective</p> <ul style="list-style-type: none"> <li>• Identifying external resources/assets available (institutional, local, community spheres)</li> <li>• Risk reduction screening for development projects</li> <li>• Community motivation and sensibilization</li> <li>• Community prevention and risk reduction indicators</li> </ul> <p>Building Community Capacity</p> <ul style="list-style-type: none"> <li>• Methodological tools</li> <li>• Identification of community resources</li> <li>• Creating appropriate materials for community needs</li> </ul>



### **CHAPTER 3. INSTITUTIONAL POLICIES FOR PEOPLE'S ORGANIZATION IN DISASTER PREVENTION**

In the Study Area, experiences and organizing models at the community levels found at community levels. These have sprung out from a combination of contextual factors. Institutions with sectoral programs have sponsored the establishment of local legal entities (health, environment or housing). Other structured programs are directly sponsored by preparation entities (such as PC, Red Cross or Firefighters). Network coordination among neighbors, neighborhoods, community/institutions, and among institutions, have yielded outputs. Overlapping and gaps on the legal framework referring to community organizing is an indicator of the absence of a system or office responsible for peoples' organization. At least seven distinct laws referring to community level preparation and organization were found. Table S23-3.1.1 summarizes competencies for People's Organization in Venezuelan legislation. Local entity are legally bound to adopt measures and develop activities in citizen protection, disaster prevention and fund raising for emergencies. Specifically, the Municipal Law stresses the obligation for Alcaldias to attend and develop civil protection and citizens safety programs. At the same time, the recently created Local Councils of Public Planning (CLPP) are entitled to establish Security Plans, develop safe local urban plans and to establish an emergency fund for disasters. Neighborhood associations are legally bounded to take care of people's security and protection, specifically to organize campaigns and practices for people's and asset's protection and safety<sup>5</sup>. Finally the citizens are bounded to develop self protection measures, to be prepared and to follow agencies commands during emergency time. The overall responsibility of design of policies and coordination is mandated to Civil Protection in their own Law.

Figure S23-3.1.1 visualize confluences and differences among Education,, People's Organization and Information Strategies. While educational strategies focus on teaching and providing knowledge to achieve attitudinal changes, organization strategies are process-oriented; they focus on steps and action plans. The tendency found in the practice of preparedness among Protección Civil and Bomberos agencies in the Study Area was the preferential use of information and education strategies as an assumed mean to reach people's organization.

People's organization for disasters is not explicitly present in the laws, but generically defined under words such as "protection" and "security". These concepts also refer to health or property aspects not necessarily related to disasters. The lack of a proper definition about organizing by the public institutions, is connected to the need of a conceptual and strategy framework prevention, preparation and organization for sustainable development with the least possible exposure to risks.

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<sup>5</sup> Reglamento Parcial No. 1. Asociaciones de Vecinos. Adjunto a la Ley Orgánica del Régimen Municipal No 4109, 1989.

### 3.1 Sponsoring Agencies

The study has identified the existence of several disaster preparedness models in the neighborhoods of Caracas. These are CAELs, Red Cross Community Preparation Program, Barrio Rehabilitation community based organizations such as Consorcios and Civil Association, Neighborhood Protection Committees, Municipal Protection Committees, and Rescue Volunteer Groups. The CAELs are models preferred by the Metropolitan District Authorities of Civil Protection, mostly present in Chacao Alcaldía sponsored by IPCA.

There are at least three preliminary sets of arrangements by which organizing tends to occur for disaster prevention.

**(1) Top Down (applied broadly in many countries, and extended literature with relative successes and notorious gaps)<sup>6</sup>.**

The greatest change this model has to overcome, is that plans are understood as last steps in the interventions efforts that disaster administrators have with communities. However, reality shows that the effectiveness of these plans will only be known if the plan is part of a capacity building process in the development agenda of the community. The steps recommended by Bomberos and Protección Civil for new groups or persons interested, are composed by a core of training contents referred to models and materials on specific. The Metropolitan Civil Protection Office has created Committees for the Actuation of Local Emergencies / known as CAELs –(a scheme originated from the Metropolitan Fire Department) as a community structure in charge of the tasks of prevention and preparation to face disasters in all their phases<sup>7</sup>. The Law of Civil Protection establishes as one its goals, the creation of strategies directed to community preparation in order to guarantee the full use of potential of people, families and communities to face emergencies and disasters<sup>8</sup>. Citizen participation is promoted through the Law of Coordination for Citizen Security, which urges individuals and collectives to participate in an organized manner in the designing of citizen security plans, proposing suggestions, observations and comments to such plans<sup>9</sup>. Likewise, the Fire Department is in charge of developing and promoting activities in preparation for the citizens facing emergencies. The law authorizes this body to promote the application of prevention and

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<sup>6</sup> See “List of Manuals” Annex from Strategies for Disaster Prevention for Earthquakes Fundapris. Social Study Set 2004.

<sup>7</sup> Among the tasks of the CAELs it is mentioned gathering population data, identification of hazards, vulnerabilities and risks, the preparation of safe areas, drills and scenario building, support in preparation of actions during the response, such as evacuation of affected areas, and others. Martinez, W. Presentation on October 10, 2003.

<sup>8</sup> National Organization of the Civil Protection and Disaster Administration Law, No 5557 13/112002 (Ley de Organización Nacional de la Protección Civil y Administración de Desastres)

<sup>9</sup> Citizen Security Coordination Law, Official Gazette No. 37318. 6/11/2001 (Ley de Coordinación de Seguridad Ciudadana)

mitigation measures, and to act as consultants and promoters in risk management matters associated with communities<sup>10</sup>.

The participation in collective community structures is stimulated by the Organic Law of the Municipal Regime, authorizing the Neighborhood Associations to promote, orient and contribute in organizing campaigns, programs and practices directed to the protection and security of persons and properties of neighbors, as well as topics closely related such as prevention of accidents, environmental protection, and citizen education.<sup>11</sup> These Associations have full authority to execute programs of citizen protection and civic education explicitly directed to youth.

Recently created, the Local Councils of Public Planning – (Consejos Locales de Planificación Pública - CLPP) are entitled to develop Plans of Local Security for Persons and Assets (campaigns against noise, accident prevention, and citizen education) and also implement programs of citizen protection and education.<sup>12</sup>

**(2) Bottom up and horizontal approaches.**

Successful experience sharing are excellent tools that support information sharing and learning, with the advantage that language barriers, credibility and detailed examples on daily basis are available from first hand sources. Methodological strategies such as “farmer to farmer methodology”, “training trainers”, workshops for exchanging live experiences, to “community to community internships”, are all methods utilized stemming from the basic concept that greater chances of replicability comes from community based experiences sharing processes. Some times Rescue Groups are seen as community organizing efforts from within, when their membership lives in the neighborhood. Communities benefiting from external support from Bomberos methodology are Anauco and La Trilla, in Libertador municipality, despite the fact that these communities do not use the name of CAELs as their true identity an identity.

**(3) Third party intervention:**

These are programs sponsored by agencies such as NGOs, national or international, religious or highly committed academic projects. The need of some sort of sponsoring (third sector) or facilitator to stimulate organization. Academic Agents doing field work require the ability to transform technical information into proper material for communities. Also appreciated as

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<sup>10</sup> Firemen and Firewomen Department and Administration of Emergencies of civil character Law, NO 5561, 28/11/2001 (Ley de los Cuerpos de Bomberos y Bomberas y Administración de Emergencias de Carácter Civil)

<sup>11</sup> Partial Regulation No. 1 about Community Participation, No 1297, 22/11/90. (Reglamento Parcial No.1 sobre la Participación de la Comunidad)

<sup>12</sup> Local Councils of Public Planning Law, No 27463 12/6/2002 (Ley de Consejos Locales de Planificación Pública)

effective in disaster response for 75% of respondents, most of these groups do not have an organizing focus, rather than a response profile.

Aspects to keep in mind about third party sponsoring are related to limitation of funds, short term interventions impacting the proper continuity of project developments, scope of initiatives and the expected results. Third party interventions have to cope with the challenge related to time-limited interventions, such as greater expectations, vacuum-effect after project intervention, or inability to continue due to limited methodologies or approaches in the transfer and development of knowledge and local capacity.

Third party is particularly helpful when difficulties to listening between sectors occur, (between institutions, between community leaders or groups or between levels. The main contributions are related to the characteristics of third party's role are non involvement; its facilitation skills to built with and from peoples suggestions; more open perception and sensitivity of communities assets, skills, sensitivity, capacity to bridge communication gaps.

From the perspective of the population, the contributions from voluntary groups recognized for their capacity to provide specialized support. These groups constitute the specialized community support, better structured, that municipalities can benefit from. Interested community members can register in these voluntary entities. They receive specialized training and instruction to take on support tasks and help organize the community during disasters under the regulations of the Civil Protection and Disaster Administration Law. Despite being secondary attention entities, these groups end up playing primary roles, given the budget and human resources limitations experienced by the institutions responsible for these tasks.

**Table S23-3.1.1 Responsibilities Pertinent to People's Organization in Venezuelan Legislation**

Law and Organizations	Responsibility
Civil Protection Law	- Must design permanent preparation policies for people's self protection and reduction of vulnerability factors; - Promote and develop citizen self protection
Fire Department	- Design and execute prevention, mitigation and preparation for emergencies and function as advisors and promoters
Municipal Law	- Mandated to work on civil protection and citizen security
Neighborhood Associations	- Promote campaigns & programs for protection of people and assets
Local Councils for Public Planning	- Set local emergency fund; people & assets security plan
Citizenship (Citizen Security /PC Law)	- Participate in self protection; readiness if required civil support
Ministry of Health & Social Develop	- Sponsor community organizing for social development

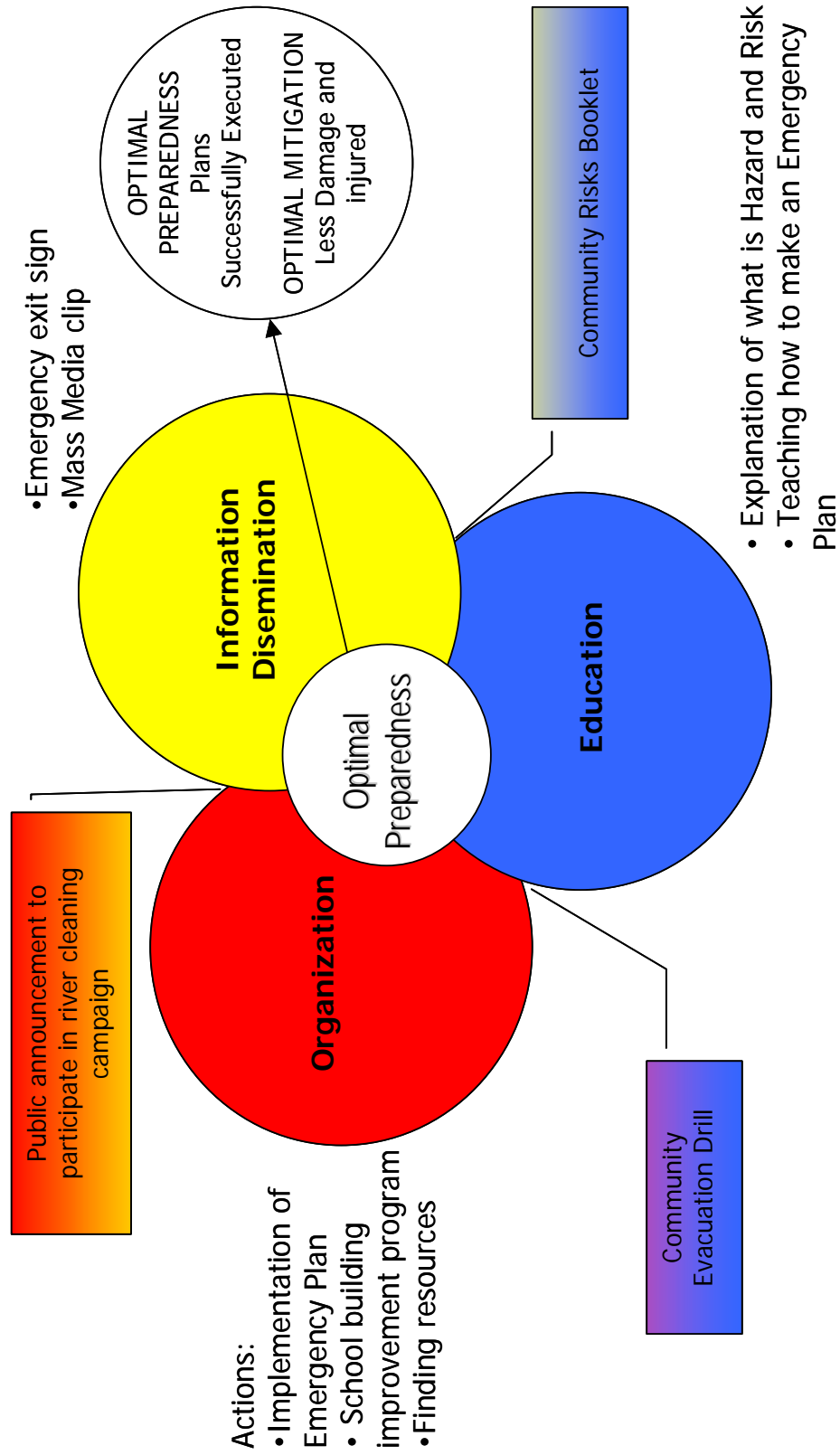


Figure S23-3.1.1 Interaction of Strategies for Education, Information and Organization for Disaster Prevention

## CHAPTER 4. LIMITATIONS

In Caracas, despite intensive efforts by the responsible agencies, the current activities are urgently demanding improvement in people's preparedness facing disasters. The skills required to accomplish the above go beyond the operational technical sphere and expands into topics like leadership development and group processes; knowledge of age and gender particularities in community organizing culture, as well as knowledge on promotion and facilitation techniques. Most of the times, the necessity of appropriate communication, negotiation or planning skills are the greatest missing linkages that do not allow current programs to evolve and merge into community- driven preparation activities and action plans.

Finally, good examples and useful printed material is highly required. Local risk management is only one part of the focus. Discussing the strategy of strategy-building from a down up approach and stakeholder analysis. Little debate on organizing for prevention. There tends to be little bi-directional contact between disaster administrators with most vulnerable people living in most inaccessible places, contrary to recommendations in Group No 4. Workshop Oct 10th.

Communities share same concern: difficulty to sustain over time if 1. Disasters are not one of their primary problems or needs 2. Conditions such as distance or communication among local people, and between them and their support sources 3. Keeping the target that communities are able to pace their initiatives at realistic levels. Also risk reduction mitigation projects handled by communities such as Catuche and Anauco show the ability of self organizing, when leadership from within is strengthened

Cases such as El Llanito Protection Committee should be studied in detail. A highly motivated leader after one year decreased substantially is interest despite the constant effort to emulate the organizing models recommended (a Central Committee and a number of subcommittees and brigades) by the guidance of civil protection authorities. The methodology of support requires revision.

## CHAPTER 5. POTENTIALS

The preparation entities have recognized the need of policies towards people’s organization in disaster prevention. It has been expressed repeatedly at the Education and Organization Counterpart Meetings the eagerness to find appropriate and effective set of tools to stimulate preparation and community actions in disaster preparedness. The results from the Social Study on Strategies for Community Organization for Disaster Prevention are meant to be a contribution of JICA Study Team on this matter on pilot projects for Early Warning and Building Reinforcement. Recognizing a process-driven organizing strategy, versus a “number of hours-based” training education program, is a key difference in strategy of preparation that needs to be set in place. The Civil Protection agents must gain understanding on how to plan lasting strategies for effective preparedness community plans.

During the Workshop for Education and People’s Organization in October 2003 the Work Group on People’s Organization discussed their own experiences for organizing communities and recommended to have multiple options, considering the comfort experience and the presence of existing groups, as alternatives to best engage people into the disasters agenda. Tables S23-5.1.1. Existing Organization for Disasters in Metrop. District of Caracas)

**Table S23-5.1.1 Existing Organization Structures working in Disaster and Risk Prevention - Metropolitan District of Caracas**

Community	Organization
La Trilla (Libertador)	Comité de Atención Local de Emergencias (CAEL)
Catuche (Libertador)	Asociación Civil -Catuche (ASOCICA)
Los Anaucos (Libertador)	Asociación Civil -Los Anaucos 2000
19 de Marzo (Sucre)	Comité de Prot. Civil / Cruz Roja -19 de Marzo
El Llanito (Sucre)	Comité de Protección Civil de El Llanito
La Castellana-La Floresta (Chacao)	Comité de Atención Local de Emergencias (CAEL)

## **CHAPTER 6. PLAN POLICIES**

The Law of Civil Protection , commands itself with the responsibility of establishing policies and promote disaster preparation. This task should be done at all jurisdictions of Proteccion Civil according to hierarchy and scope of responsibility. The PC National level provides the broad framework and is in charge of larger coordination. The Municipal Proteccion Civil Institutes role is to stimulate communities to prepare and organize themselves for disaster prevention in a coordinated way. The Metropolitan and National entities´ role rather than to directly organize people are in charge of general guidelines and attending wider jurisdictional events, where as municipal policies and procedures are more directed to stimulate community action and preparation. In each Alcaldia, the strategy should be articulated with and by IPCs. Task Groups must be set in place to establish connections within each jurisdiction to share policy commonalities.

The goals to pursue with the people’s organization is to provide tools, strengthen capacities and set procedures for citizens of Metropolitan District of Caracas to successfully protect their lives, families and assets in preparation for disaster events in Caracas.

The principles of people’s organization include a bottom up approach as Figure S23-6.1.1 shows. 1. A community “motor” starts the initial work; 2. Networking and effective coordination among agents in communities as well as between disaster related institutions within municipal jurisdictions; 3. Exchange and sharing of resources; 4. Strengthening capacity building and community building processes. The set of measures proposed are programmatic actions and processes to be developed in increasing stages as paralleled and combined programs.



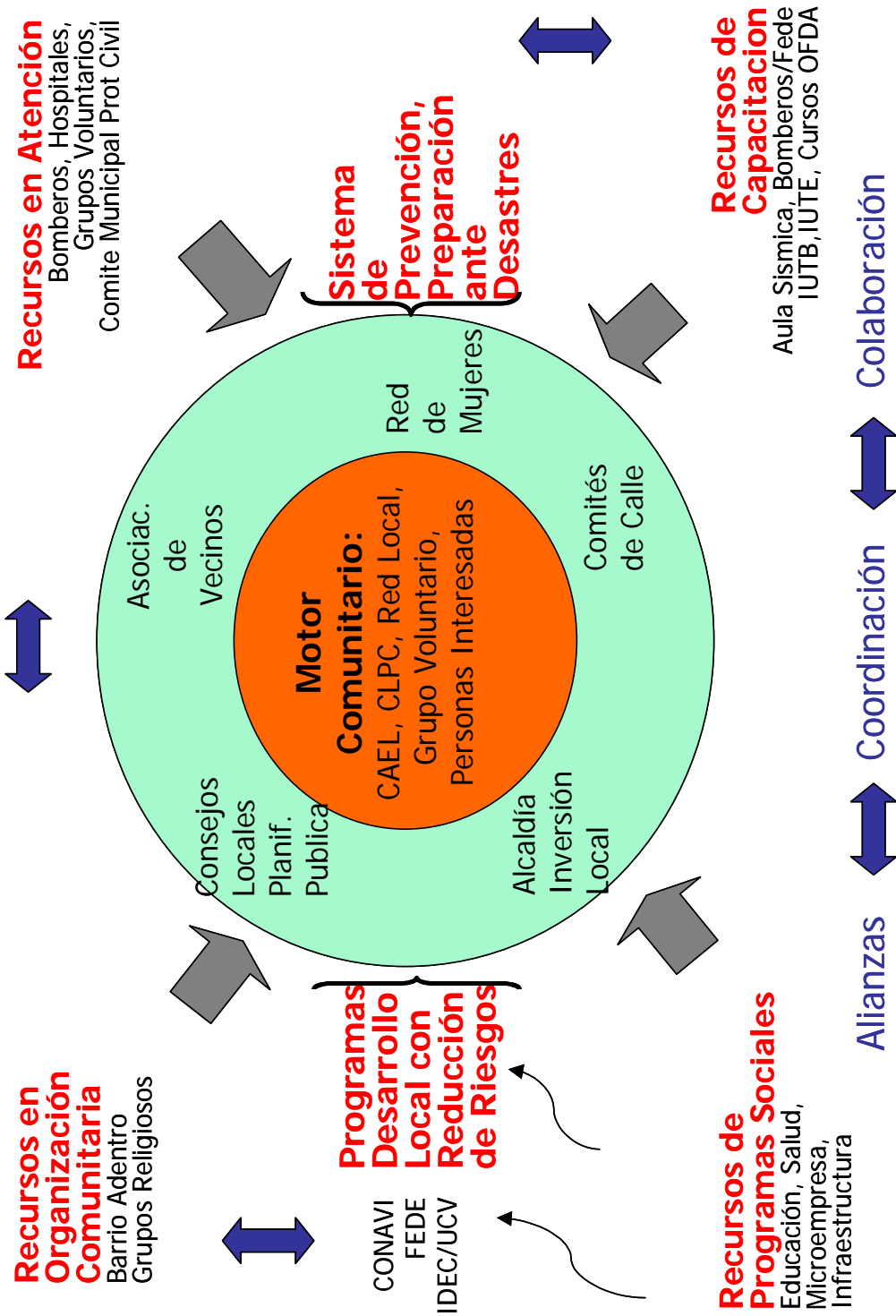


Figure S23-6.1.1 People's Organization for Disaster Prevention

## **CHAPTER 7. STRATEGIES**

The following section presents the sets of measures and strategies for designing, implementing, and sustaining people's organization throughout time in the Metropolitan District of Caracas. Summarily, it includes four areas, not as independent or alternative sections but conceived as one single unified effort. These are:

1. Preparation of a Strategy for People's Organization in Disaster Prevention
2. Disaster Preparation Program
3. Disaster Prevention and Risk Reduction Policy Building
4. Support Programs

The following Strategy for People's Organization for Disaster Prevention are combined programs that attend the short middle and long term policies. Part 1, Strategy Design and Adoption, explains the model to create, lobby and adopt the Strategy for People's Organization built upon the existing conditions both at community and institutional spheres.

Parts 2 and 3 are short and long term sections (preparation and prevention) of a broad action plan. Part 4, Support Programs, is conceived as foreseeable and required institutional support.

### **7.1 Design and Adoption of a Strategy for People's Organization in Disaster Prevention**

The preparation of this Strategy is conceived as a joint effort, sponsored by Protection Civil, carried by a Technical Team, built under a multi-stakeholder approach. Figure S23-7.1.1 shows steps to be taken to establish and adopt a Strategy for People's Organization. The basic concept is that a Technical Team must be established with the task and authority to design, promote and set in place a People's Organization Strategy. In order to accomplish their task, the criteria for selecting appropriate members of the Technical Team, requires a combination of professional organizers, community experts and disaster preparedness experts, but also with highly effective advocates and achievers of institutional engagements, since the Strategy must be adopted by the end of the approval stage. A profile of the Team skills can be found in Table S23-7.1.1.

Both left and right sides of the Flow Chart in the mentioned Figure S23-7.1.1 are the sections where required inputs and outputs happen, during all the preparation process. The process takes place and moves forward at the center of the Chart from above to below through time. A key task of the Technical Team is to systematically lobby, advance and gain support from stakeholders, both in community spheres (right side of the Figure) as well as through the institutions (left side of the

Figure) to obtain commitments and political willingness to adopt and accomplish the subsequent programs in disaster preparedness. This approach avoids the pitfalls of outside technical teams establishing non applicable methodologies because not considering factors particular to institutional culture, levels of decision making, or miss communications between departments or entities, which could be solved during the lobbying period. Selected communities will be involved at initial stages for the Strategy to be piloted.

The Strategy while a broad framework, will have generic conditions, one of them is the need of flexibility according to particular social configuration of each community, the social texture, nature of leadership in place, as well as existence of (or promotion of new) motors and institutional resources at place. The Strategy will utilize community and institutional assets found in the Social Study. As an example, women appeared to be key assets in most of the communities not only because of their active presence and engagement in community improvement activities, but also because they seem to be the key resource the family counts during disasters, while being more time close to or at home<sup>13</sup>. Specific methodologies must engage female leaders and community women expressing interest in learning organizing skills with respect and assessment of their particular situation. Other assets to at place are existing networks, neighborhoods associations with risk-related agendas, as well as individual home and local supplies, and appropriate space for evacuations.

The process of design and adoption of the strategy is outlined in Table S23-7.1.2 Steps for Adoption of Strategy. The Strategy implementation sections are explained in following sections S23.2.2 Disaster Preparedness and S23.2.3. Disaster Prevention and Risk Reduction.

For starting the process of Design of the Strategy. One position designated specifically to work in Community Organization. This managerial position requires qualifications on preparedness, community psychology and understanding of the regular development agenda communities live. Produce a programmatic action plan to develop the community organizing topic on disaster prevention, with the support of a Joint Technical/Community Team.

Procedure for Implementing this Strategy. Implement involves creating a new position for the specific purpose of developing a continued program. Table shows desired profile of Manager and Technical Team for Community Organization program setup.

## **7.2 Disaster Preparedness**

Protección Civil at Municipal offices require having qualified social expertise for understanding human dynamics to improve policy making based on societal promotion, networking and organizing. It is key for Protección Civil to find a balance between teaching and implementing preparedness and

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<sup>13</sup> Ethnographic Study Section Social Survey and Quantitative Survey. Jica Study Team. November 2003.

planning processes done by community while strengthening their own capacities. The policies on reduction of risk and prevention of disasters have to be people centered. Consultation and participation should include all stakeholders, women and men, recognizing differences in organizing styles, time, abilities and perspectives. Particular care must be stressed in understanding the difficulties for areas with greater exposure.

The use of tools produced for this study, such as the Hazard Map, the Risk Map, the Social Vulnerability Studies, the Successful Cases examples, the Building Test Models and the Strategies for Community Activities in Disaster Prevention should be put into use for all involved actors and agents.

### **7.3 Disaster Prevention and Risk Reduction Policy Building**

Recent studies in developing countries affected by major disasters stress the need of a social development approach for risk reduction.<sup>14</sup> Links have to be set in place between Protección Civil and Ministry branches with programs at localities, such as Ministerio de Salud y Desarrollo Social (which has a community organizing program) or government's efforts such as Barrio Adentro. It is important to stress that sectoral-only approaches tend to create pressure over existing community structures and leadership, and over time can create community disunity, overwhelm leaders and reduce community's effective actions. In order to link disaster prevention with risk reduction, effective communication and collaboration seem to be the initial conditions.

While Protection Civil's job is not directly defined towards reduction of risky conditions, the Risk Perspective is a key part of the disaster prevention equation. Protección Civil and Bomberos must find ways to support that communities and local institutions include disasters into the community's agenda, while at the same time risk reduction has to be part of the disaster preparation agenda of specific preparedness existing or newly formed groups.

While this topic might be seen as going beyond Protection Civil functions, disaster prevention promotion should include institutional cooperation for zoning policies and considering relocation into municipal planning as effective ways to prevent disasters. People do not want to live in risk and if choice permitted they would move out. This major finding which undoubtedly should be explored and studied in greater detail, already is revealing interesting paths towards where people could want to organize themselves, if appropriate policies are offered as alternatives.

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<sup>14</sup> Lavell Thomas, 1999. Sistema de Naciones Unidas frente al desastre asociado con el Huracán Mitch en Honduras. De la atención de la Emergencia a la Gestión de Riesgos. Red de Estudios Asociales en Prevención de Desastres en América Latina.

#### **7.4 Support Programs**

The three previous parts of the People's Organization Strategy require institutional support. A permanent support programs can help solve inherent or co-lateral and inherent issues otherwise could affect the outcomes sought. Several support sub programs are key. One area is the institutional support for newly formed groups and programs as well, for the existing efforts adopting disaster agenda into their activities. The types of supports range from proposal requests to office supplies, or from printing to teaching to resource mobilization and lobbying.

Another sub program is monitoring and planning systems, to stimulate the community itself construct and build follow up on their own baseline and indicators of disaster preparation and prevention. Computer equipment and training are aspects included in supporting development of capacities for communities with high exposure to risks. At the Alcaldia level office equipment and database systems or maintenance support for radio communications systems can make a huge difference in motivation and outcomes of the organizational plans. These databases are local subsets or branches of a wider metropolitan informational network, constant update preparation databases measures as well as policy development plans.

**Table S23-7.1.1 Manager Position for Community Organization for Disaster Prevention**

**Tasks**

- To develop the Profile for a Program for Community Organization for Disaster Prevention
- Plan must include mechanisms to coordinate the different action levels required for Community Preparation for Disasters in the City
- To develop a Team Profile to support build up and accomplish specific tasks
- To develop a community based methodology to build community organization for disaster prevention in Caracas

**Desired Qualifications**

- Program Management
- Community experience in disaster preparation (practical on site, not response, training, teaching) building capacity from down-up.
- Two year minimum experience as member in community or neighborhood groups. Successful organizing practice is a plus.
- Two year minimum experience coping with external institutions, negotiation of agendas and interests
- Understanding about community development from social point of view
- Courses, training and practical experience in building from down up
- Understanding of exclusion processes, community methodologies of coordination, demands, agendas
- Community Empowerment Rationale
- Knowledge of program performance: development of program and results indicators
- Ability to bridge the gaps, for socially integrated initiatives

**Support Committee Team**

**Community Organization for Disaster Prevention**

**Tasks**

- To develop a bottom up approach program, learning from community, bridging the gaps between formal and informal sectors, assessing carefully existing resources

**Team Profile, consider including these items**

- Understanding of disaster literature and experiences in the region
- Background and experience in community development
- Background on applied social psychology, applied community anthropology, applied social work, local development planning, community health programs (Applied -not on research or teaching- but working inside communities for at least 3 years
- Mediation, negotiation and conflict resolution skills (training knowledge and mostly practical experience)
- Experience in Social, public and community inside community environments communication
- Practical experience in working from within the community (as opposed to “for”)
- Ability to apply concepts, principles, objectives into practical steps
- Ability to work side by side with people from different backgrounds, gender, culture, political

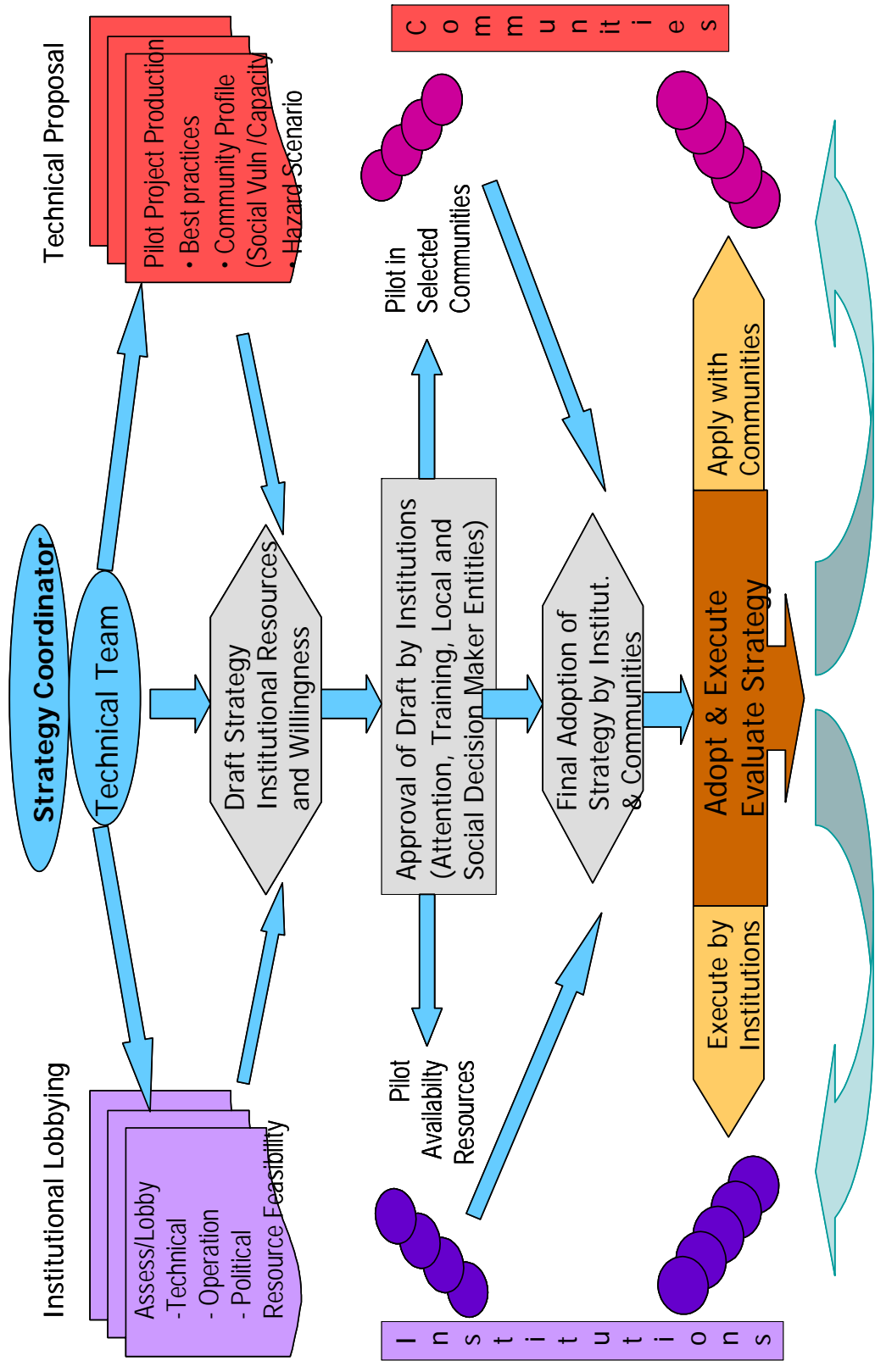


Figure S23-7.1.1 Adoption of Strategy for People's Organization -Flow Chart

## **CHAPTER 8. PEOPLE'S ORGANIZATION PLAN**

The Third Social Studies were conducted to promote the design preliminary activities in disaster prevention in five selected communities (three barrios, one urban and one suburb site). A technical/community studied the specificities of selected communities in terms of social vulnerability conditions, hazard scenarios, building damage and local assets and capacities. By looking at these conditions, the study process included methodological processes named Town Observation and Disaster Imagination Game –DIG- involving community persons and/leaders, as well as agencies, who collectively developed a set of principles and intentions towards future coordination at the communities and municipal spheres. The Study offers a strategy framed to establish links between community agenda and disaster agents in order to facilitate communication, permanency and adoption of the disaster related people's organization policies.

### **PRINCIPLES FOR PEOPLE'S ORGANIZATION PROGRAM**

Significance and urgency

Bottom Up Capacity Building

Optimizing existing resources

Population coverage by diversity and particular needs

Asset based: networking and capacity sharing

Sustainability: Ability to create multiplying-effect over time

### **TARGET FOR PEOPLE'S ORGANIZATION PROJECT**

People in most risky areas, defined as the resultant of the following criteria:

Communities with greater building damage for Earthquake.

Communities at risk in Sediment Disaster Scenario

Most vulnerable social condition: (such as income and education level) as well as accessibility to support system

The present section outlines in Tables S23-8.1.1, 2, 3 are key components of People's Organization Project for the Master Plan. Table S23-8.1.4 includes a Summary budget for the project.



**Table S23-8.1.1 Outline of People’s Organization Projects**

**Support to Civil Protection System**

- Organization of appropriate structures or networks in most vulnerable areas
- Technical and Institutional Support
- Community Preliminary Diagnostic
- Identification of initial motors
- Inter-institutional coordination
- Capacity building and transference
- Standardized training modules with specific methodologies and approaches according to characteristics of target population

**Support to Civil Society**

- Support directly work with populations through social organizations
- Identification of capacities in the organizations
- Direct support for civil organizations inserting risk factors into their development plans
- Identifying development needs and their relation with risk management
- Sustaining disaster prevention over time by facilitation and multiplying effect

**Holistic Perspective**

- Identifying external resources/assets available (institutional, local, community spheres)
- Risk reduction screening for development projects
- Community motivation and sensibilization
- Community prevention and risk reduction indicators

**Building Community Capacity**

- Methodological tools
- Identification of community resources
- Creating appropriate materials for community needs

**Table S23-8.1.2 Principles for People’s Organization Program**

1. Significance and urgency
2. Bottom Up Capacity Building
3. Optimizing existing resources
4. Population coverage by diversity and particular needs
5. Asset based: networking and capacity sharing
6. Sustainability: Ability to create multiplying-effect over time

**Table S23-8.1.3 Target for People’s Organization Project**

People in most risky areas, defined as the resultant of the following criteria:

- Communities with greater building damage for Earthquake.
- Communities at risk in Sediment Disaster Scenario
- Most vulnerable social condition: (such as income and education level) as well as accessibility to support system

**Table S23-8.1.4 People's Org. Summary Project**

Strategy for People's Organization in Disaster Prevention			1	2	3	4	20 yrs
							<b>1.500.000</b>
Program	Target Population	Measure	900.000	400.000	200.000	0	
1. 1. Design and Pilot Strategy for People's Organization in Metropolit District	Municipal PC Institutes, communities in risky areas, social groups and training entities	1.1.1. Strategy building and institutional lobbying					
			300.000	-	-	-	300.000
		1.1.2. Pilot Project implement Peoples Organiz Strategy					
			200.000	-	-		200.000
1.2. Policy adoption	28 Parroquia Sectors, Alcaldias & Alcaldia Metropolitana	1.2.1. Institut & Comm. Workshops in Alcaldias Adopt Preparedness Strategy. Program revision, update					
			400.000	400.000	200.000	-	1.000.000
<b>2. Disaster Preparation Program</b>							
			700.000	700.000	400.000	400.000	<b>2.200.000</b>
2.1 Disaster Preparation Program	Groups and population in most risky areas, expand to all study area	2.1.1. Program Development in Sector, Parroquia and Municipal units					
			300.000	300.000	-	-	600.000
		2.1.2. Emergency Plans, Drills & Preparation					
			300.000	300.000	300.000	300.000	1.200.000
		2.1.3. Community workshops and networking for periodical revision and upgrading					
			100.000	100.000	100.000	100.000	400.000
<b>3. Disaster Prevention and Risk Reduction Policy Building</b>							
							<b>1.400.000</b>
3.1. Risk reduction lobbying, planning & policy adoption	Neighborhood associations, CLPPs, Alcaldia, community networks	3.1.1. Work sessions, Workshops Seminars, Lobbying for Risk Reduction Policy Development					
			200.000	200.000	200.000	200.000	800.000
		3.1.2. Community workshops & networking for policy building risk reduction					
			100.000	100.000	100.000	100.000	400.000
		3.1. 3. Municipal Seminars on Disaster Prevention Policies					
			50.000	50.000	50.000	50.000	200.000
<b>4. Support Programs</b>							
							<b>4.200.000</b>
4. 1. Institutional strengthening	Sectors, Parroquia and Alcaldias	4.1.1 Policy Development Support Program					
			300.000	300.000	100.000	-	700.000
		4.1.2.Evaluation & Monitoring					
			200.000	200.000	200.000	200.000	800.000
		4.1.3 Supporting Materials & Tools					
			200.000	200.000	200.000	200.000	800.000
4. 2. Community & Municipal Database		4.2.1. Inventory of Vulnerability and Assets					
			100.000	100.000	50.000	50.000	300.000
		4.2.2.Computer equipment, programs, training					
			500.000	500.000	300.000	300.000	1.600.000
<b>Total People's Organization Program Cost</b>							<b>\$ 9.300.000</b>

**S24**

**SOCIAL SURVEY**

*“Let us construct future, demolishing risks”*

*Jeymi Sivoli Blanco*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S24

SOCIAL SURVEY

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## **S-24 SOCIAL SURVEY**

### **CHAPTER 1. BACKGROUND TO THE SOCIAL SURVEYS**

#### **1.1 Introduction**

Since disaster is attributed to a combination of natural hazards and human systems (social structure and resources, dynamics of human behavior, etc.), it is important to integrate social aspects into the disaster prevention agenda. For this reason, JICA Study conducted three Social Surveys, each with its own specific objective in accordance with strategy for Community-Based Disaster Management by empowering community autonomy and ownership (see Figure S24-1.1.1).

As the primary step, investigation of the pivotal factors of existing community risk management, namely “Social Vulnerability Survey” and “Case Study of Successful Experiences of Social Risk Management”, were conducted early in September 2003 for three months. The Social Vulnerability Survey pursued existing social vulnerabilities and characteristics in 15 areas of the Metropolitan District of Caracas, which would cover a more serious disaster. The Case Study of Successful Experiences of Social Risk Management, specifically aimed at identifying key elements and capacity of the community to perform risk management based on past disaster experience in three local communities: Catuche, Anauco and La Floresta. As final Survey, “Pilot Study of Community – Based Disaster Management” was carried out from early July 2004 for three months. This study particularly aimed to identify the real unrecognized issues and needs of the community as well as important roles for integrated disaster management. In addition, this study was expected to make selected feasibility study (F/S) of the following subjects: 1) Preparing of early warning system and evacuation system for debris flow, 2) Promotion of reinforcement of risky buildings, and 3) Encouraging people to live away from risky areas. In order to meet goals of JICA Study Team, the participatory approach played an extremely important role in the pilot study. Five communities were selected as pilot communities for applying F/S subjects. JICA Study Team and local subcontractors nicely worked together with each community, and succeeded in building up a sense of thrust and respect for the common goal of community-based disaster management. As a result, continuous and constructive work with each community in the pilot study encouraged community ownership of disaster management for “early warning system for evacuation” and “promotion of reinforcement of risky buildings”. In addition, effective roles of the intermediate group, which is an innovative catalyst to connect community and related institutions, not only strengthened the capacity of community for self-initiated disaster management, but also contributed to aspects of sustainability and interdependency of the communities for their own disaster management.

All process worked through Social Surveys, and the findings validated the innovative Strategy, which integrated community's needs, roles, and expectations into an institutional agenda and disaster prevention planner's perspective. Also, a Manual was successfully produced for community organization formation.

## **1. 2 Major Methodologies through the Social Surveys**

In Social Surveys, the main actors are commonly "community people" who are a diverse, complex, multi-dimensional group of people. Inevitably, many different methods to target community people are needed. In order to fully cover these, an ethnographic approach aimed at understanding the human aspects of social life, human actions, social meanings, intentions and beliefs related to disaster was applied for practical disaster management as major approach, particularly in the social vulnerability survey and case study of successful community initiated disaster management. In addition, in the pilot study of community-based disaster management, "community people" were never a passive object for the Survey, but needed to be active and initiating actors of the community's own disaster management. Therefore, various types of participatory approaches were applied as common methods in the pilot Study; these include: 1) stakeholder approach on specific disaster topic, 2) Disaster Imagination Game (DIG) developed in Japan as participatory disaster simulation game, and 3) participatory planning and learning, and participatory development of the strategy for coping with disaster management.

The following sub-sections describe major and important methodological techniques used in the Social Surveys. A few minor techniques are omitted because of limitation of space.

### **1. 2. 1. Ethnographic Techniques**

#### **(1) Participant Observation**

Observation about the real life of people in each community was obtained by participating in community events. This method helped to reveal the complexity of existing community life, different types of narratives related to disaster, and dilemmas or constraints among community people and other related actors on risk management. Participant observation was one of preliminary methods to grasp community characteristics. Social workers who conducted the participant observation needed to have their presence in community be accepted by each community. The major focuses of participant observation are mentioned below.

- Social Aspects: Everyday life in the community, norms, activities and behaviors related to social risk management.

- Physical Environment: Conditions of physical vulnerability such as infrastructure, and measures taken for disaster prevention.
- Identification of key players, basically hidden or informal key players

**(2) Key Informant Interviews**

Key informants were easy to talk with to understand the information needed. Since these social surveys targeted community risk management, leaders in different roles within the community who are knowledgeable, discerning and reliable were considered as key informants. Significantly, key informants did not necessarily have formal or official status. It is rather important to reveal the key roles and functions on a certain issue regardless of direct or indirect source of information, for example, from informal female leaders, etc .

**(3) Focus Group Interviews (applied in the Case Study<sup>1</sup>)**

In this technique, participants were expected to interact with each other and develop individual ideas and knowledge through participation in the group interviews. In the case study of successful experience of social risk management, the participants were encouraged to discuss the following topics: 1) Risk and Disaster, 2) Memory of Previous Events, 3) Resilience, 4) Leadership, 5) Community Organization, and 6) Socio-Cultural aspects. This method encouraged shy people on a topic to speak up and reach common ideas by sharing participation and facilitation skills.

**(4) Life History on Disaster and Narratives (applied in the Case Study)**

Social research techniques of Life History on disaster experiences provided not only the facts of disasters which the informant had faced, but also revealed the frame of mind, and the cultural and ideological structures of the informants related to disaster events by letting the informants express things in their own words.

**(5) Semi-Structured Interviews and the Sample Selection and Size**

Semi-structured interviewing exposed every surveyed informant to the same stimuli that included some open-ended questions.

- 1) Social Vulnerability Survey

---

<sup>1</sup> The Case Study of Successful experiences of Social Risk Management applied in depth ethnographical approach. The Social Vulnerability Survey also used ethnographical approach, however focusing more on quantitative techniques because of study objectives, scale of sampling, time limitation, etc.

This was the main technique and the analysis was completed based on confirmation with statistics. In the Survey, the total sample size of 4,800 was selected by random or systematic random sampling according to scientific validity in each targeted study area. The outline of questionnaires is shown in Figure S24-1.1.2.

## 2) Case Study of Successful Experiences of Social Risk Management

As mentioned earlier, the Survey focuses on a qualitative approach so that the sample size of Semi-Structured Interviews in each community is necessarily small, approximately 20. This is enough to identify the tendency of the variety of community responses rather than deliver statistical results. The selection of the sampling method applied a combination of elements like probabilistic and intentional sampling to fulfill the survey objectives (see Table S24-1.2.1).

### **1. 2. 2. Social Vulnerability Map**

For debris flows and earthquakes risk scenarios in the Study area, Social Vulnerability Maps were made based on criteria to establish the results and questionnaires of the quantitative part of the Social Vulnerability Survey. Variables for the measures are listed in Table S24-1.2.2. For the criterion of decision variables, it may be necessary to check applicability regularly since social environment or others influence these factors.

### **1. 2. 3. Participatory and Constructive Approach**

The main techniques in the Pilot Study were integrated participatory methods applying a bottom up approach such as: 1) Stakeholder Approach, 2) Disaster Imagination Game (DIG), and 3) constructive community meetings and workshops for certain topics, etc. As participatory methods, socio-cultural promotion techniques such as conflict resolution techniques, communicative facilitation, and joint-construction for the community strategy with diverse community were used in an appropriate manner.

#### **(1) Stakeholder Analysis**

The Stakeholder Analysis is a set of effective tools for diagnosing attributes and relational features of stakeholders on a certain topic focusing on stockholder's interests, objectives, linkage with different world views, values, perceptions, needs, knowledge and power positions. This tool is commonly used in policy formulation, project planning, implementation, evaluation, and participatory natural resource management in which many types of stakeholders are involved and have crucial roles in the activity. In the Pilot Study, it was found that

stakeholders in different levels existed regardless of formal or informal status for the community-based early warning system and earthquake disaster management focusing on promotion of reinforcement of unstable buildings. For example, in case of establishment early warning system, stakeholders ranged from an inhabitant in a certain community to governmental organizations. Therefore, it was effective and appropriate to use stakeholder analysis for the complicated heterogeneous actor groups and organizations involved.

The following is a flexible set of guidelines for conduction Stakeholder Analysis that could be adapted according to each situation.

- 1) Identify main purpose of the analysis
- 2) Develop an understanding of system and decision-makers in the system
- 3) Identify Principle Stakeholders
- 4) Investigate stakeholder interests, characteristics and circumstances
- 5) Identify patterns and contexts of interaction between stakeholders
- 6) Define options for management

## (2) **DIG (Disaster Imagination Game)**

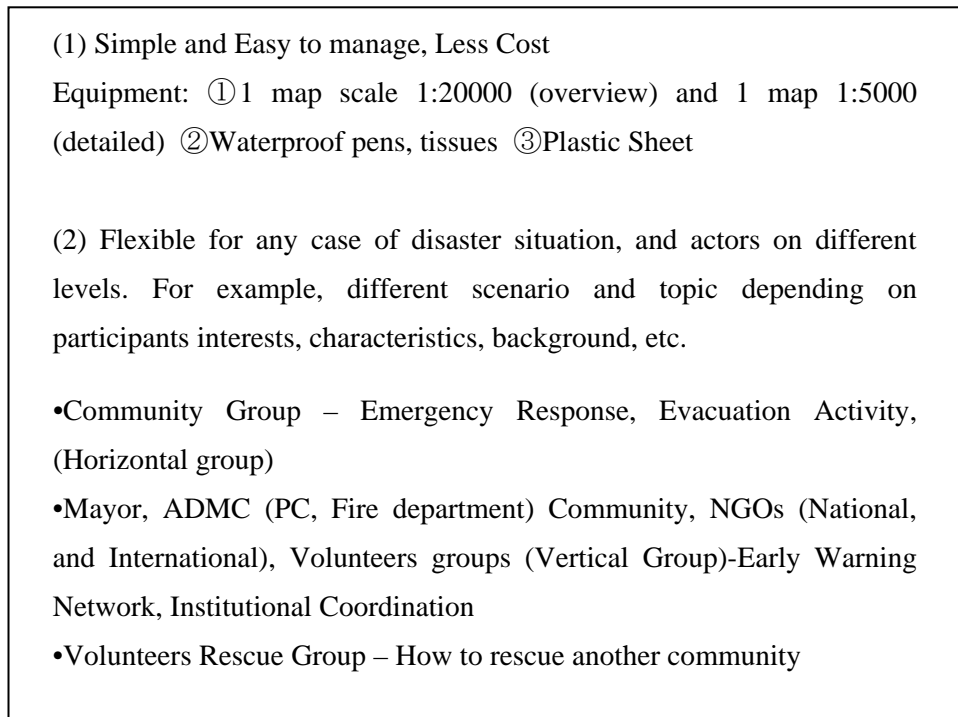
DIG is a tool of participatory disaster simulation and learning-by-doing activity developed in Mie Prefecture, Japan in 1997, by a community volunteer group of disaster prevention and an official in Civil Protection as an easy and simple tool for community disaster management. The tool is a kind of CPXs (Commanding Post Exercises) as a practical and handy tool for any actors in the community and related agencies for disaster management. Since DIG is a powerful tool frequently used today among communities in Japan, this technique was applied in the Pilot study in Venezuela.

DIG is expected to enrich the capacity of preparedness of people by visualizing the possible surrounding situation in case of disaster on a map with participatory groups in a workshop. The main characteristics and workflow are shown below

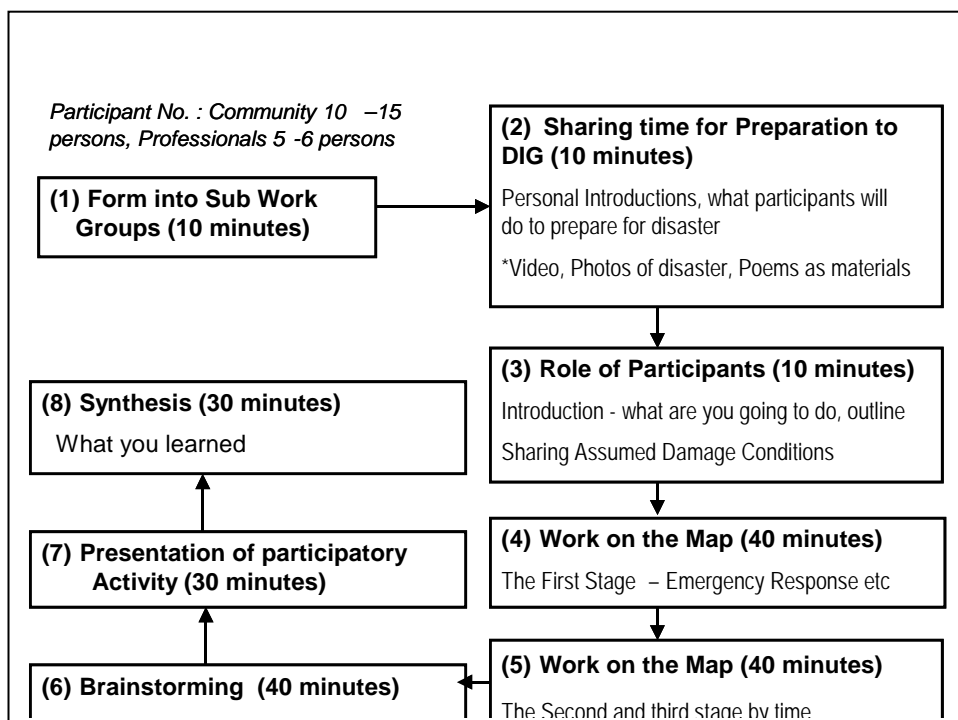


**Participatory Group Work in DIG**

## Main Characteristics of DIG



## Work Flow of DIG



As direct learning points, participants are able to find vulnerability of their own town as well as understand the strengths of their own (and related) community by imagination work on work map. This imagination activity brings possible disaster situation into focus, which is the first step toward community preparedness for disaster. In addition, as indirect interesting points, participants are able to understand the importance of cooperation with neighbors and collaboration among stakeholders, which strengthen community-based disaster management. Furthermore, the strong point of DIG is that “Group Dynamics” appears as a new type of leader, empowerment, giving confidence. All this process contains the full source materials for making a community-based disaster management strategy.

### **(3) Participatory Planning in Community–Based Early Warning System**

Closely linked with S18, this participatory planning method is used in order to develop an early warning system proposed by JICA Study Team. The proposed early warning system involves diverse and complex issues so that application of this methodology greatly contributes to grasp real needs and possible functions of the community, and to integrate technical parts and human parts to be consistent for the case of Metropolitan District of Caracas.

Using graphic materials of the discussion, the issues below were discussed among community stakeholders.

- From where and who will inform warning information to the community and how the communication should be established between the communities and the institutions as well as among community members.
- For an early warning to function for effective evacuation, which kinds of Information and materials are required by community.

**Table S24-1.2.1 Multi-Level and Combination of Different Types of Sampling Method**

Level	TYPE OF SAMPLING	
1	Conglomerate	Segmentation by blocks.
2	Simple random	Selection of a specific number of blocks through a table of random numbers.
3	Systematic	Selection of a specific number of housing units at predefined intervals.
4	Intentional	Selection of a specific number of subjects according to relevant characteristics.

**Table S24-1.2.2 Selected Variables Descriptors for Social Vulnerability Map**

No	Variable of Vulnerability	Criteria
1	Number of Families / Housing	3 or more = 3 2 = 2 1 = 1
2	Children, elders and handicapped presence	Handicapped and children under 14 years old = 3 Older than 64 years = 2 Adults between 15 y 63 years old = 1
3	Number of pets / Housing	2 or more = 3 1 = 2 0 = 1
4	Interviewed education level	College = 1 High School = 2 Basic or none = 3
5	Employment type	unemployed = 3 own, Informal or part time = 2 Permanent, Retired, Doesn't require or other = 1
6	Simultaneous potential loss of housing and employment	House or Neighborhood = 3 In the City = 2 Out of the City = 1
7	Monthly Family Income	from 0 a 500 thousand = 3 500 thousand to 1 million = 2 More than 1 million = 1
8	Insurance	Without insurance = 3 Any other than Familiar and/or housing = 2 Familiar and/or housing = 1
9	Number of floors / Housing	4 floors or more = 3 between 2 and 3 floors = 2 1 floor = 1
10	Number of exits / housing or building	1 exit = 3 2 or 3 exits = 2 More than 3 exits = 1
11	Open spaces or Parking lots	Without patios or parking lots = 3. With Parking lots = 2. Patio with or without parking lots = 1.
12	Tenancy of the house	Housing Other/ doesn't know = 3 Owned = 2 Rented = 1
13	Community Alert Systems	None = 3 Robbery or Looting = 2 Flood with or without others = 1



No	Variable of Vulnerability	Criteria
14	Food, Medicines and Tools	Without: Restaurant, Grocery store, Clinic, Drugstore, Supermarket, Hardware Store = 3. With at least one: Restaurant, Grocery store, Clinic, = 2. With at least one, Drugstore, Supermarket, Hardware Store = 1
15	Concentration spaces of unforeseen population	With: Pre-school and/or Elderly home = 3. With at least one: School, Hotel / Lodging, Temple = 2. Without: Pre-school, , elderly home, School, Hotel / Lodging and/or Temple = 1
16	Emergency equipment existence	Without at least one = 3 With at least one of the following: First Aid, Radio Transmitter, Electric Plant and/or Extinguisher = 1. Any other evaluated = 2
17	Experience in disasters	none = 3 Any other different from Earthquake or Flood = 2. Earthquake or Flood = 3
18	Appreciation of the potential damage	"yes" his community might be affected = 1 "No" = 3
19	Knowledge of the propensity causes of disasters in the community.	Answers with one or all of the following: Nature...; God and destiny and/or Idiosyncrasy of Venezuelans = 3 Answers with one or all of the following:: Localization of the community; Urban Development and/or Lack of Laws = 1 Any other combination = 2
20	Information received and frequency	None = 3. Information about Earthquakes and/or Flooding with a monthly, weekly or daily frequency = 1. Any other combination = 2
21	Past training	None = 3. House evacuation training = 1. Any other combination = 2
22	Willingness to move in case of high risk	"yes" willingness to move if informed high risk = 1 "No" = 3

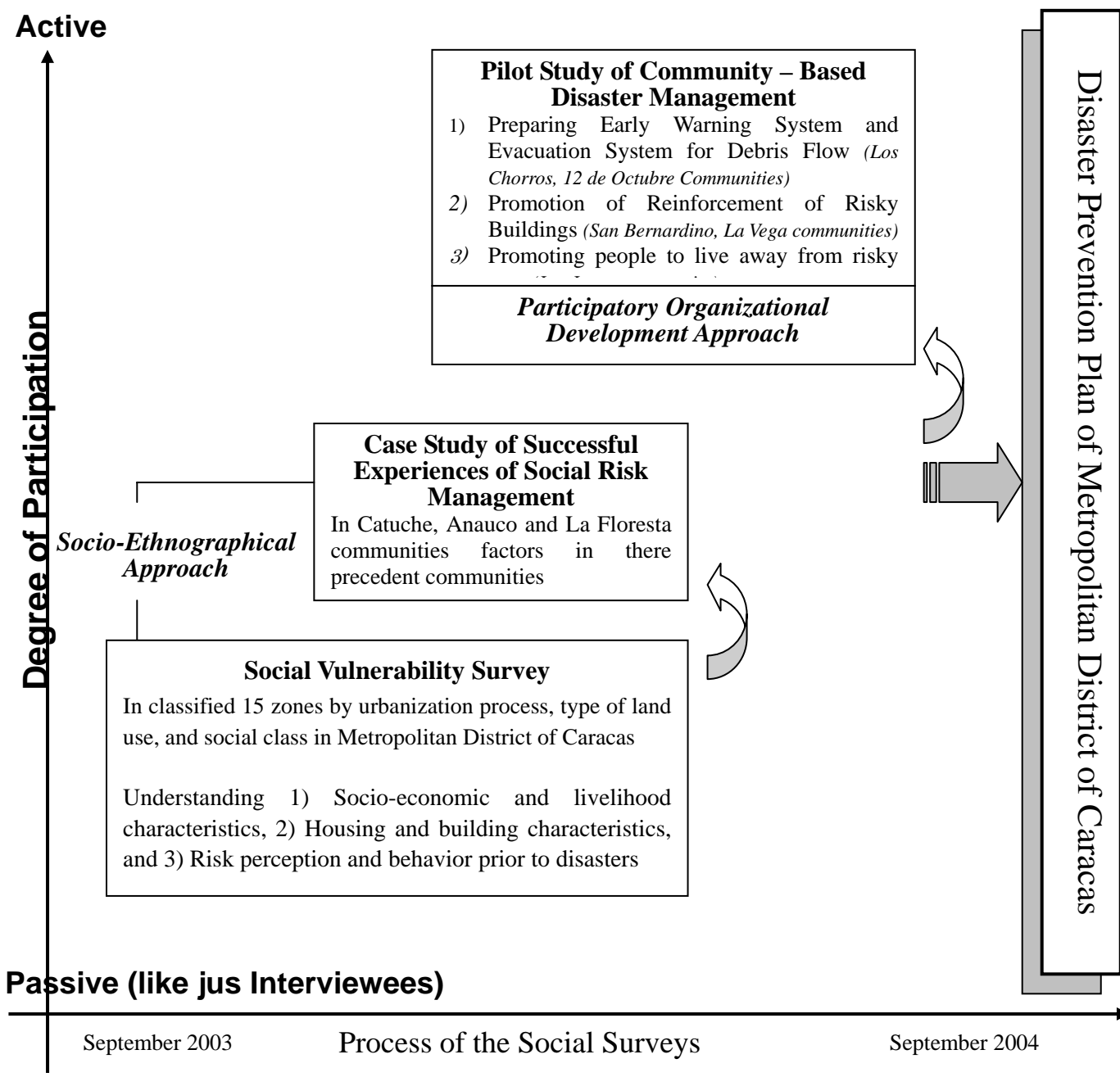


Figure S24-1.1.1 Process of the Social Surveys in the Study

## CHAPTER 2. SOCIAL VULNERABILITY SURVEYS

### 2.1 The Setting and Objectives of the Survey

Disaster vulnerability for the complicated urbanization development of Caracas has its roots in socio-economic, political, and cultural aspects as well as physical aspects. The overall objective of the Survey was to identify different types of vulnerabilities that correspond with the urbanization process in Caracas, and thus includes human systems. For the Survey, the focus was on the following specific areas: 1) Socio-economic and livelihood characteristics, 2) Housing and building characteristics, and 3) Risk perception and behavior prior to disasters

### 2.2 Classification of Social Vulnerability Zone and the Survey Area

The survey area was classified into 15 zones in terms of urbanization process, type of land use, and social class. The zones are briefly described below and the Survey area is shown in Figure S24-2.2.1.

Name of the Zone or Unit		Decade developed	Predominant Land Use	Social Class
Urban Central Area				
1	Altamira – Los Palos Grandes- La Castellana	50-60	Residential	Medium-High
2	Campo Alegre – Country Club -San Bernardino-Los Chorros – La Florida – B.Campo	40-50	Residential	Medium- High
3	Casco Tradicionales – Casco Central – Prado de María – San Agustín – San José – Cementerio – Los Castaños – La Pastora	20-30	Residential - Commercial	Medium
4	El Marqués – La California	60-70	Residential	Medium
5	El Recreo-Bello Monte – Los Caobos – Las Acacias – Los Rosales – Valle Abajo – Av. Victoria – Las Delicias – Sabana Grande – La Campiña	40-50	Residential	Medium
6	El Rosal-Sebucán-La Carlota – La Floresta	40-50	Residential	Medium-High
7	La Urbina – Montalbán	70-80	Residential	Medium
8	23 de Enero-Simón Rodríguez	50 s	Residential	Medium-Low
9	Caricuao - Valle – Coche	60-70	Residential	Medium
10	Santa Monica – Colinas de Bello Monte - Vista Alegre – El Paraíso	50-60	Residential	Medium
11	Chacao - La Candelaria	20-40	Residential	Medium
Slums (Barrios)				
12	Chapellín-Sarria	30-60	Residential	Low
13	La Vega		Residential	Medium-Low
14	Mariche		Residential	Low
Suburb				
15	Macarao		Residential	Medio Bajo

## **2.3 Results of the Survey**

### **2.3.1. Socio-Economic Characteristics**

#### **(1) Inhabitants Statistics**

The major statistics of inhabitants are different in every area as shown in Figure S24-2.2.2. Youths outnumber adults in zones 5 and 14; on the other hand, zones 1 and 6 have more elders above 65 (between 10% and 15%), and a higher percentage of handicapped as well. These results helped to identify in which zones the social vulnerable people are distributed and contributed to making a community evacuation plan including vulnerability location map, rescue responsibilities and procedures, etc. It was also noted that the number of women is generally higher than men in the Survey area. Participant observation confirmed that the reason is because of the social phenomenon of single mothers in the society. This background reveals that an autonomous role for women in disaster management is indispensable and their participation is crucial in terms of influence on her own family and availability.

#### **(2) Education Level**

Figure S24-2.2.3 shows that almost all adults have completed basic education in all zones. However, a large number of inhabitants in zones 12, 13, and 15 (mostly in barrios) completed only basic education while inhabitants in zones 1 and 2 (mostly in the suburbs) are middle and high social class and have received university education. Although there is a relation between social class and educational level, the findings indicated that the educational level was not at all related to risk perception or action for risk management.

#### **(3) Employment Condition**

Employment categories such as permanent, hourly or self-employment prevail particularly in zones 1, 2, 5, 7 and 11, which are intermediate-middle and high-middle class areas. However, in zones 1, 7, 9, and 10, middle class unemployment rate is also high, which is reflected by the political and economic crisis. Another characteristic of the employment condition is more than 90% of people are involved in the Tertiary sector.

#### **(4) Estimated Family Income**

Income of the majority of those surveyed is between Bs. 0 and 500,000/mo. In zones 2, 4 and 10, some incomes lie between Bs. 500,000 and 1 million. Zone 6 is the only place in the city where the incomes are pretty well distributed since more than 30% of the population earns more than Bs.1 million. The reason is possibly that major offices and service centers surround

the zone and the conditions may be attractive to better incomes earners. The better income residential and commercial areas have ideal conditions for tax collection, which allows the corresponding municipalities to use their larger budgets to apply and support disaster mitigation activities such as offering frequent training, and providing facilities and equipment for first aid and rescue activities.

#### **(5) Type of Insurance**

Through all zones, insurance for individuals and families includes major types and accounts for 20% to 45% in the total; cars are also major insured property, which is only applicable in zones 1, 6, 10 with middle and high class. In zone 1, car insurance even reaches 35% of the total. On the other hand, insurance for houses accounts for less than 5%, which is the least purchased kind of insurance. Only zone 1 has 15% of houses with insurance; however, it is mainly for protection from robbers. It can be seen that recovery for damaged houses by disaster is not seriously considered yet.

### **2.3.2. Housing and Building Characteristics**

Type of building structure is predominantly reinforced concrete (97%), followed by almost 3% of prefab buildings. These structures are covered by clay blocks walls (77%) and concrete blocks (18%). As a whole, the buildings in Caracas are generally frangible, which may be the reason why the seismic-resistant regulations of Caracas are not applied much. In zones 1,2, 6,7,8,9,10 and 14, more than 80% of inhabitants possess yards, and in zones 1, 6 and 7, more than 20% of inhabitants have ground floors. Also, in zone 8, 88% of inhabitants have car parking spaces. The issue of parking on the road in Barrios is crucial since even main roads don't have enough width, and such parking would likely disturb evacuation and rescue in case of disaster.

### **2.3.3. Risk Perception and Behavior Prior to Disasters**

#### **(1) Risk Perception**

Regarding risk perception on earthquakes, more than 80% of inhabitants in all zones considered that earthquakes would likely occur in over 5 years, and risk perception on floods showed a similar reaction. These results indicate that these kind of disasters are not easily considered as a daily issue. Even worse, in zone 6, around 50% of inhabitants answered that floods would never happen, and 26% of the people replied that earthquakes would also never happen.

The quantitative survey revealed a degree of indifference and ignorance about the cause of disasters, particularly in zone 6. However, the narratives of some informants in Sebuacán and

the 23 de Enero community revealed that perception, attitude, knowledge regarding natural hazard or disaster are not diverse; this is illustrated below.

*"We know that there is a fault that runs under the whole northeast part of the city that could affect us in the event of an earthquake. And... due to the proximity of the Ávila, and based on that of Vargas, it could affect us for some type of natural event caused by a strong rain." " Rain, because the sewer channel is very faulty, because it is the end of the street, and there is a gigantic wall, about 3 to 4 meters, and the water doesn't have anywhere to escape but to our houses."*

That opinion reflects a concerned attitude, while the following opposite comments are also heard many times and in all the zones.

*"Here anything of natural origin never happens." "We had an earthquake a long time ago and it didn't affect us at all because these blocks have an anti-seismic system and in the year '67 worked perfectly in the 23 de Enero".*

Figure S24-2.2.4 shows the trend of inhabitant's beliefs on disaster. The typical responses are among "Destiny", "God", and "Nature". In Zones 3 and 9, inhabitants mentioned that these three factors are causes of disaster. In zones 1, 14, and 15 (the former is middle class area and latter two are in slum and suburb areas), inhabitants also had not much response. The pattern indicated that the middle and low class inhabitants have lived with relative safety, and they seem to be in a place where they can rely on God's will and Destiny or Nature in a disaster. Whereas in middle and high class with a high education profile, they seemed to consider that this type of question is not applicable in terms of reliance on science, etc. On the other hand, in case of barrios, inhabitants have lived daily with extremely high risk of disaster, and pragmatic thinking overrides their beliefs and values.

## **(2) Behavior to Needs for Disaster Prevention**

Figure S24-2.2.5 shows the results of analysis on how inhabitants analyze the cause of vulnerability. In all zones, the major cause of the vulnerability (20-40% of answers) was considered to be just unfortunate and unusual natural hazard that occurred. Another interesting point was that around 10% of inhabitants in the whole zone regarded the cause of vulnerability was lack of training, information, and urban development without considering the nature of events. The results indicated opportunities to turn these attitudes of vulnerability into positive factors for reducing disaster.

### **2. 3. 4. Source of Information Disaster Issues**

As shown in Figure S24-2.2.6, TV and Radio mass media sources (almost double that of other answers) are widely used for receiving information on disaster issues, and secondly newspapers. The results indicated that the information through mass media was widely spread, effective and highly available regardless of type living condition, etc. As the third source, education in schools also played role of providing information on the issue.

Also, Civil Protection and Fire Department have influenced people, particularly in zones 1 and 14. This is mostly since Chacao Municipality has taken initiatives and supported community activities, such as the well-known group in Altamira. Similarly, in Sucre municipality, people also have traditional experience with organizations for civil protection in good collaboration with certain barrios.

### **2. 3. 5. Contents of Community Training on Disaster Prevention**

As shown in Figure S24-2.2.7, 30% to 45% of inhabitants through all zones responded that they have never had any program on community training on disaster prevention. 15% to 25% of inhabitants have generally received training on first aid. The results also indicated the factors to be improved like how important it is to provide disaster prevention training program to leaders and how to diffuse significant activity knowledge and skills on the first aid and rescue, which are direct and first actions for community leaders before institutional organizations can act.

### **2. 3. 6. Community Organization and Social Network**

Several organizations such as Neighbors Associations, Condominium Associations, Local Committees, and Citizens Assemblies are identified as functional community-based organizations. These organizations work for their own objectives, such as improvement of living conditions, for security, youth and children, environmental protection, political issues, etc. These types of organizations range from registered ones in local government to extremely local grass-roots level. Through community activities, a social network spreads within the community. Also, constraints and difficulties in socio-economic and political aspects discourage people from facing the predicament of their situation. As a result, the approach for tackling these problems is to enforce consolidation and to unify these communities more. However, it must be noted that discussion rarely happens beyond one's own community.

In addition, it was also noted that isolated neighbors exist in the middle class communities where individualism is respected; these neighbors rarely know each other so that it is not easy to associate to reach common objectives for risk management.

On the other hand, the majority of active actors in community organizations are women, particularly in the middle class, and they spend most of their time in their house. They have spare time and also are sensitive and care about family issues, even the threat of disasters, and actually they are involved in community activities instead of the head of the house. In La California and Los Rosales for example, women remarked on feeling satisfaction to work for community activity related to family protection, including the disaster issue. Although youth were also one of the components of community organization, youth participation is rarely seen and they do not have any discussion with the community administration.

### **2.3.7. Variations of Community Leadership**

Through the Survey in-depth analysis, various leaders were identified. The representative types of leaders were as follows: (1) Institutional Leadership - relatively constant and associated with the community institutions, (2) Situational Leadership - addressing each situation, (3) Community Promoter Leadership - working for community development at the grass-roots level, which perform special functions in barrios, (4) Religious Leaders, and (5) Gender Tendency in Leadership.

#### **(1) Institutional Leadership**

The leader is chosen by voting in the community for institutional reasons, although there is a sort of consensus among community members in qualifying. Basically this type of leader has a tendency to be less enthusiastic for something related to community development rather than to fulfill the responsibility as a duty for an institutional reason. That is to say, this type of leader is relatively less recognized among leading inhabitants so that this type of leader is less effective for community organization, and takes much less initiative in community disaster management.

#### **(2) Situational Leadership**

As an example, the Situational Leader was brought about through supervision of infrastructure works like in La Vega community. This leadership took place in community work projects. Apart from cultural and sports groups, in barrios this type of leadership is relatively autonomous and expected to negotiate the community needs assessment. Hence, community organization led by this type of leader has experience with flexibility through projects. However, the problem is that the degree of leadership has depended on the situation, so if the project is finished, the leader could also disappear. For example, a political leader is in this type.



### **(3) Community Promoter Leadership**

This type is more spontaneous, more specific and reactive leadership, truly interested in a real direction for the community and to complete their work. They are committed people. These committees have representation in the directive of the Civil Association. A good example of a community promoter-leader was seen in Catuche community. The leader was dedicated to the development and improvement of community and played a significant role in organizing the community; he is an intermediary between community people and local government, acting as manager, organizer, negotiator, etc. This type of leader is recognized as trustworthy, respected and a reliable person in the community.

### **(4) Religious Leaders in the Communities**

The great majority of the interviewed religious leaders affirmed that the topic of disaster is not part of the discussion for religious activity except for the Catuche community. The words one of Priest describe the situation directly:

*"... The three Christian churches that exist in the sector, are not involved in any work with the community at all... Basically, the activities of the church are focused on assuring the spiritual control of the society and in incorporating a Christian way of life among people of the communities."*

On the other hand, the Priest of La California's Charismatic Group brought up an interesting fact: they have had the experience of activating support groups to face emergencies, through the Charismatic NETs which has 1,300 cells. They could be activated quickly to give answers to community needs in case of a disaster. According to the interviewee, the NET was sufficiently solid and was even constituted to confront a Disaster.

That is to say, the attitude and way of thinking about relationship with disaster prevention activity and religious activity are different; however, they can be combined and strengthened by cooperation of the Priest and community people.

### **(5) Gender Tendency in Leadership**

There are some distinct female community leaders like in Altamira community. The female leaders displayed a feeling about the community as they have about their own home. It was observed that women are more interested in roles in educational, health services and some cultural areas, which are related to human activities. On the other hand, male leadership has a tendency to be associated with administrative tasks linked to the infrastructure: for example,

condition of the streets, water service, electricity, gas, security, transport, local advice, lands committees, etc.

### **2.3.8. Social Vulnerability Map**

Figure S24-2.2.8 shows differences of vulnerability in terms of knowledge and understanding on disaster management and this varies from place to place. This map is useful to find which community needs more support to improve the knowledge and understanding on disaster topics. By combining with other variables, compound analysis become possible and more effective to strengthening capacity of the community. As a note, educational level is also considered as one of vulnerability variables; however, the ethnography study proved that educational level necessarily always is linked with disaster prevention and action. Therefore, treatment of each variable needs specific discussion before being applied.

## **2.4 Conclusions**

Although the above analysis illustrated only one part of the Survey, various social vulnerabilities exist in communities of the Metropolitan District of Caracas. The vulnerabilities are complex, fuzzy and not uniform, but they definitely affect people. As shown in the social vulnerability map in Figure S24-2.2.8, the extent of social vulnerability varies from place to place. Although vulnerable zones were identified, this doesn't mean the zones won't be fixed; there is the possibility to improve the community capacity by some kind of approach to tackle vulnerability in the future. Also, as seen in the procedure for defining indicators, some biases are contained as limitations. Therefore, the map needs to be used as output of quantitative results together with the results of ethnography. In general, factors of vulnerability are considered as a negative or problem. However, JICA Study Team is attempting to take advantage of social vulnerability factors as indicators of potentials to better the community, particularly for community-based disaster management.

Findings on typical vulnerabilities are summarized below:

#### **1) Cultural Vulnerability**

- Knowledge from disaster experiences and awareness of risk in everyday life do not necessarily directly produce risk management activity. Also, risk preparation knowledge seems to depend on the types and frequency of risk or disaster happening. For example, local knowledge from experience of floods or sediment disaster tended to raise awareness for the preparation. However, earthquake disaster doesn't happen frequently in the same area. Therefore, past one time experience rarely stimulates enough preparation knowledge for another earthquake in a particular community.

- However, these factors could be improved by active social organization, solidarity, leader initiatives, knowledge through training in community, etc.
- Perception that it is somebody else's issue is distinct among higher social class and people with higher education.
- Belief that disaster won't occur since it has never happened so far.
- Attitude that taking action for preparedness and prevention are separate unrelated to the great concern about disaster in barrio areas.
- Attitude that people only need to care about disaster after 5 years; this is related to the issue of sustainability.

2) Socio-Organizational Vulnerability

- Lack of capable leader who can apply charismatic supervision
- Leaders and their approaches in communities are less integrated
- No agenda for disaster management in community
- Less consistent approach and method for disaster management
- Less discussion about disaster outside the community

3) Economic Vulnerability

- Lack of budget for community disaster prevention work.
- Lack of access to essential preparedness resources, including technology
- Belief that economic conditions don't have practical influence on disaster management activities

4) Factors of institutional vulnerability

- Weak legal and normative regulations are counterproductive by duplicating roles among governmental organization
- Weakness or less effective institutional support from government
- Lack of institutional management in community
- Weak communication and collaboration work between community and government

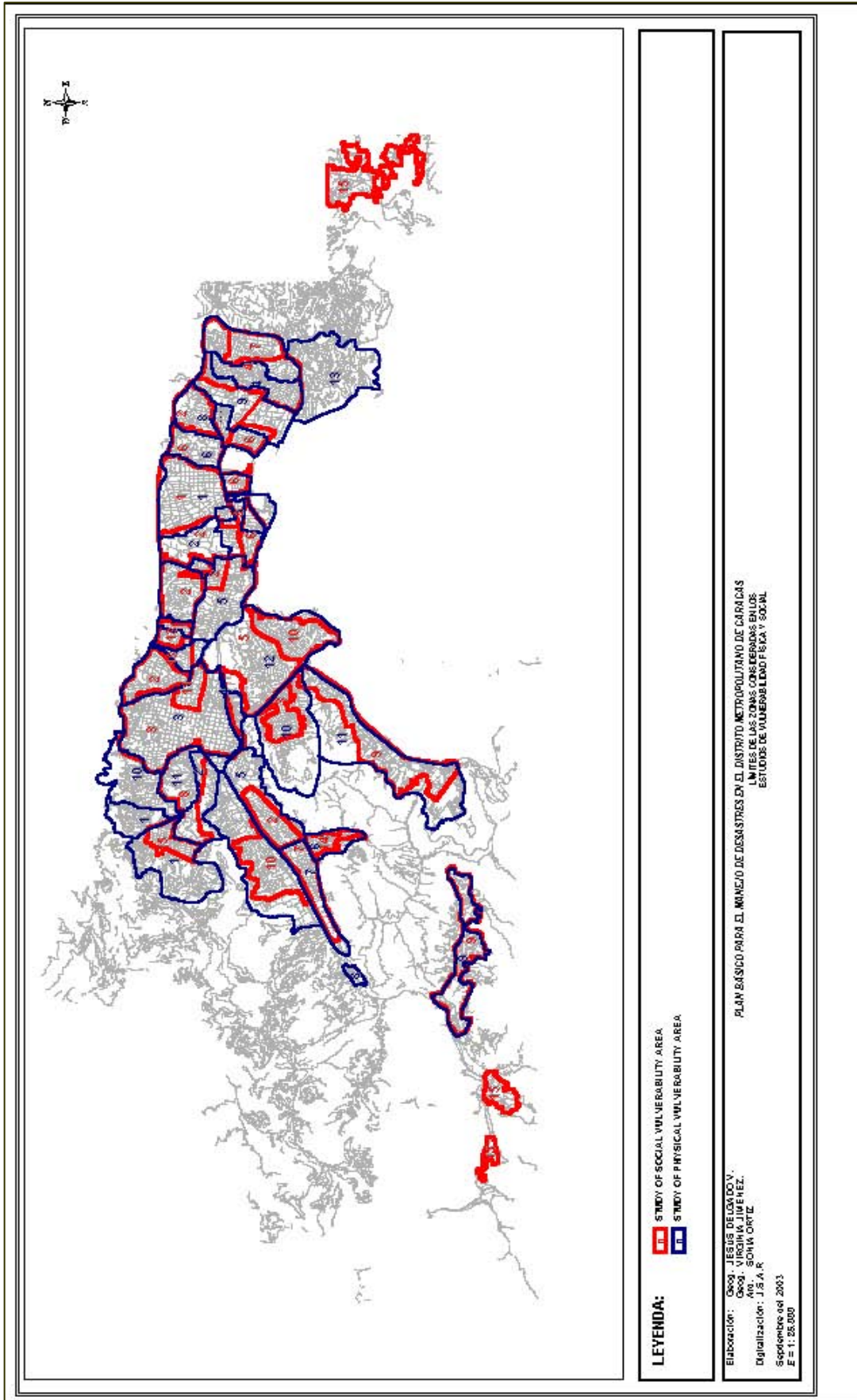
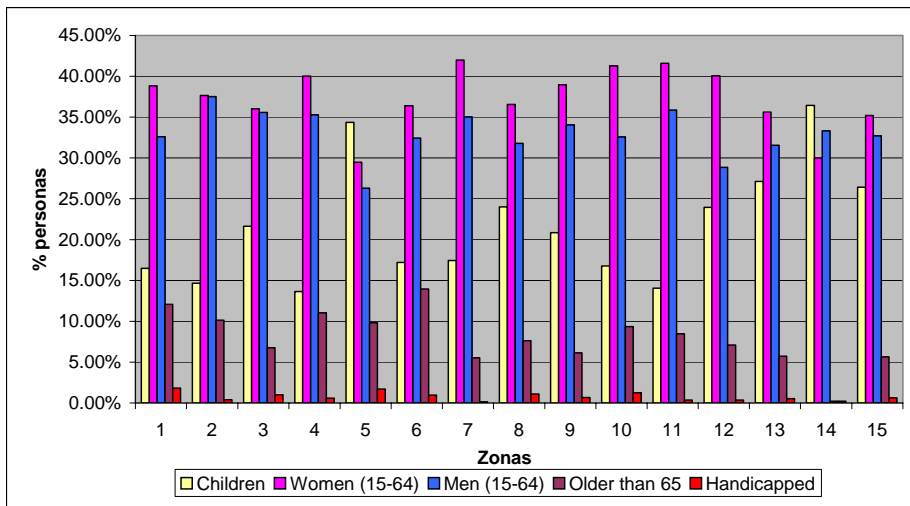
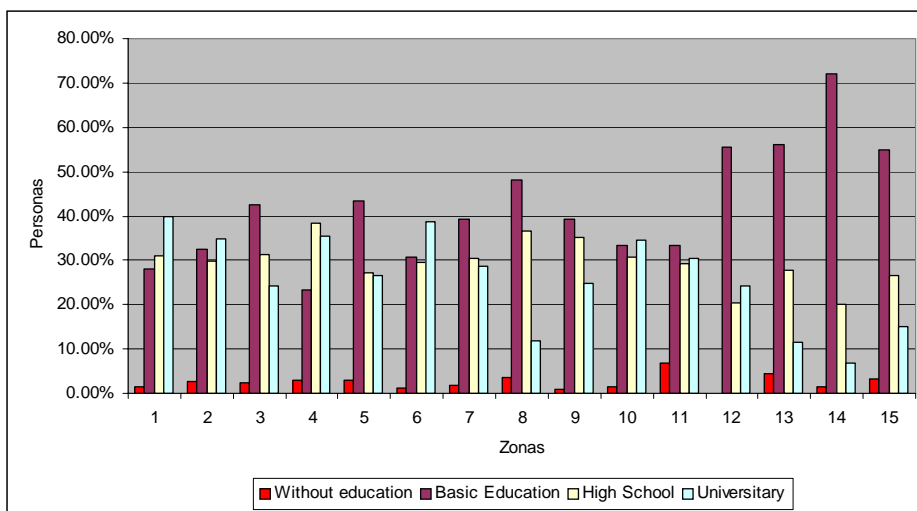


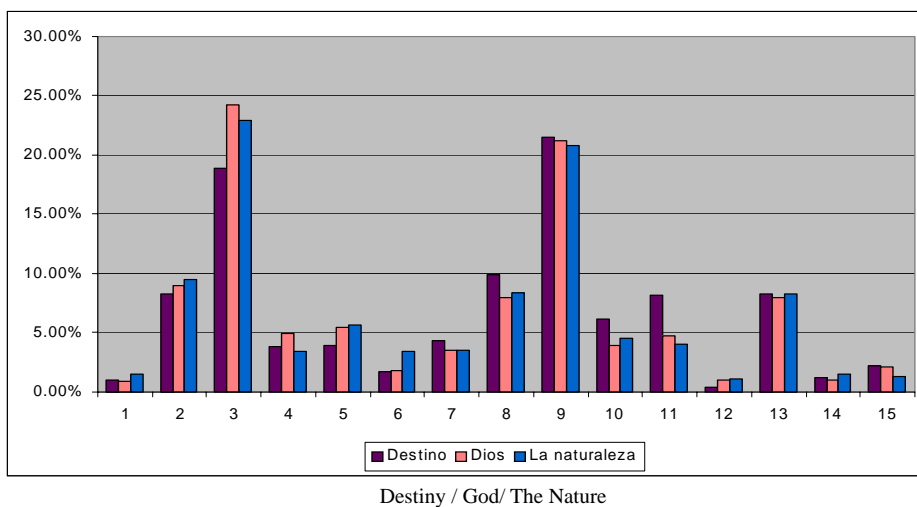
Figure S24-2.2.1 Social Vulnerability Survey Area



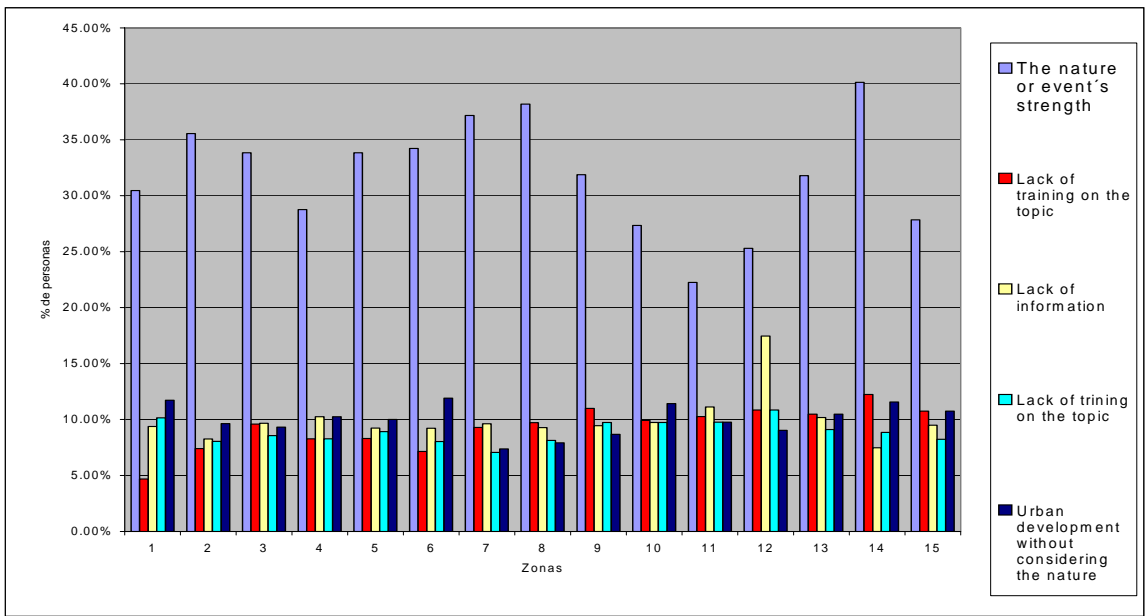
**Figure S24-2.2.2 Inhabitants Components in the Suveyr Area**



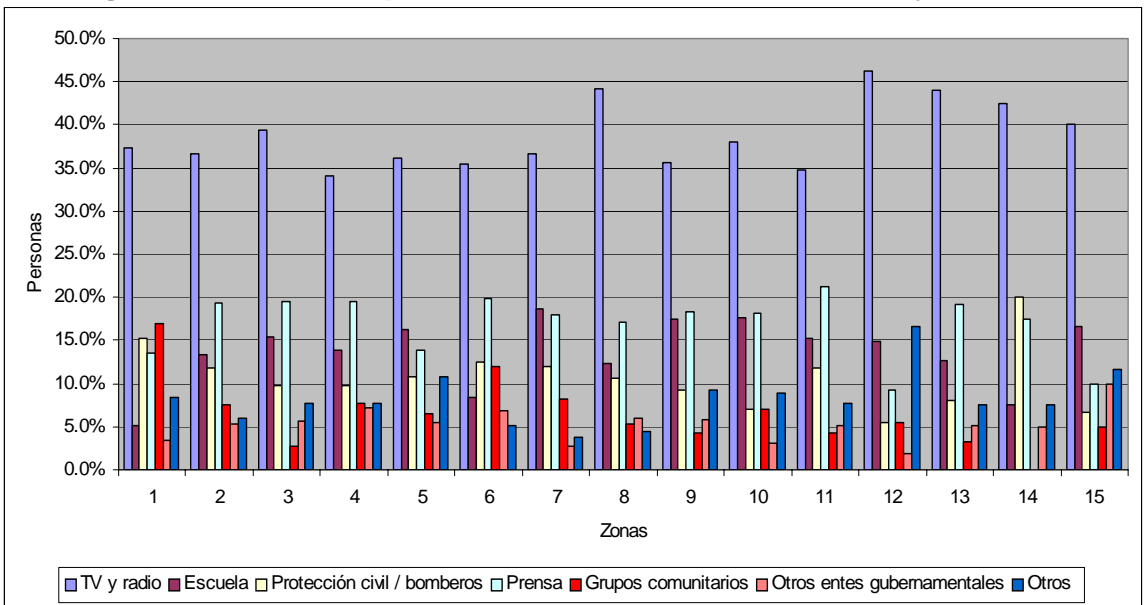
**Figure S24-2.2.3 Education Level in the Survey Area**



**Figure S24-2.2.4 Inhabitants Belief on Disaster**

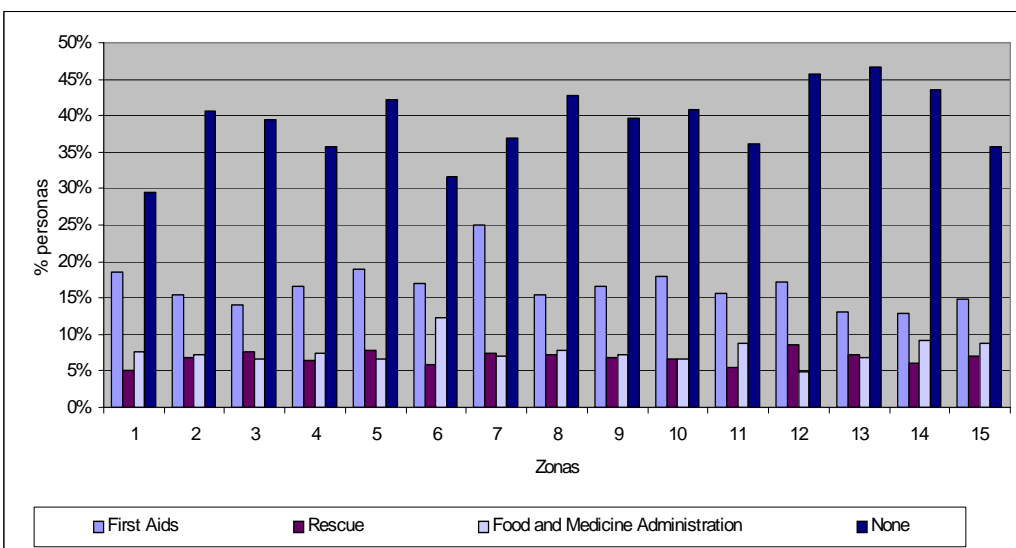


**Figure S24-2.2.5 People's idea on the Cause of Vulnerability**



TV & radio/ School / Civil Protection / Firefighters/ Newspapers/ Community Groups / Other government organizations/ Others

**Figure S24-2.2.6 Information Source on Disaster in the Study Area**



**Figure S24-2.2.7 Contents of Community Training on Disaster Prevention**

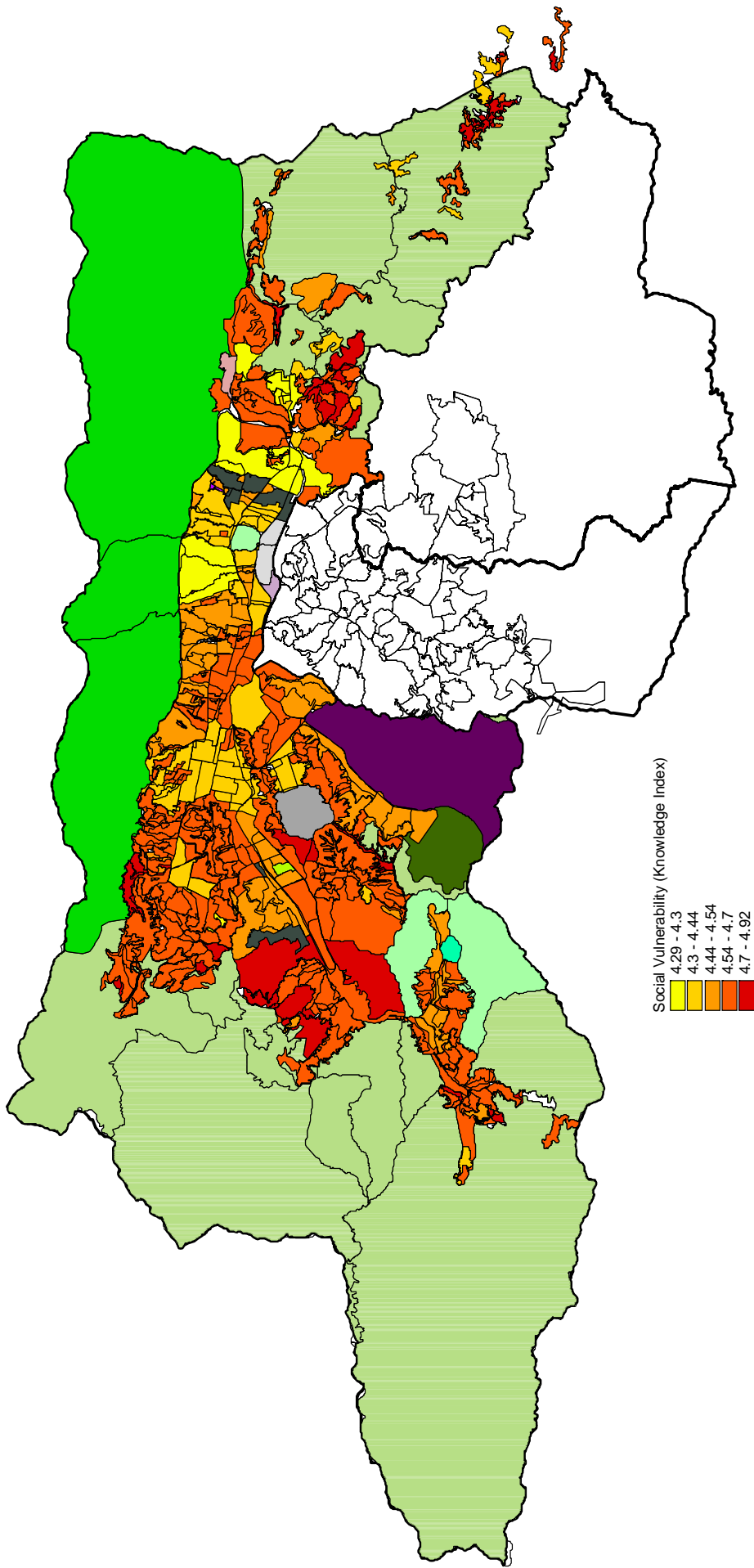


Figure S24-2.2.8 Social Vulnerability Map (Knowledge of Disaster Index)

## **CHAPTER 3. CASE STUDY OF SUCCESSFUL EXPERIENCES OF SOCIAL RISK MANAGEMENT**

### **3.1 The Setting and Objectives of the Study**

Three communities (Catuche, Anauco and La Floresta) are well-known models since they have executed community-initiative risk management for disasters. The experience has proved their capability to resist and cope with the disaster as community. The ultimate objective of the survey is:

- To identify elements which potentially could improve capacity for social risk management in the three communities in order to adapt the self-management systems to other communities.

### **3.2 Findings and Analysis of Three Communities**

#### **3.2.1. Anauco**

##### **(1) Location and Sectors**

The basin of Anauco stream covers approximately 15.5 km<sup>2</sup>. The Anauco community is composed of 10 sectors around the stream: Gamboa, Los Lanos, 11 de Agosto, Anauco II, Anauco III, Dos Tuneles, Lopez Mendez, Los Aliados, Bambu and Fermin Toro. These are part of the Urban Design Units U.D.U. 3.3 and 3.4 of the Unit of Physical Planning UPF3 Cotiza. This urban settlement is situated between the San Jose and San Bernardino parishes in Libertador Municipality, occupying an area of 10.72 ha.

##### **(2) Socio-Economic and Demographic Characteristics**

40% of the surveyed homes have women as head of the household, and approximately 65% of the inhabitants are older than 18 years old. Family income is around Bs. 330,000 per month. The socio-economic distribution is 17% for Stratum C (middle class) and 59.51% for Stratum E (greater poverty). The inhabitants of Stratum E mostly are concentrated in the sectors of Los Aliados, Lopez Mendez, Fermin Toro and Anauco III. The foundation of these sectors dates back more than 40 years.

##### **(3) Physical Facilities Conditions**

*Medical assistance facilities:* 12 public and private outpatient centers and hospitals are located in Anauco stream area. San Bernardino suburb provides high level of private medical services and activity.



*Educational facilities:* There are several public and private educational centers which cover from pre-school to high school.

*Sports and recreational facilities:* There are recreational and sports facilities such as El Avila National Park in Libertador Municipality, and also some situated to the north of Cotiza, near Avenida Boyaca.

*Sanitary and electrical infra-structure:* 91% of the housing units are connected to the aqueduct network. For sewage collection, some units are connected to the existing system while others discharge into the stream. Regarding rainwater, some drains are channeled to the sewage network. With respect to electricity, 100% of residents have service and about 45% of them are registered users, although after the 1999 landslides, the network was severely affected. This has brought about voltage drops and an inadequate state for installations.

*Communication services (fixed telephone):* About 35% of the housing units had communication services through the company CANTV before the natural events of December 1999.

#### **(4) Risk Management**

In the year 2001, structure analysis was done by an engineer upon request of the National Housing Council (Spanish acronym CONAVI). It determined that almost 62% of the existing housing units were in good condition and 19% of the units were affected. In addition, a private consultant was requested also by CONAVI to conduct Hydraulic Study of Quebrada Anauco, Federal District between Panteon bridge and Avenida Boyaca.

The Project of Physical Refitting exists but it needs sustainable monitoring intervention in the mid- and long-term since displaced families are living in inadequate housing.

#### **(5) Community organization**

According to key informants in the community, in the December 1999 tragedy, the degree of isolation of the slums around Anauco stream required better social focus since there were no community organizations, no training on emergency situations and no link with the primary attention institutions. After the December 1999 tragedy, the parish church San Bernardino de Siena (jurisdiction of the Caracas archdiocese) deepened the integration and connection of the slum residents and promoted processes of community organization as a means to achieve more effective support for the disaster. In the process of organization, the advising and institutional support by CONAVI and local church appeared. CONAVI supported the communities within the framework of the Project of Physical Refitting. In this way, formal representation of the community for the development of the project was created through the Civil Association

Anauco 2000 (Spanish acronym ACA 2000). Later, the Anauco Social Consortium was created as well. Both associations are juridical entities and are presently active. Likewise, they have a community radio transmitter as a significant communication tool for emergency in the Fermin Toro Barrio. The programming in this radio transmitter includes prevention measures to be taken before, during and after a disaster. Within the Civil Association, there is a group that deals with contingency plans and early warning systems. The following are illustrative testimonies of the group's members.

*“We have a permanent community monitoring system. When it rains, we get in contact with all the sectors through radios. I participated in the organization of the evacuation plan in my sector this year; this is the lowest sector in Los Anaucos, where four streams flow, and therefore, the risk of emergency is increased. We have put signs on the emergency routes, one to San Jose and the other to San Bernardino. The alarms were activated and the people knew what to do.”*

*“We have an early warning system and the radio system to communicate with other sectors. Our community has a storage center for emergency supplies, there are people who are prepared, nurses in the community who have been trained for disasters, and the children and adolescents have done workshops with the firefighters.”*

### **3. 2. 2. Catuche**

#### **(1) Location and Sectors**

The basin of Catuche stream is approximately 8,045 km<sup>2</sup> long, and it is situated in the administrative jurisdiction of the La Pastora, Altagracia and La Candelaria parishes, Libertador Municipality. The Barrios around this stream (such as Boca de Desecho, La Jungla or Toma, Las Torres de Los Mecedores, El Millo, El Boulevard, El Kinder, La Quinta, Portillo and Guanabano) are part of the Urban Design Unit UDU 2.4 although La Trilla is also a separate unit UDU 2.5 for activity in informal settlements related to risk management, and it is considered together with UDU 2.4 by the inhabitants.

#### **(2) Socio-Economic and Demographic Characterization**

General population and sectors

Before the landslide disaster in 1999, the 11 sectors (in both UDU 2.4 and UDU 2.5) had about 7,519 inhabitants (CONAVI, 2000). According to a coordinator of the Catuche Civil Association (Spanish acronym ASOSICA), the current population registered in the Catuche Consortium is approximately 3,000 inhabitants, which excludes 15 persons who died in the

tragedy and a new families assigned housing outside Catuche after that. The year of foundation of community dates back to the decade of the 1950's.

### **(3) Physical Facilities Condition**

*Medical assistance facilities:* Jose Maria Vargas Hospital, a private rest home, and mothers/childrens hospitals, such as Padre Pedro Arrupe Medical center, are located in the area.

*Educational facilities:* The school-age population basically attends the schools in La Pastora parish which has 18 educational centers including public and private pre-schools, primary schools and high schools. It has the Community Educational Center Fe y Alegria de Portillo, which is managed by the Civil Association Fe y Alegria (Faith and Joy) and the La Quinta Community Educational Center.

*Cultural facilities:* In the proximity of the area under study are the Panteon Nacional, the National Library (Foro Libertador) and the Arturo Michelena Museum.

*Sanitary and electrical infra-structure:* The network for the distribution of potable water is precarious and there are a large number of informal taps. This situation varies from one Barrio to another. After the events of December 1999, both the formal network and the precarious service were severely affected, which caused a large part of UDU 2.4 to be without water service for a while. The majority of the housing units discharge wastes into the stream. Regarding electricity, almost all residents have this service, and except for several Barrios and formal residences, the rest obtain the service through informal ways.

*Communication services (fixed telephone service):* Most of the area does not have telephone service.

*Road/street network and public transport:* There is no asphalt road/street in the barrios, except for pedestrian paths.

### **(4) Risk Management**

Geotechnical study in the community confirmed the geological processes of dragging sediment and erosion caused landslides that have affected many people. Reflecting on such disaster experience, a document "A summary of the actions of the organized community of Catuche from 1998 to date" was presented by General Coordinator of the Civil Association Catuche. At present, Catuche Project includes the measure of substitution-housing in its reconstruction project guidelines which do not permit the construction of housing units in risky areas, like on the banks of the stream. Influenced by the Project, community people are developing a

similar project for residences in nearby areas. The first one is in Puerta Caracas, which will enable the first 107 affected families to move in within a few days

Likewise, risk awareness of community people has been raised through “the Accompanying Program for Living in Condominiums”, which includes workshops and provision of pedagogical leaflets. Particularly, the urban-architecture leaflet covers the topics of risk, specifically the chapter on managing risks in the construction, in the surrounding areas, and of solid waste as well.

In La Trilla Barrio, narratives of Fe y Alegría illustrate the following ideas: 1) the effectiveness of community organization for raising awareness and action through participatory activities such as drills and other educational and training activities by community organization, 2) the Catuche Project, and 3) Constraints in the community.

#### **(5) Community organizations**

The organization process of the Catuche community for the initial clean up and physical refitting project is seen in a reconstruction project which is supported by two community organizations: Catuche Civil Association (Spanish acronym ASOCICA), and the Catuche Social Consortium.

In mid 2000, the Catuche consortium, through one of its divisions, appointed an interdisciplinary team to accompany and advise the community on executing the initial technical documents to develop the Project of Physical Refitting. This increased the number of people involved from 7 to 18 and started a training process for 65 people. It allowed them to form the juridical civil association ASOCITRILLA.

### **3. 2. 3. La Floresta**

#### **(1) Location and Sectors**

The Sebucan stream basin in La Floresta is 2.03 km<sup>2</sup> and its length is estimated in 5.5 km. It is situated between the Sucre and Chacao municipality.

The urban settlement of La Floresta consists of the suburb with the same name and the Barrio San Jose de La Floresta. It is in the jurisdiction of Chacao Municipality, Miranda State, southeast of the jurisdiction.

## **(2) Socio-Economic and demographic characteristics**

According to the national 2001 census of INEP, La Floresta is a residential suburb with 764 housing units (321 houses, 317 apartments, and 16 owned houses, all equipped with all services), occupied by 2,547 residents, 65% of whom are heads of households, and people ranging from 40 to 49 years of age. San Jose de La Floresta, Barrio was founded in 1958 on land belonging to Parque Romulo Betancourt (East Park) where people were evicted in the 1970's.

This population has a high educational level (51% has a university degree), 95% of school-age children attend an educational center.

The residents of La Floresta suburb have carried out a sustained campaign to maintain the residential nature of their area, which is more than 50 years old. Almost all of their houses have sheltered three generations. This no doubt gives them roots to the suburb and gives them a feeling of identity with it.

## **(3) Physical Facilities Condition**

La Floresta suburb was created in 1949, exclusively for residential use. Located in the area of the suburb are Clinica La Floresta and a private school, U.E. Santiago de Leon. This school is at the place where the streams flow into one another; the streams are clean and dammed. The dominant construction in the suburb are houses, generally with two stories and in very good condition.

*Sanitary infra-structure and electricity:* The suburb has all the necessary network services in perfect condition (water, electricity, sewers and drainage).

*Communication services:* All houses are connected to the fixed telephone system. Likewise, the majority of the residents have cable television. They have direct radio communication with Polichacao, the fire fighters and the traffic policemen. They also have a wind sound alert for high risk emergencies. There are delegates for each block and they communicate through radio.

*Road/street network and public transport:* Francisco de Miranda Avenue in particular offers very good public transportation, including subway.

## **(4) Risk Management**

In the case of La Floresta suburb, the geomorphologic study was done by Universidad Central de Venezuela together with the Center for Integrated Environmental Studies (Spanish acronym

CENAMB), for the Institute of Civil and Environmental Protection of the Office of the Mayor of Chacao. The map of geological risk indicates that most of La Floresta suburb is a geotechnically stable area but situated on unfavorable lithology that may generate street collapses.

Assessments carried out in the area by the Office of the Mayor of Chacao indicate that no considerable floods have taken place by the overflow of Sebucan stream in the last 40 years. However, during the atypical rains of December 1999, the increase in water level caused some minor damages in some outdoor parts of the houses situated nearby the stream, although no structural collapse occurred.

As a response to the vulnerability situation of the area, the Civil Protection Institute of the Chacao Municipality regularly offers training courses regarding action in cases of emergency. As part of this initiative, posters have been placed on the lampposts of the main streets with the symbol of an eye, which is an alert sign for residents. The posters inform that residents must call the police in case of security irregularities.

#### **(5) Community Organizations**

The main community organization in La Floresta is the Residents Association, Spanish acronym ARUFLO. There is also the San Jose de la Floresta Residents Association (Spanish acronym AVESANJO) which covers the small slum near the suburb.

ARUFLO was founded on May 9<sup>th</sup>, 1961. It is the first of its type in the Caracas metropolitan area and it was created for the purpose of preventing the invasion of its parks with informal construction. The association's objectives is to seek a better quality of living for the community through intermediation between the residents and the municipal, state and national authorities. It fights against unendorsed uses, eliminating abortion clinics, brothels and unauthorized restaurants. Recovery of green areas (for example Aruflo Park and La Salle Park) was one of its projects.

There is an attempt to integrate all residents in community participation since everyone's contribution is necessary to achieve total quality of life.

### **3.3 Conclusions**

The major contents and characteristic in the three communities are summarized in Table S24-3.2.1. Although it is not a priority to simply compare the three-targeted communities, it was found that La Floresta is the oldest community having more than 40 years activities and experience, which resulted from the desire to protect and improve their own community environment without much

governmental support, particularly from the security aspect of risk management. On the other hand, in the case of Catuche and Anauco, they have developed the basis to improve community's living conditions to meet basic human needs. Common and interesting points among these communities are that they have functioning community organizations (like Civil Association or Consortium) as key components to work with and to provide strong leadership in the communities. It was noteworthy to discover the negotiation skill of Catuche to get technical and financial support from certain institutions. Through investigation in the three communities, the following key elements and common vulnerability elements in social risk management were identified.

1) Key elements

- Leadership is ultimately the key element for community organization for risk management in terms of solidarity, innovative challenge, diplomacy and sustainability for community organization.
- Everyday life with disaster arouses awareness of risk, but doesn't directly affect knowledge on disaster preparation. Additional actions such as contact with knowledge technicians or spontaneously attending training for risk management by community people themselves puts risk management into the community agenda as a priority. As a result, these actions strengthen community solidarity and improve the quality of risk management..
- Multiple approaches integrated by internal organizations (such as Civil Association), intermediate organizations (such as Consortium), and external organizations (like ADMC, municipality Chacao, local and international NGOs) collaborate with stakeholders to enable risk management activities to function in sustainable ways.
- The communities have completed risk maps and recognized evacuation routes, as part of their own early warning systems in the communities. In addition, they set up high priority roles in the community's agenda.
- The reputation as a well-organized community for risk management increased the community's confidence, which will lead to future influence on other communities.
- There was learning by doing and diffusion of good practices, such as the relationship in the case between Catuche and La Trilla. A practical method for diffusion of community risk management activity was described in "Learning from Neighbors, Catuche".

2) Common Vulnerability elements

- Not all individuals are interested in disaster and prevention management. People are diverse.

- Cooperation with external organizations sometimes bring about dependency and limitation for community risk management in terms of motivation, innovation and financial promotion.
- Individual enthusiasm and participation for community risk management easily disappears without any personal attention.



**Table S24-3.2.1 Findings on Three Communities**

	<i>Anauco</i>	<i>Catuche</i>	<i>La Floresta</i>
Functioning Years	3 years	14 years	43 years
Emergence of the organization/reasons	<ul style="list-style-type: none"> <li>• Landslides</li> <li>• To improve their habitat, quality of life in the framework of the Program for the Fitting of Slums</li> </ul>	<ul style="list-style-type: none"> <li>• Improving the environment and quality of life.</li> <li>• For 1993, by the Project of Physical Fitting of Slums. Pilot case of the Slum Sector Program</li> </ul>	<ul style="list-style-type: none"> <li>• Threat of invasions, protection of the use of urban space and of the residential nature of the suburb.</li> </ul>
Origin of initial leadership	<ul style="list-style-type: none"> <li>• Religious</li> <li>• Residents</li> </ul>	<ul style="list-style-type: none"> <li>• Religious</li> <li>• Residents</li> </ul>	<ul style="list-style-type: none"> <li>• Residents</li> </ul>
Relation with technicians in the consortium	<ul style="list-style-type: none"> <li>• Social and sympathetic commitment</li> </ul>	<ul style="list-style-type: none"> <li>• Social and sympathetic commitment</li> </ul>	
Existence of organizations linked to the issue of risk	<ul style="list-style-type: none"> <li>• Social consortium</li> <li>• Civil association</li> <li>• Early warning committee</li> </ul>	<ul style="list-style-type: none"> <li>• Social consortium</li> <li>• Civil association</li> <li>• Risk management brigade (La Trilla slum)</li> </ul>	<ul style="list-style-type: none"> <li>• Residents' association</li> <li>• Risk committee</li> <li>• Security committee</li> </ul>
Organizational structure that groups the whole of the urban settlement	<ul style="list-style-type: none"> <li>• Social consortium (2<sup>nd</sup> level, organized by functions)</li> <li>• Civil associations (1<sup>st</sup> level), linked to residents</li> <li>• Decisions are joint</li> </ul>	<ul style="list-style-type: none"> <li>• Social consortium (2<sup>nd</sup> level, organized by functions)</li> <li>• Civil associations (1<sup>st</sup> level), linked to residents</li> <li>• Decisions are taken by consensus in community assembly</li> </ul>	<ul style="list-style-type: none"> <li>• Residents' association (1<sup>st</sup> level)</li> <li>• ARUFLO association committees.</li> <li>• Decisions by committees, block representative and assembly (different levels)</li> </ul>
Knowledge of the existence of the organization on the part of the residents	<ul style="list-style-type: none"> <li>• Partial knowledge</li> <li>• Partial participation</li> </ul>	<ul style="list-style-type: none"> <li>• Full knowledge</li> <li>• High Participation</li> </ul>	<ul style="list-style-type: none"> <li>• Full knowledge</li> <li>• High participation</li> </ul>
Relation to institutions linked to the issue of risk	<ul style="list-style-type: none"> <li>• Metropolitan firefighters</li> <li>• Civil Protection</li> <li>• FUNVISIS</li> <li>• National Red Cross</li> </ul>	<ul style="list-style-type: none"> <li>• Metropolitan firefighters</li> </ul>	<ul style="list-style-type: none"> <li>• Fire fighters</li> <li>• Civil Protection</li> <li>• Office of the Mayor of Chacao</li> </ul>
Links with academic and research institutions related to risk	<ul style="list-style-type: none"> <li>• Institute of Fluids, School of Engineering, UCV</li> <li>• Institute of Experimental Development of Construction IDEC-FAU-UCV</li> <li>• Institute of Regional Urban Studies (IERU-USB)</li> </ul>	<ul style="list-style-type: none"> <li>• Institute of Urbanism</li> <li>• FAU-UCV</li> </ul>	
Links with first response institutions during the	<ul style="list-style-type: none"> <li>• Firefighters (1)</li> <li>• Civil Protection</li> </ul>	<ul style="list-style-type: none"> <li>• Firefighters (1)</li> <li>• Red Cross (post</li> </ul>	<ul style="list-style-type: none"> <li>• Does not say</li> </ul>

landslide	(Metropolitan) <ul style="list-style-type: none"> <li>• Red Cross</li> </ul>	disaster)	
Knowledge of the legal norms that rule the topic of risks and disasters	<ul style="list-style-type: none"> <li>• Known</li> </ul>	<ul style="list-style-type: none"> <li>• Known</li> </ul>	<ul style="list-style-type: none"> <li>• Well known</li> </ul>
Promotion of community organization for risk by GO's and NGO's	<ul style="list-style-type: none"> <li>• San Bernardino parish supports the organizational aspect</li> <li>• ACA 2000</li> <li>• Socsal regarding risk</li> </ul>	<ul style="list-style-type: none"> <li>• Fe y Alegria – Gumilla Center supports the organizational aspect</li> <li>• UNPD (international support / project of water culture)</li> </ul>	<ul style="list-style-type: none"> <li>• ARUFLO</li> <li>• Office of the Mayor of Chacao</li> </ul>
Sources of finances (after the tragedy)	<ul style="list-style-type: none"> <li>• CONAVI</li> <li>• Office of the Metropolitan Mayor</li> <li>• Women of Alfaro (Spain)</li> </ul>	<ul style="list-style-type: none"> <li>• CONAVI</li> <li>• Community of Jesuits in Germany</li> <li>• PDVSA</li> <li>• European community</li> <li>• Red Cross</li> </ul>	<ul style="list-style-type: none"> <li>• Own resources</li> <li>• Office of the Mayor of Chacao</li> </ul>
Relation with the national, regional, local government and its institutions	<ul style="list-style-type: none"> <li>• CONAVI</li> <li>• Municipal council of Libertador Municipality</li> <li>• Ministry of the environment</li> <li>• Foundation Housing of the Metropolitan Municipality (FUNVI)</li> <li>• Simon Bolivar Geographical Institute</li> </ul>	<ul style="list-style-type: none"> <li>• CONAVI</li> <li>• Municipal council of Libertador Municipality</li> <li>• Ministry of the environment</li> <li>• Foundation Housing of the Metropolitan Municipality (FUNVI)</li> <li>• Ministry of Infrastructure</li> <li>• Hidrocapital</li> </ul>	<ul style="list-style-type: none"> <li>• Office of the Mayor of Chacao</li> </ul>
Plans developed around risk	<ul style="list-style-type: none"> <li>• Community and risk map</li> <li>• Geological and Hydraulic studies</li> <li>• Contingency plans</li> <li>• Early warning plans</li> <li>• Evacuation plans</li> </ul>	<ul style="list-style-type: none"> <li>• Community and risk map</li> <li>• Geological and Hydraulic studies</li> <li>• Contingency plans</li> <li>• Early warning plans</li> <li>• Evacuation plans</li> </ul>	<ul style="list-style-type: none"> <li>• Community and risk map</li> <li>• Geological and Hydraulic studies</li> <li>• Contingency plans</li> <li>• Early warning plans</li> <li>• Evacuation plans</li> <li>• Security plans</li> </ul>
Leadership	<ul style="list-style-type: none"> <li>• Residents</li> <li>• NGO's</li> <li>• Religious</li> </ul>	<ul style="list-style-type: none"> <li>• Residents</li> <li>• Religious</li> </ul>	<ul style="list-style-type: none"> <li>• Residents</li> </ul>
Other organizations by sector or slum	<ul style="list-style-type: none"> <li>• Residents' association 11 de Agosto and Fermin Toro slums</li> <li>• Urban land committee, 11 de Agosto slum</li> </ul>		

## **CHAPTER 4. PILOT STUDY OF COMMUNITY-BASED DISASTER MANAGEMENT STRATEGY**

### **4.1 The Setting and Objectives of the Study**

As already mentioned, the Pilot Study is closely linked with proposals of the feasibility study in the JICA Study, the aim is to strengthen community-based disaster management in collaboration with related institutions and agencies for disaster prevention. Based on the objectives of the feasibility study, the Pilot Study covers the following topics: 1) improvement of early warning system, 2) promotion of earthquake-resistant construction 3) consideration of relocation and resettlement measures. In the pilot communities, the strategy covers both case of communities (urban and Barrios types) when applying items 1) and 2) above. The selection reflects the diverse and dynamic characteristics of the urban development process in Metropolitan District of Caracas, which have produced urban and Barrio community types. The JICA Study takes these social aspects into account in feasibility study as essential aspects. As mentioned earlier, various participatory methods were actively applied and played a central role to empower targeted communities to experience community preparation and mitigation measures.

### **4.2 Selections of the Pilot Communities in Each Topic**

For the selection of the Pilot communities in each subject, several discussions were held based on hazard maps both for earthquakes and debris flow; these were produced by JICA Study Team leading jointly with social and community development experts, a seismic engineer, a debris flow engineer, and subcontractors. The reason to take such a multidisciplinary approach was to make the study results more feasible. In addition, overall results of previous Surveys, “Social Vulnerability Survey” and “Case Study of Successful Experiences of Social Risk Management” were prioritized as important considerations for the selection.

At the first step, the main criteria for the selection were set up as follows: 1) topographical condition of community like in slope area, namely, affected communities according to disaster scenario area for both earthquake and sediment disaster, 2) Uniqueness of social vulnerability, 3) existing types of community organization (neighborhood associations, strong women’s leaderships or women’s health networks etc (see qualitative study), and 4) participation of community disaster management and other community-based activities.

The selected communities and listed below and their locations are shown in Figures S24-4.2.1 and S24-4.2.2

No	Specific Topic	Communities	
		Urban	Barrios
1	Improvement of Early Warning System for Evacuation	Los Chorros	12 de Octubre
2	Promotion of Earthquake-Resistant Construction	San Bernardino	La Vega
3	Relocation and Resettlement Measures	Los Lanos	

### 4.3 Improvement of Early Warning System for Evacuation in 12 de Octubre Community

#### 4.3.1. Background to 12 de Octubre (Barrios type Community)

##### (1) Profile of 12 de Octubre

The Barrio 12 de Octubre belongs to the Petare parish, North Petare, in the Miranda State's Sucre Municipality. It borders with 5 de Julio Barrio to the north; to the east with 19 de Abril Barrio, to the south with the Sucre Barrio, and finally to the west with the Santa Lucia highway. The 12 de Octubre community is divided into 11 main sectors although it further owns more than 20 sectors, which contain the *Escaleras*<sup>1</sup> (Stairways) and *Callejones*<sup>2</sup> (Alleys) which are in the Barrio. Additionally, the Barrio is divided into more than 60 apple-blocks defined by FUNDACOMÚN-CAMEBA. Based on the criteria, the agency was assigned for handing of land property titles to the inhabitants of the Barrio.

As in other Barrios, almost all housing in the community has antiquated building conditions, no technical supervision, etc., so that many stories are laid one upon another, to make the "Typical" Barrio view. Most of stairs are very narrow and irregular, and in some cases, a step doesn't exist but big sewage tubes are used instead of steps. Manuel Machado is the main street beginning from the Barrio entrance, and there are no open spaces or public transportation lines over there. Because of this condition, most private cars are parked in the main road, which disturbs the flow of traffic in the community. Electrical wiring that doesn't follow the general standard makes jungles, and this condition creates more dangerous living conditions for inhabitants, particularly in rain. Regarding hygiene, inhabitants have the waste habit to throw garbage in the stairs and streets. As a result, the garbage accumulates in the sewers, which overflow and damage homes, and even collapse when it rains. This causes serious problems for people who live in the lower parts of the community nearby sewage.

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<sup>1</sup> Escaleras: the name was given to parts of a Barrio which begin from the stairways on, and there are houses settled on both sides of it.

<sup>2</sup> . Callejones means that some of the steps that get until certain areas and don't continue.

There are contention walls constructed by the FUNDACOMUN-CAMEBA project in order to avoid slipping in the terrain and collapses which cause material damage, destruction or loss of housing.

**(2) Physical Vulnerability Disaster Experiences in the 12 de Octubre**

The landslides have occurred in the upper parts of the community, causing total or partial housing collapses, generating cracks in others, and weakening physical structures. When slips take place, the community offers to help the affected and damaged neighbours, including one case in which U. M. E. Abajo Cadenas School was provided as temporal shelter.

In rainy season, since there were no drainage of rain waters in the upper parts of the community, the community's stairways got flooded. In addition, the lower sectors of the community such as La Farmacia, Brizas del Zulia y El Puente were flooded. In the case of La Farmacia sector, the last big flood took place in 1999, when the sewage collector collapsed; in this collector, apart from 12 de Octubre, other neighbouring Barrios' sewers were concentrated, such as 5 de Julio, 24 de Julio, Sucre and 19 de Abril.

Due to ruptures of the sewer pipes in the upper part of the community and the strong rains, the ground in some areas has generated fractures and/or collapses of contention walls, which have affected adjacent housings. A sewage collector located under some housings of the La Farmacia sector, was harmed significantly, to the point of losing part of its structure. The water level reached until the second floor of the housing built there and generated a state of chaos and terrible panic. In the traditional way, the members of the community helped and worked with the neighbours affected by the flood in the sector.

**(3) Internal Resources**

The community of the 12 de Octubre possesses internal resources including health centers, educational centers, religious centers, markets, cooperatives, day care centers and communitarian feeding centers. Regarding health centers, the community has two dispensaries from the Barrio Adentro Mission, that offer medical assistance to all inhabitants of the community, especially to the poorer inhabitants with fewer possibilities to access these kinds of service. In one of the consulting offices, four doctors attend the public diagnosis, two for each shift, morning and afternoon. Also, there is a Popular Dental Clinic, located in the exterior part of the community, very close to the entrance. The Metropolitan Mayoralty has "Fixtures to the Ambulatory of 12 de Octubre" in a site located on the principal street of the community for the purpose of providing free medical services to the community.

Regarding the educational centers in the community, there is one public school, the “Abajo Cadenas” Municipal Educational Unit which offers only one level of basic primary education, only till the sixth grade; it holds approximately 1,000 students. Infrastructure and facilities in the school are ample with four floors, a computer center, and a library. Based on a pre-established schedule, students have access to these facilities. Also there are two private preschools, installed within the houses of the community, which are not duly registered in the Ministry of Education, Culture and Sports. Because of social-economic conditions, most of the inhabitants in the community don’t have enough access educational service. For improvement of the condition, a “Robinson” Mission and the “Ribas” Mission are located in the community, which adds up to over 10 classrooms, and takes place in the “Abajo Cadenas” Municipal Educational Unit.

The community has a day care center, which started this year, and is financed by the National Autonomous Service for Integral Attention to the Infancy and the Family (SEINFA), and provides free day care services to the children of the community.

Regarding the religious centers, the community has built one on their own (through wine tasting, bazaars and raffles) over 15 years ago; it’s a chapel is called “Virgen del Carmen”, and is located in the “El Cerrito” sector. In this chapel, catechism courses are given to the youngsters of the community, as well as nursing courses, vacation day-camps amongst others.

Within the community there are diverse types of businesses such as convenience stores, grocery stores, lottery centers, fruit markets, mechanical garages, bread shops, car spare parts shops, one pharmacy, “mercalitos” (“Mercal” grocery stores), amongst others. Also, since 20 years ago, a cooperative, “Cooperative 12 de Octubre Servicios Mixtos R. L.” has existed with over 1,000 members, inhabitants of the community. However it seems there is not much contact with the neighbors association.

In addition, the community has a “Feeding Unit”, which is a kitchen (or soup kitchen) in a house, where free lunches are offered to low income or inhabitants in extreme poverty who live in the streets. This Feeding Unit is financed by FUNDASUCRE, part of the Sucre Municipality’s Mayoralty.

Finally, regarding sports, the community has a multiple-use sports court (basketball, volleyball and “futbolito” [variation of football]), located in front of community entrance, where youngsters of the community and of adjacent communities (in spite of having other sports courts nearby) practice sports. Also, there is an empty lot on one side of this sports ground, it

is reported that a Food Market (“Mercal”) shall be constructed and also a public clinic to assist the community.

**(4) Existing Community Organization**

The 12 de Octubre community has major community organizations as follows: a) Neighbor’s Association ASO-12, b) Bolivarian Circles, c) Urban Land Committees and d) the Election Battle Units.

1) Neighbor’s Association

Among Neighbor’s Association, an Election Committee was created to conduct a census of the community in order to know the total number of inhabitants. The products completed by the committee members are shown in Figure S24-4.3.1. In addition to these members 5 members, coordinators of each sector of the community are also included as Neighbor’s Association members, which aims at satisfying diverse community needs. The Neighbor’s Association gets involved in various types of activities such as Special Vaccination Day activities, Street Cleanings, Capacitating Courses in the Virgen del Carmen Chapel, implementation of a Day Care, Feeding Unit, Scholar Afternoon Snack for the Abajo Cadenas school, Special Residential Letter requests Day activities, etc.

2) Bolivarian Circles

Currently, in the community one Bolivarian circle is active out of five formed within the community. This organization is considered rather for politics, and some representatives of the Neighbor’s Association members are also involved.

3) Urban Land Committees

Through FUNDACOMUN – Caracas Project to Improve the Barrios (CAMEBA) and the land registry, Urban Land Committees (CTU) have been organized in the community of 12 de Octubre, in order to hand out property titles to the land of the inhabitants according to 1.666 Decree on the Regularization of the Land Holding. To date, 300 property titles have been handed over. In the community, 10 CTUs have been formed, one for each sector, with Coordinator and two substitute Coordinators, in addition to having a General Coordinator for the CTU within the community.

4) Election Battle Units

Because of the political situation the country is going through, within the community there is an Election Battle Unit (UBE), whose purpose is to support actual government actions and to assist electors to cast their vote, which respond to the Maisanta Command guidelines, as a support to the Florentino Mission.

**(5) External Resources**

Through the Neighbor’s Association, the community maintains bonds and interacts with institutional organizations from the Sucre Municipality Mayoralty such as Social Development Direction, FUNDASUCRE, Municipality Comptroller, Citizen’s Participation, Municipality Land Registry; as well as with FUNDACOMUN–CAMEBA, The Federation of Neighbor’s Associations of the Sucre Municipality of the Miranda State, the National Autonomous Service for the Integral Attention of the Infancy and the Family (SEINFA) and FUNDABARRIOS.

Details of Institutional Organization which have relations with 12 de Octubre

Institutional Orgs	Descriptions
The Sucre Municipality Mayoralty	Highest authority in the municipality, in which diverse directions and organizations appointed to attend communities work to respond to the community’s needs as long as it’s within their competency
FUNDACOMUN	This organization started on January 30, 1962 with finance of the housing developments and service infrastructures, besides having the qualified attention of the Municipal Councils. Their mission is to improve the management capacity of the local and communitarian governments.
CAMEBA Project for Improving the Caracas Barrios	This project is located in the La Vega and North Petare to benefit over 200,000 inhabitants, as in the case of 12 de Octubre community. The implementation is for the massive process of regularization of land ownership, through the presidential decree 1.666 (02-APR-02), and to guarantee the participation of the community’s organizations; the Urban Land Committees (CTU) were then formed.
FUNDABARRIOS Foundation for Barrio furnishings	This organization was formed according to what was previewed in decree N° 246, dated June 29, 1994, published in Official Gazette of the Republic of Venezuela, N° 35.492 dated June 29, 1994. Its mission is to procure the construction of a dignified Habitat for the Venezuelan population of fewer resources through the physical enablement of the Barrios with the activation of the participative processes and communitarian development, which would allow them to become the main characters in their own social-cultural transformation.
SEINFA National Autonomous Service of Integral Attention to Infancy and Families	This service has the fundamental purpose to provide integral attention to children under 6 years of age, covering areas of daily care, nutrition, health, initial education and psycho-affective development, as well as orientation, capacitating and specialized advising to the family members and the communities. Principal functions are to direct, coordinate and supervise the execution of the Daily Care and Multi homes Programs.



### **4.3.2. Stakeholder Analysis in Barrio 12 de Octubre**

Stakeholder is defined as any actor (individual, group or entity) who has a relationship or interest (direct and indirect) with the organizations for a specific topic. For examination of community-based Early Warning System in 12 de Octubre community, in depth diagnosis enabled reaching the stakeholders in the community shown in Table S24-4.3.1 which led to further Stakeholder Analysis. In particular, analysis of the power balance and interrelationships between groups or organizations existing in the community or among different social actors was focused on in this section for effective Early System for the community. The precise Stakeholder Analysis brought about community stakeholder collective energy to overcome particular concerns and to make enough preparation for proper action through appropriate early warning.

#### **(1) General characteristics of stakeholders 12 de Octubre Community**

- Most of Stakeholders' age ranges between 35 and 60 years old
- There was strong female leadership, although duplicating in amount with men who participate and work for the community. Most of female stakeholders are housewives, and some are women who work out of the community. They maintain their activities inside the community.
- In a way, the current political situation seemed to stimulate every one of the active actors to work for the community, even for community-based Early Warning System subjects as well.
- Most stakeholders simultaneously participated in other community organizations.
- These Stakeholders know about community problems, such as the sectors or zones which have been affected by landslides and floods.
- The Stakeholders showed great interest in the Pilot Study and recognized its importance. This is because, despite their being organized, there is no group or network to handle emergency situations or to prevent natural disasters in the community.

#### **(2) Specific Characteristics of Some of Stakeholders as Reference**

Almost all stakeholders in the community have been involved in many kinds of community activities as well as having private roles in their home, which was indicated by one woman, for example, who was carrying her baby at the community meeting. This tendency of stakeholders in the community revealed involvement in community organizations in order to

satisfy their own needs to distinguish themselves as a key actor in the community. These stakeholders are not only sensitive to any topic related to improvement or protection for the community, but also have capacity to take action to cooperatively overcome problems, which means they are influential and primary understandable actors recognised by the whole community. Brief descriptions of some of stakeholders or key actors identified within the community are presented in Table S24-4.3.2.

### **(3) Social Network and organizational relationships of 12 de Octubre Community**

As mentioned earlier, a main constituted organization, ASO-12 Neighbours Association, is closely linked with other social organizations, such as the Urban Land Committees (CTU), the Bolivarian Circles and the Electoral Battle Units. CTU was formed under the Fundacomún-CAMEBA's follow-up, which is a agency in charge of executing improvement tasks in the community and of negotiating the process to the hand property titles to the inhabitants of the 12 de Octubre's community. Also, the Neighbours Association has organized the community to fit the design of the CTU coordinators from each sector of the Barrio.

On the other hand, Five Bolivarian Circles were formed within the community for the purpose of community action for political issues rather than for carrying out community activities. However, it maintains links with ASO-12 the Neighbours Association to meet community's needs and expectations, and some of main representatives are also members of Neighbours Association.

In a similar way, Electoral Battle Unit within the community was set up to support the current government administration in the forthcoming abrogative referendum. This organization is based on better participation of the community in political action. It seems that the majority the Neighbours Association members are political activists; however, most of representatives or main leaders are trying not to give political influence to this organization just for the purpose of community involvement in the association. Regardless of the community leading actor's political positions, they have made efforts to integrate various types of community activists for whatever benefits for the 12 de Octubre Community.

It is also reported that some sort of conflicts arose between some members of current the Neighbours Associations and those who came from formers Neighbours Association in terms of recognition of their own community. The main reasons of the conflict appear to be political differences with the lack of control and leadership. In addition, certain disagreements exist within the stakeholders regarding administration carried out by the Neighbours Associations

which was considered as not really matching certain expectations and demands from some parts of the community. As an example, a matter of construction of a Foods Market (Mercal) and medical offices located in front of the community's entrance in land where some members of the community have requested the construction of the sport complex for the youths and children of the community. Also, internal disagreements occur sometimes within the Neighbours Associations because of political background in some cases and the lack of specification of roles for the members. However, such disagreements were discussed and negotiated through joint weekly meetings to collaborate and find solutions.

On the other hand, the community has health services, educational canter, religious centres, trade shops, a cooperative, among other services. All of them interact with the Neighbours Association through activities and the organization of events that involve the community in general. Regarding health services, the community possesses two medical offices of the Barrio Adentro Mission which, through the organization and collaboration lent by the local association, offer medical assistance to all the inhabitants of the community, and carry out health day activities and vaccination day activities for the children as well.

In educational matters, by means of the Abajo Cadenas Municipal Educational School direction of Neighbours Association, for example, events for the children are organized, and the community participates apart from negotiating the installation of the Robinson and Ribas Missions which provide education possibilities to many members of the community.

Regarding religious centres, there is a Chapel "Virgen del Carmen" in the community which was built with the effort and resources of the community more than 10 years ago, and in which some formation courses are dictated. For example, there are nursery courses coordinated by the local association for benefiting the community, offering them training to a certain extent, but nevertheless useful to perform some occupation and to improve the quality of life. In the case of the existing trade shops, they maintain good relationships with the Neighbours Association; however their interaction is not so relevant. In a similar way, the cooperative that has worked within the community for more than 25 years, keeps away from many community events in spite of having kept on servicing the community for such a long time.

Through the administration of the Neighbours Association, the community receives benefits from institutional agencies in permanent communication and interaction. The local association has maintained institutional relationships with the Municipality Sucre Mayor's Office, specifically with Fundasucre and the Social Development Direction, from which it has been able to get the financing for a solidarity kitchen within the Barrio to ensure the feeding of people with very low resources as well as to guarantee the supply of an afternoon snack for the

children of Abajo Cadenas Municipal Educational School. It also maintains contact with Participación Vecinal (Local Participation), the Municipal Controllershship and the Federation of Neighbours Associations of the Sucre Municipality. As mentioned before, it maintains relationship with Fundacomun-CAMEBA, which is the agency in charge of executing improvement works in the community, and of negotiating the handing of property titles to residents through the urban lands committees. Likewise, it has been able to set up a Daily Care Home for free within the community, by means of the SENIFA and the supervision of the BINFA (Integral Homes). Finally, it has presented a project in Fundabarrios to solve problems that affect a great part of the community regarding infrastructure; in this project, a housing plan in the Barrio is contemplated.

#### **(4) Summary**

By understanding of characteristics, knowledge, position, and relationship of each stakeholder with the community, appropriate role for the stakeholder is applied to community-based activity such as introducing new topics, Early Warning System, and examining, for example, a specific task without any misleading or pressure by outsiders. Stakeholders, particularly The Neighbors Association, represents a key factor for any kind of community activity for achievement of integration of the inhabitants as well as negotiation with governmental agencies to better link empowerment of the community. Findings show that the Neighbor Association and its key actors have something more than just feelings for the community, which drives them to work for any kind of benefit for the community regardless of type of local organization or other factors. Therefore, the leading attitude and uniqueness that these key actors have bring is a lot of credibility and legitimacy within the community, which enables them to organize and to get diverse inhabitants from the different sectors involved. On the other hand, the stakeholder analysis proved that trusted, skillful actors have united the community as organization with solidarity. In other words, there is bilateral effectiveness that key actors bring to empower the community, and in return, the community also empowers these key actors. In other words, functional and active community organizations have great potential for community-based Early Warning System, which needs to be integrated into the community organization's activity in terms of monitoring system, autonomy and sustainability.

furthering addition, relationship analysis through the Stakeholder also identified the community relationships with other institutions, and indicated which is the influential and effective body to get cooperation; those organizations have the potential for providing community capacity in case of disaster. For introduction of an early warning system, good communication skills and trusted channels are indispensable, which will function as the most reliable and friendly institutions for disseminating warning information from the viewpoint of the community.

Lastly, through Stakeholder Analysis, stakeholder's opinions and expectations from the 12 de Octubre Community to governmental agencies are presented below. This is the most powerful messenger to connect community and institutions.

#### **Interactive Relationship with Governmental Agencies**

For involvement of various types of problems existing in our community, efforts by government agencies such as Municipality Mayor's Office, Miranda State Governorship, Central Government are needed.

#### **Transparent Communication**

We need to be listened by other agencies and to obtain answers on our anxieties and claims.

#### **Attention to Our Livelihood and Feasible Support**

- Issue of insecurity and high delinquency are predominant in the Barrio.
- So many years we have been struggling to acquire benefits to meet our needs in the community.
- We have been concerned about the condition of the housing in the upper part of the Barrio since we know that these houses are located in areas with fragile slips and have lots of leakage.

#### **Interest to the Agencies activities what they have been**

We would like to have the Study for preparation for disaster situations.

### **4. 3. 3. Disaster Imagination Game (DIG) in Case of 12 de Octubre**

#### **(1) Introduction**

The Workshop on the Disaster Imagination Game was carried out by facilitators who have great experience working with the community and excellent facilitation skills from BL Consultants.

At the start, the facilitators introduced DIG and the objectives and achievement through DIG activity for participants, with dedicated interaction to get participants involvement. Then, the participants were divided into three workgroups ("A", "B" and "C") formed by free selection of the participants without any influence on coming work activity. In each of the workgroups, the role of "Narrator" was provided to observe and register the workgroup dynamic development; for example, how participants coped with certain situations and cooperated within the workgroup, etc.

*Role playing* was performed in the DIG workgroup as a common rule so that members of each team could come to recognize a variety of necessary roles, their importance in case of emergency: for example, roles of Nurses, Rescuers, and Firemen. Through the simulated

performance, participants were able to recognize all individuals having roles and understand the importance and powerful functions of community cooperation.

In the introduction at the start, a brief description of the 12 de Octubre community was presented in which the location, physical condition, the approximate number of inhabitants as well as references about the obstruction of the principal roads by parked cars, accumulation of garbage in the drains, pollution and seepage problems caused by sewage pipelines, irregular and anarchic constructions which form the community, and the risk posed for the surroundings.

Also mentioned were the resources that the community counts on, such as educational institutions, religious, commerce, medical offices, among others; of the existing social organization forms in the community; and the absence of a communications network within the community.

Thereafter, each group was presented with information and emergency situations contemplated within the game, and in parallel, they were presenting particular and/or personal situations to some of the members of a different workgroup to observe their behavior and to see if the all activity contributed to redirected their actions, according to what was established, out of the general context of the emergency. The contexts within the imaginary game included flooding events, garbage flow and landslides. The following section describes some examples of the development of each one of the teams, with regards to different emergency situations which were presented to them.

## **(2) Work Activity of GROUP “A”**

In this section, one example of the work activity is reviewed. Group A was formed with seven participants of the community. During the set up of the game, they begin organizing themselves and designated their narrator who maintained a registry of all what occurred during the activity. In Group A, the narrator was the youngest participant with the least experience; nevertheless, he obtained the trust of the rest of the Group. According to observation, it seemed that the intention of the selection was to get the largest number of older volunteers involved in an emergency.

Once the team received a brief description of 12 de Octubre community, which was based on newspaper clippings, informing of rains up to the moment surpassing the normal index of rainfall. This generated alarm among the members of the community, and the participants started to visualize the situation and began to organize themselves to assume their responsibilities, for any event which could occur.

A moment later, they received their first report, where they were being notified of the flooding in 12 de Octubre community, and they begin to outline a series of strategies to cooperate and help the affected persons in the community; also they established the groundwork of an immediate help plan. Then they received their second report, increasing their action through the incorporation of more volunteers to be able to help the largest number of families possible, and to provide First Aid attention, food and security to the persons accommodated in the provided shelters. Upon receiving the report, announcing the ceasing of the rains and informing of the presence of the Fire Department and Civil Protection, the participants begin monitoring the affected areas, the physical damage produced by the flooding and landslides, such as the material and human losses, in order to get to know the magnitude of the events happening to the community.

In spite of the rains and counting on the arrival of the organizations in charge of solving the emergency, the participants decided to take preventive measures and keeping a permanent alert in case there were new events of equal or larger magnitudes.

<b>PARTICIPANT</b>	Elisa Barrera
<b>ROLE IN THE GAME</b>	Teacher
<b>ROLE IN THE COMMUNITY</b>	Sub-Secretary of the Neighbors Association

<b>TIME</b>	<b>ACTIONS</b>	<b>RESPONSABLE</b>	<b>OBSERVATIONS</b>
2:43	July's rains. We found out through the press.	The rains.	Landslide of the houses, the Fire Department, Civil Defense, infirmary of the community and barrio adentro, are sending the affected to the Church and to the school where Omaira and the slum doctors are receiving them.
7:10	We are warning the people of the sector of el Pino and la Farmacia which are the most affected.		
	Land collapses, landslides, floods. Land collapses in 8 sectors: los Mangos and los Manguitos. Structures are affected, there are 5 houses affected.		We have the telephone numbers of the Fire Department, Civil Defense and we called them. I took into my responsibility calling them and placing my children in suitable places where they would not be affected and I went to the affected places especially to la Farmacia.
9:10	I am in my house, I just found out and I am informing Ibrain, Omaira and Margot.	The Fire Department, Civil Defense and the organized Neighbor's are working.	
9:20	In the principal street runs a torrential amount of water, it has dragged many vehicles which obstructed the Mercal, totally blocking the principal entrance to the slum.	The radio.	
11:10	They just informed by radio that the torrential rains have affected all the Sucre Municipality, affecting la Urbina, la Agricultura and some slums of the Petare-Guarenas.	Radio transmission.	The neighbors are already cooperating. Ibrain, Margo and Leticia, informed that Mrs. Omaira was at the school with Mr. Pedro, cooperating with the injured persons we are sending them.
	The rains are ceasing and all the obstacles on the roads are being removed.		Mr. Henry has been taking food, mats, water, and candles for the people at the school and Church. Henry designated Pedro to help his family.
			The community of 12 de Octubre slums cannot provide all the help to other areas of the Municipality, but we have already sent the Fire Department and some members of the community.



### **(3) Participant's learning from the DIG to Strategy of Community based Disaster Management**

Through the DIG workgroup activity, participants recognized that current community conditions have limitations such as: 1) absence of an established communication network, 2) absence of a First Aid team. 3) many blind alleys and no alternate and effective escape routes for evacuation, which would most probably cause great confusion in case of emergency. In addition, these community participants reached a consensus that they needed to get rid of these inconvenient physical conditions as soon as possible, and for that, they considered the great importance of the role of community organizations and rescue group cooperation. They concluded that: 4) the lack of awareness and low morale on garbage management, which have caused throwing garbage anywhere has even lead to stuffed up drainage and sewage, which indirectly accelerates vulnerability of the community in case of disaster. In the second step, the above mentioned negative points could be turned into points for strategy in an appreciative way. Through dynamics of DIG, the following were **strategies** recognized by participant stakeholders in this Group.

### **(4) Summary**

For the transmitting information function, coordinators Neighbors Associations, coordinators of CTU and members of the Bolivarian Circles and other collaborators took initiative to disseminate the necessary information within the community. In addition, these organizations took action to cooperate with governmental organizations and other communities with the knowledge and experiences learned. In short, dynamic participatory activity of DIG was of great use for the participants of the community to recognize their own community's current physical and social vulnerability in collective way, and they had the opportunity to stimulate a disaster situation, and finally to lead to make their own community strategy for community-based disaster management. By development and the interaction of DIG, the making of the strategies of the Disaster Prevention Plan for the community generated the following relevant needs:

- Identify and recongnise community vulnerability and the emergency plans in the community.
- Establish an inter-external communication network that works with a link to govenemental institutions and the rescue groups.
- Define evacuation plans indcluding maps of possibly affected area and vulnerability map.

- Establish possible sheltering centers with necessary equipment and materials.
- Diagnosis and evaluation of the damages and losses suffered.

In sum, it has been realized that the networks of social support, their dynamics, their configuration and the list that acts as strategy of survival before the crisis situations are categories related with the social communication, (such as the rumor and their effect in the human communities), and are bound to concepts on the attitudes, the motivation, the collective behaviors, the interpretation of the disasters, atypical behaviors and other concepts that allow formulation of action guidelines or plans to reduce the effects of the disasters in the community.

### **1) Understanding One's Own Community's Risk and Vulnerability**

Every community members has responsibility to know and understand the risks in the neighborhood environment and conditions where floods or landslides, etc. could occur.

### **2) Establishment of Community Resources Profile**

Community Resources Profile (such as identified stakeholders list of the role of emergency situation) and diplomacy roles (such as negotiation with governmental organizations to get more supports or cooperation with other communities to obtain any resources which improve the community capacity against disaster) are necessary from the preparation stage. In addition, "contact telephone trees" within the community is needed to enable effective communication of any information on risk or evacuation flow in the community.

### **3) Community Map**

Including evacuation route, shelter locations, risk and vulnerability areas, responsible persons with instructions or possessing keys, and Locations of Community Organizations (NA, CTU and others), and disabled persons needing help.

Although the "Abajo Cadenas" school and the 12 de Octubre cooperative have been used as the shelters for people needing medical attention, it is still necessary to check them out.

### **4) Registration of Information System**

At first, community census is to be completed by some community organization or with cooperation of a governmental organization. Generally these activities are supposed to be covered by governmental organization; however, it is a reality that such support has not materialized. Considering these circumstances, the community's own initiative and actions are enormously important for the community itself. In case technical support is needed, related organizations should be approached to give technical lessons or support.

**Material and Human Losses** produced by the flooding and landslides have occurred in the slum, so it is proposed to make a **census** in the community to determine the number of injured, missing, deceased and the magnitude of the physical damage to the houses and access ways to the slum to build an effective information management system.

#### **4.3.4. Participatory Planning in Community-Based Early Warning System**

##### **(1) Introduction**

The participatory planning aimed at examination of applicability of the early warning system proposed JICA Study Team, ultimately focuses on the community roles, which have been unknown, as adjustment to the Caracas model. As mentioned earlier, the human system is complicated and rarely fits into a regular pattern which can be assumed by outsiders. In order to come to grips with these assumptions, community stakeholders involved are encouraged to discuss about the proposed Early Warning System to take it as their “own issue” and “plan for themselves”, and not let it be enacted as an armchair plan by policy makers.

In the participatory planning meeting, first of all, the concept and expected effectiveness of Early Warning System were explained as a prevention measurement for disasters in the community. In addition, as basic risk information on related disasters, the alarm system, sediments concept, debris flow, land collapses, landslide, others are also illustrated. Then, the participants were divided to two groups for the purpose of providing the global institutional framework to promote the study in the community. As the main topic of the discussion, Early Warning System in the community were highlighted, particularly of the processes and channels for warning information at various times:

- 1) Level 0 (normal) - Level 1 (Alarm)
- 2) Level 1 (Alarm) - Level 2 (Evacuation).

In addition, during the workshop, fundamental and necessary but uncertain questions were addressed to the participants such as: “What information and material is needed by the community for the early warning for evacuation?”, “From where and who should inform to the community?”; and “How should the information be disseminated to the communities?” by using visualized materials. By making use of these materials, the participatory planning was conducted with the skills of facilitators.

##### **(2) Results of the Participatory Planning of Early Warning System Proposed by JICA Study Team**

As an achievement of the workshop, constructive development of the participatory planning with community on the Early Warning System was completed.

As a preliminary result of constructive discussion by participants, Neighbors Association ASO –12 members and representatives of each 24 sectors were connected directly on the subject of emergency information flow. In order to guarantee network communication, establishing a

“phone tree” among the different members of the community was suggested. In it, each person would inform another five members, and each one of these would also transmit the information to another five members, and so on. Thus, the community could create a multiplier effect for the warning system. However, after interactive group work led by facilitators, the participants re-thought the effectiveness and efficiency of the information flow. The participants decided to make use of the functions and cooperation of existing community organizations such as CUT and Bolibarían Cirol as shown in Figure S24-4.3.2

In addition to this work, expansion of the chart with the participants could result in community stakeholder profiles, such as names, sector, telephone with other information and through the activity, the community could obtain the information flow that would structure a network of communication. For reasons of privacy, the completed list is not presented in this report. According to participant opinions, in order to guarantee the effectiveness of the warning system, the following is necessary:

- To have the capacity to embrace **any type of disaster**, not only events caused by floods or landslides, but rather also include other hazards that affect the community.
- To **create a committee** to face disasters that would work like a formal organization in the community.
- To motivate the participation of other community members in the formation of **volunteer groups** able to collaborate and to work for the community, in order to improve the capacity of response in the case of any emergency.
- To recognize the necessity of formulating a **communications network** in the community.
- They proposed as warning material, to **use the “Virgen del Carmen” Chapel’s bell**, megaphones, audio equipment; any means that is able to alert to the whole community so that they could take measures according to the received information.
- To point out possible **escape roads or evacuation routes**, since the main streets of the neighborhood can collapse.
- To **sensitize and raise awareness** of the members of the community in relation to the topic of disasters, and to prevent and mitigate flooding and sediment flows.

In short, we can say that the Early Warning System’s purpose is to avoid disaster that it can be prevented, and to help the members of the community become qualified to

respond and take the necessary countermeasures in any possible emergency situation of natural origin.

#### **4.4 Improvement of Early Warning System for Evacuation in Los Chorros Community**

##### **4.4.1. Background to Los Chorros Community (Urban type of Community)**

###### **(1) Profile of Los Chorros**

Los Chorros is located towards the northeast of the Ávila slope on the Leoncio Martínez Parish of the Sucre Municipality, in the Metropolitan District of Caracas. The environment is moderately surrounded with planted trees in the street and has Los Chorros national Park (4.5 ha). The Tocomé River flows from north to south in the upper parts of the urban area. In El Rosario, El Amparo, La Estancia, Los Castaños, Tenería, Hebraica and Montecristo sectors, the amount of natural riverbed starts to decrease due to the construction of housings at its margins; even worse, in some cases houses have been built above one. The majority of houses have 7 to 10 stories with high walls, electric fences and private surveillance. Social stratum is middle and high class. The population of the community is about 1,000 persons.

###### **(2) Debris Flow in Los Chorros**

Reflecting the environment where Tocomé River flows through the community, the main threatening and potential as natural disaster for the community are attributed to sediments flow and gulch flash floods. The first gulch flash flood was seen in 1951 and then in 1981 and 1999. According to a community member, in 1999 cumulus clouds covered the whole mountain range and formed natural water pots. The magnitude of the flash flood was so large that it not only dragged sediments but also it moved big stones with a deafening noise. Finally, the bridge was swept away by the enormous scale of debris flow.”

###### **(3) Existing Community Organizations**

Los Chorros urban area has a Proprietors and Residents Association (commonly known as the APRUCL Neighbors Association), formed in the early 90's. Since then, it has dedicated itself to defending the community interest, as it is written in the Nr. 1 Partial Rules and Regulations of the Municipal Régime Law (1989).

The APRUCL's Board of Directors (for year 2002) formed, in conjunction with other neighbours, a communication network (phone and radio) between the neighbours of the whole urban area. Additionally, due to the geographic extension of the urban area, the idea of subdividing it into 10 areas was proposed to guarantee its effectiveness so that each area

possesses a representative and two substitutes, in charge of motivating and informing the closest neighbours, and these to other close neighbours, thus creating an “expansive wave” effect.

In addition, the community possesses a register of the existing qualified human resources (firemen, doctors, policemen, military, among others). These representatives don't belong to the neighbours association because their commitment is voluntary. It is to be highlighted, that the initiative of the network was encouraged by the current political and social difficult situation, and community people felt the need to develop a prevention plan for the urban area. In addition, the citizens assembly and the Local Peace's Tribunal, which possess a close link with the APRUCL for the resolution of the urban area's problems.

APRUCL possess relationships with the neighbors associations of adjacent urban areas because APRUCL is member of the Conoreste Civil Association, which consists of 36 neighbors associations working as a Neighbors Association's Federation of the Northeast of the Metropolitan District of Caracas. In addition, Conoreste holds monthly meetings to discuss the main concerns of the urban areas to present the positions as a package of claims to the competent municipal authorities (Chacao Mayor's Office and Sucre Mayor's Office).

#### **(4) Relationship with Governmental Institutions**

The Neighbors organization have permanent contact with the Sucre Municipality authorities: (1) In case of APRUCL, through the president Gisela Brignones and Mrs. Rosario Machado every Tuesday morning to discuss the resolution of some of the urban area's problems which are to be resolved by the Major Office, and (2) the Miranda Governorship's Authorities through participation in meetings, neighbors assemblies among others, to which APRUCL is invited. The Los Chorros community possesses a list of police departments, civil protection, and fire department, as well as some governmental organizations.

#### **(5) Physical Resources**

There is only one Santa María Clinic located inside the river fan in the community. In case of emergency, the clinic will supply first aid, however, it does not seem to have enough facilities for emergency. There are 17 schools, 3 nursing homes, 3 embassies with consulates, and 3 churches. Los Chorros community doesn't have any rescue group, firemens agency, or police station. Generally, the relation between the community and the competent institutions in managing of disasters is a function of the degree of communication as well as requirements based on physical conditions. So if there is a stronger relationship from activities such as

workshops, the community will require a project for the cleaning of gulches and removal of trash.

**(6) Social Vulnerability, Social Response and Action**

The social vulnerability in the community is in a way linked to the political and insecurity situation of the country. Responses from the community range widely from the opinion that solidarity exists only among own neighbors to the opinion that strong individual responsibility also exists among neighbors. For example, house fencing leads some neighbors to limit their community responsibility only up to the fencing of their properties. On the other hand, there is another type of neighbor who is concerned and focused on coping with community problems as a whole, under feelings of solidarity and co-responsibility. Some members of the community are well aware of the surrounding hazards, so that they are willing to review the existing prevention plan in the community.

The community people believe an event of large magnitude wouldn't affect them but possibly to the Montecristo Urban area (down stream) since it has happened once already. In the most vulnerable sectors (La Estancia, el Rosario, el Amparo and the zone 10) of the urban area, the neighbours have applied the reasoning outlined in the contingency plan for the gulch's swelling, incorporating a variant of telephone communication with the Forester to monitor the growth of gulch waters and to take actions.

**(7) Leadership and Key Actors**

Leadership or key actors for the addressing the risk can be found in network members and motivated neighbors; for example, Diana Ricón (who in 1999 experienced the Vargas State tragedy, since this was her working neighborhood); Roberto Araya (geotechnical engineer and who worked on a Risk Management Project in Maracaibo Lake's eastern coast), Betzaida Barela (resident of La Estancia, who performed some eviction tasks together with her neighbors during the last Tocomé swelling in the zone of El Rosario), Felipe Delmot (urban dweller and architect resident of Los Castaños sector, with planning experience in risk management. He has established the early warning mechanism with the neighbors of his sector during the Tocomé's swelling.) These people have not developed strategies, nor are community organizations dedicated to such topic; however their concerns and initiatives are evident. In short, the community has human resources with professional skills and knowledge on the topic, and although there isn't strong leadership, there are organizers who are trusted by the community.



#### **4. 4. 2. Stakeholder Approach in Los Chorros**

##### **(1) Profile of Stakeholders**

- The majority of stakeholders (90%) are professionals in engineering administration and economics, with postgraduate studies (fourth level).
- The average age is 40 years old.
- Women and men are more or less equal in number.
- Most of the women are professionals. Also, there are housewives who are taking care of their grandchildren.
- Collaboration from different organizations in and outside the communities (for example, neighbors association and “conoreste” or citizens assembly).
- Active people with knowledge about the natural hazards they face in their community.
- They had interest in the project which means this work motivated them to produce strategies for prevention of sediment disasters, the central objective of this study.

##### **(2) Community social network: organizational and social relationships**

Prior to explaining the operation of the organizational network and the relations of stakeholders, it is important to mention the kind of organizations existing in the community, namely:

- Educational Centers (schools, secondary schools and pre-schools, around 20)
- Health Centers (Santa María Clinic, Nuevo Amanecer Medical Institute, and Los Chorros Psychiatric Institute), Nursing homes (around 10)
- 3 Embassies
- 2 Religious Centers (the Franciscan Mission and the Pentecostal Church)
- 1 Local Peace Justice Tribunal
- Different trade shops
- Building Condominium Associations

- Small closed plots, Citizens Assembly
- The presence of a Forester in Los Chorros Park
- Hebraica Social Center (this sector is formed by Jewish families who keep it “locked” since access is restricted)
- Atenea Foundation (heading to care for homeless children)
- Small groups of neighbors organized by sectors
- Neighbors associations and those individuals responsible for sectors.

The Urban area Owners and Residents Association established a communication network with the participation of two representatives for each one of the 10 urban areas to be in charge of motivating and informing neighbors (see Figure S24-4.3.3). This Association registers the qualified people (firemen, doctors, policemen, and military, among others) in Los Chorros. The network activation depends on the neighborhood association’s board of directors who start the chain between those responsible per zone (this chain concludes when the last person communicates with the first one, according to a preset pattern).

Links from Urban area Owners and Residents Association’s to other community actors, such as educational centers, health centers, Nursing homes and Religious centers is bi-directional and it is sustained by support requests or collaboration in activities; on the other hand, the relationships between the Peace Judges, the Forester, and the Citizens Assembly require communication coordination.

It must be pointed out that some power struggle exists between the Los Chorros Neighbours Association and certain organized groups in the sectors, since they have adjacent jurisdictions to the one specified by the Municipal Régime Law; however, in spite of certain differences, they possess knowledge and they are both recognized as stakeholders by their neighbors.

Accordingly, the community has some identified primary actors who are committed to community dynamic improvement, and who are excellent allies in the prevention and disaster management strategies process.

Regarding secondary actors, the community is in touch with the competent authorities (firemen, police, civil protection, among others) as access channels to all the citizens since these authorities are looked to for help at the moment when the community is not able to cope with a particular emergency situation.

#### **4. 4. 3. Disaster Imagination Game (DIG) in Case of Loss Chorros**

##### **(1) Introduction**

Basic approach and methodology are the same as for 12 de Octubre. Participants formed two workgroups and conducted DIG with facilitators. Each group was presented with information and emergency situations within the game, and in a parallel, they were presenting particular and/or personal situations to some of the members of the different workgroup, who were observing their behavior and evaluating if the all activity contributed to actions according to what was established, in the general context of the emergency, which means out of the flooding events, garbage flow or landslides, within the imaginary game. The following section describes “Disaster Scenario” which help to closely simulate the real situation, as well as some examples developed by each of the teams, with regards to different emergency situations. In this section, details of Disaster Scenario and Damage Condition and real metrological condition are presented. Realism is pretty important since DIG is conducted based on the information and even what participants imagine is happening in the situation, so they can makes plans for prevention or evacuation. Therefore, organizers of DIG needed to develop the collected information to be practical and detailed, and close to reality.

### **Development of Disaster Scenario in case of Los Chorros**

Between Wednesday the 1st and Sunday the 12th of September, there is frequent and intense rainfall towards the Southern slopes of El Ávila.

The neighborhood near Tócome gulch, has shown its concern and some people head towards Parque Los Chorros, sharing their worries with the Forester, making comments about the increase in the water flow, the change in coloring, dragging of solid material, and intensity in the sound. Cagigal (Observatory) and Air Force Meteorology reported an accumulated rainfall of 50 mm and that the bad weather will continue over the whole nation.

The media inform that there are land collapses and landslides in the slums situated East of La Urbina, specifically in those located close to the Petare – Santa Lucía road, between Km. 1 and 3 (“5 de Julio”, “12 de Octubre”, “Sucre”, and “19 de Abril” slums).

Given the conditions observed in the Southern slopes of El Ávila, the organizations are notified that the communities must be alert to any unusual behavior they notice in the surrounding water bodies.

Nº 1-a

Today, Monday September 13th, from 4:30 in the afternoon on, it starts raining intensely.

At 4:51 in the afternoon, the Forester of Los Chorros observes and reports to INPARQUES about a swelling at the Tócome gulch; the headquarters indicate to him to continue monitoring the water level.

At 5:10 in the afternoon, the Tócome gulch is overflowing above the level of the bridge at Principal of Los Chorros Ave. and a great amount of water, mud and pieces of plants and trees are beginning to flow through this avenue and Principal Ave. of Los Castaños, dragging various vehicles which were driving-by that moment.

Simultaneously, the Tócome gulch overflows the mesh level of the “Mi Guarimba” parcels, which affected the road, park and houses. There are four houses affected. Next to the Santa María clinic, seven houses are flooded.

At a pronounced angle which is part of the flow of the gulch, on one side of the Doña Juana building, the neighborhood at the towers report hearing a deafening noise and request help in case they need to be evacuated.

The water transports bamboos, rocks and sediments which block the drainage entrances at El Centro Ave. / El Rosario Ave., collapsing the bridge and flooding the basement at Ávila Plaza building.

In the drainage under Rómulo Gallegos Ave. and as consequence of a beam partially blocking the gulch, there is an overflow that interrupts traffic on this important avenue. This situation worsens with water flowing like a river through Montecristo Ave. and its side streets.

## Damage Conditions

Buildings: 30 to 32% of the buildings close to the Tócome gulch have been destroyed or seriously damaged.

Fires: No fires are reported in the disaster area for the time being.

Victims: Deceased: more than 15 people. Injured: over 100 (estimated) given it is nighttime and the floating population of Los Chorros is smaller than the resident population. There is an undetermined number of missing persons.

In all Hospital Centers, there are many patients coming in, and too many of them are waiting for medical attention even outside the facilities.

More Details:

The Metro: Out of service because of the flooding of the stations of Bellas Artes, Chacao, Altamira, Los Dos Caminos and Los Cortijos.

Electrical Service: There is no electrical service in various sectors of Caracas.

Telephone Service: Normal but it does not work in various sectors of Caracas.

Cellular Phones: Sometimes there is a connection, but there is such large simultaneous demand that many of them do not work.

Water Supply: Affected in various sectors of Caracas.

<b>PARTICIPANT</b>	Betzaida Barela (Bicky)
<b>RESPONSIBILITY IN THE GAME</b>	
<b>RESPONSIBILITY IN THE COMMUNITY</b>	La Estancia Neighbors Association Member and Chief of zone 1

<b>TIME</b>	<b>ACTION</b>	<b>RESPONSIBLE</b>	<b>OBSERVATIONS</b>
	<p>Since August 31<sup>st</sup>, I observe the mountain gulches in order to know if they look wider or they look like threads.</p> <p>Then I go to the park (the one at the La Estancia Urbanization, from where it can be observed the crossing of the Tocome Gulch, down waters) and I observe the Gulch's volume.</p>	Bicky	
5:10 pm	I alert every street Representative, especially the ones at La Estancia Urbanization main street and further down.	APRUCL	Activation of the communication network with APRUCL, monitoring with external agents.
5:40 pm	<p>The Mi Guarimba contention wall collapses. I call Rosario Machado. I communicate with the Fireman (retired) at the Estancia Sur Residences.</p> <p>I continue monitoring my zone and receiving information from the outside.</p> <p>The house members reunite and decide when to evacuate and to where to go.</p> <p>The Ávila Plaza Building contact is called for report about the bridge in</p>	Bicky, Street's Representative	<p>I can see the needs of Mi Guarimba.</p> <p>When Mi Guarimba wall collapses, its stones contribute to the erosion of walls and ground of every house at the main street adjacent to the gulch.</p> <p>It is recommended not to drive through El Rosario Ave.</p>

El Rosario Ave.

6:30 pm Begin to activate doctors, health,  
feeding commissions.  
Wait for disaster status  
communication.  
Move out the elderly if possible.

7:10 pm Evacuation of the zone. Commission Chiefs  
Report to the authorities and Zone  
representative

#### **4. 4. 4. Analysis of the Disaster's Imagination Game**

One of interesting findings was that for all participants, none of them assumed roles different from those that they carried out within the community, and it was starting from them and their residential location, that they built their actions and strategies. Likewise, both groups responded according to their logic of communal operation and of the communication network activation, and the commissions established in the contingency plan for safety; however, the main difficulties in the execution of evacuation strategies concentrated on the lack of evaluation and prior selection of shelter areas.

Regarding the operation of the groups, the first action of both was to focus work as a team on the map of the urban area, and especially follow the path of gulches to identify vulnerability zones. The differences were in the language used between them, which is why at the beginning of the activity, the leadership was assumed by the Geotechnical Engineer. In this sense, both groups planned overall strategies and actions, leaving aside their individual characteristics; therefore, intervention of the facilitators was required to modify their leadership, from the technical to the practical, since it was expected by the participants who have been involved directly with the gulch's flash flood down stream. Additionally, both groups of participants that received specific messages, decided to leave them aside, and to focus on the emergency situation they were in. Another particularity in the operation of the groups was the residential location of each one of them. Specifically, the ones who reside in zones away from the gulches, took the posture to help their neighbors down stream, for what it is evidenced as ingrained inter-neighborhood sense of solidarity. This could constitute the key to continue the work of management and prevention of disasters caused by sediment flows and to guarantee its sustainability, apart from counting on dedicated and qualified human resources interested in risk administration topics.

Regarding actions and strategies in general, they were linked in the following ways: activation of the Neighbors network and state of alert from August 31st, checkup of the gulch flow for possible further flash floods, constant inter-neighbor communication, taking evacuation countermeasures, activation of the commissions, mobilization and attention to those injured, waiting for the authorities and for air rescues. In Group B, they were given the recounting of previous flash floods and the measures that were taken at that moment, and this was outlined as strategy to establish an early alert mechanism between neighbors of the gulch's upstream zones with those of down stream zones, to prevent and to establish the time for evacuation. However, it is interesting to note some reactions in the groups. Both looked at the situation and the different information from several points of view: with a humorous sense, and of anguish and desperation in the moments when they didn't know what to do. This shows some cultural vulnerability, because responsibility was left to others, and people expected



just to react to the situation without the application of any foresight. Other reactions were surprise, doubt and caution that a situation like the one outlined could ever happen.

It is important to point out that, at the beginning of DIG, both groups were very rational and cautious to make decisions in the Game. Accordingly, they were slow to note that they were facing a disaster situation. However, the game advanced, and they could evaluate the data given by the facilitators, they formulated some strategies and actions, identifying community's weaknesses and strengths to face the adverse event. The participants recognized that DIG allowed them to revise their organization and procedures for community participation. Also, they mentioned the importance of having a better network in order to prevent and mitigate disasters for sediments and to formulate a better plan. As a footnote, in the discussion in the plenary session, the participants agreed that they required information and training to be able to consolidate their plan for management and prevention of disasters caused by sediments flow.

#### **4. 4. 5. Participatory Planning in Community-Based Early Warning System**

As shown in Figure S24-4.4.2, from Level 0 (normal) - Level 1 (Alarm), community participants were shown the availability of Internet and Website for meteorological information, and given information to technical institutions and local observations as well. In this community also, the central function of neighborhood association and sector coordinators was suggested. It is an interesting point that formation of "Community Technical Committee (5 persons)" was suggested by these participants as a necessity through the constructive meetings. The role of these technical members was considered with specific skills of early warning for evacuation. In addition, in Level 1 (Alarm) - Level 2 (Evacuation), the committees merged into neighborhood organizations as disaster prevention committees to strengthen the capacity against the coming disaster (see Figure S24-4.4.3). For the participatory planning on Early Warning System, participant opinions were necessary resources as shown below.

- Disaster is not only events caused by floods and landslides that affect our community. In order to deal with any type of disaster, it better include other hazards like the delinquency, fires, earthquakes, etc. for preparedness.
- Formal Committee against disaster. In order to preparer for disaster, it is necessary to set up formal committees working for disaster.
- Volunteer Group as promoter for community. In order to improve the capacity of response in the case of any emergency and to motivate and participation of other community members, formation of volunteer groups would be a benefit for the community.
- Communications network in the community. Communications network in the community is currently missing, which could accelerate warning information to residents at the appropriate time.
- Warning Information Tools. As warning information tools, the “Virgen del Carmen” Chapel’s bell, megaphones, audio equipment which may able to alert the whole community so that they can take actions according to the received information.
- Evacuation Route Map. Preparation of escape roads or evacuation route map would be helpful to identify them. Also, understanding of evacuation routes will help community people take proper action quickly.
- Effectiveness of Macro Project. Having constant Macro projects in the community would easily qualify key members in continuous work which will help the community to respond to any kind of disaster.
- Rasing Awareness on Mitigation and Sediment Disaster. Through some activities, it would be useful to sensitize the members of the community in relation to the topic of disasters, and to prevent and mitigate floods and sediments.
- Training of Community Youth Organization for Emergency. To assist in responding to emergency situations, the community intends to organize youths and to hold training workshops from the Fire Department and Civil Protection.

In short, the early warning system’s purpose is to avoid disaster that can be prevented, and to help the members of the community become qualified to respond and take the necessary countermeasures in a possible emergency situation caused by natural disaster. The summary of Participatory Planning in the Community is shown in Table S24-4.4.1.

#### **4.5 Results of Pilot Study of Community–Based Disaster Management–Strategy for Earthquake Disaster**

One human characteristic revealed in the ethnography part of Social Vulnerability Study is that perception of earthquake disaster wouldn’t stay people’s in minds due to the low frequency of earthquake occurrence and its episodic trend. Thus, it is not so simple to raise community awareness on preparedness for an unknown earthquake disaster beforehand in spite of the importance to the community. For the purpose of raising community self-motivation and self-preparedness against

disaster, Stakeholder Analysis and DIG of earthquake disaster were applied as participatory community centered methods in two pilot urban communities (La Vega as Barrio area and San Bernardino). In this section, results of DIG in San Bernardino and Stakeholder Analysis in La Vega are presented because of the limited space in this report.

#### **4.5.1. San Bernardino**

The population estimated in San Bernardino is about 26,973 inhabitants (National Institute of Statistics 2001). San Bernardino is composed of the middle and high class families, with high income levels related with import and commercial activities; it is one of the areas in Caracas with a higher number of public and private assistance and educational centers. The environment is considered as having important parameters for establishing the outlines for earthquake disaster preparation. DIG of earthquake disaster is presented as follows:

##### **Earthquake Disaster Scenarios**

###### **Notification Message 1 Hour: 4:30 p.m.**

A strong seismic movement shakes the whole sector. Screams and aid calls are heard since then. Many houses have collapsed or are seriously affected. Due to the collapse of towers and antennas there is neither electric power nor telephone service and the cell phone lines are faulty and congested. Pipes carrying drinkable water have collapsed. There is no information about the magnitude of the event in the parish, or in the rest of the city, or the country.


###### **Notification Message 2 Hour: 4:40 p.m.**

Information from a radio station was obtained: Seismic movement, 7.5 on the Richter scale has affected the centre and west part of the city. The damage scale is over the capacity of security and emergency organization: Police and Fire Departments. Several bridges have collapsed, particularly the bridge of Panteón Ave that links the Parishes of San José and San Bernardino. The authorities have prohibited the use of the Cota Mil because of structural damage. The roads are obstructed by trees, posts and electric lines knocked down.

###### **Notification Message 3 Hour: 4:50 p.m.**

San Bernardino's population is isolated due to collapses in several sectors. A neighborhood group went through to estimate the degree of damage. At least 30 fires have been detected in several sectors. The only exit from the community is the Cota Mil. In Avila Ave., 2 buildings are affected. To the north of San Bernardino 50 houses, and in the commercial sector 52 and 23 houses are not able to access any assistance centre because of closed road. 7 persons were found injured in the Cristóbal Rojas Avenue due to the fall of an electric pole. Smoke is coming out of the CADA supermarket.

After the above-mentioned individual simulation work on the community map, the group simulation work proceeded. Output of certain workgroup in DIG is described below.


<p><b>Immediate Action Taken</b></p> <p>Output of summary of simulation by participants</p> <ol style="list-style-type: none"> <li>1. - Looking for exits and rush to open spaces</li> <li>2. - The neighbors were evicted to concentration places.</li> <li>3. - Communication with Fire Stations and Assistance centers.</li> <li>4. - Confirmation of appropriate communication measurement (Bicycle?, foot ?)</li> <li>5. - Location of Banks (to look for Radios)</li> <li>6. - Transfer the injured to safety places</li> <li>7. - Searching localization of electric plants</li> <li>8. - Gathering to activate security brigades by sectors</li> <li>9. - Starting evacuation by sectors</li> <li>10. - Precaution regarding our neighbors (areas)</li> <li>11. - Logistics and distribution of medicines, food, water and first aid.</li> <li>12. - Contact with the Companies to cut off services.</li> <li>13. -. Location of possible heliports</li> </ol>	<p><b>The DIG Group Work</b></p> 
<p><b>Strengths</b> <i>Available Physical and Organizational Resources</i></p> <ul style="list-style-type: none"> <li>• Assistance centers</li> <li>• Available free areas</li> <li>• Coordinating Neighbors Association</li> <li>• Support Institutions (Navy-CALEV-Banks, etc.)</li> </ul>	<p><b>Weaknesses</b> <i>Lack of Resources for Disaster Management</i></p> <ul style="list-style-type: none"> <li>• Less Organization and communication among neighbors (community)</li> <li>• Lack of roads which help communication for rescue</li> <li>• Missing pharmacies and medical information</li> <li>• Lack of urban area and infrastructure maps</li> <li>• Lack of Community contingency plan</li> <li>• Lack of a Security Committee</li> <li>• Lack of knowledge of the roads for the planning and urban areas</li> </ul>

**Work Map**




Through active participant involvement, people understood the strengths and weakness of the surroundings of the community from earthquake disaster imagination game and developed group responses. In short, this type of “Learning by doing” in participatory lessons encouraged the community to take next step for community preparation to target reducing vulnerability and overcome weaknesses in the community. The constructive meetings for the next step were proposed from the community. The material below presents conclusions through Stakeholders Analysis in San Bernardino by revealing different responses of each stakeholder in the community.


### Community People, San Bernardino:

<p><b>Demands</b> - we need;</p> <ul style="list-style-type: none"><li>• Technical knowledge for making our own emergencies plan by ourselves</li><li>• How the existing organizations take responsibilities in emergency prevention and attention.</li><li>• The risk policies of institutions at municipal state/national levels</li><li>• Housing Reinforcement Fund and subsidies</li><li>• Improvement of training given accessibility</li></ul>	
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### Civil Protection - Municipality Libertador:

<ul style="list-style-type: none"><li>• We try to offer our maximum support and training in communities, for emergencies prevention and attention.</li><li>• The members of the community worked par excellence. They were the first to respond in an emergency, and so it is necessary to stimulate the creation of voluntary groups to integrate the emergencies brigades and by training them in accordance with the necessities of the community.</li><li>• The members of the voluntary groups can help in the training of the community.</li></ul>	
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### Caracas Metropolitan Fire Department:

<ul style="list-style-type: none"><li>• We are at the disposition of the community, offering a wide range of courses.</li><li>• Tell us which training they need as support</li><li>• We have the capacity of also assisting them on Saturdays.</li><li>• We offer to apply them in the educational facilities for the School Emergency Plan.</li></ul>	
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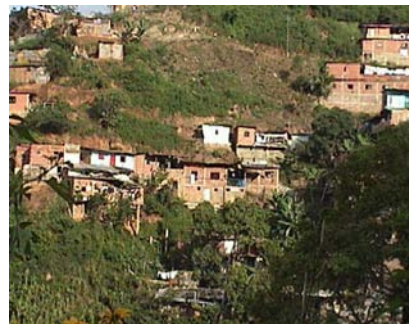
### Electricity of Caracas:

<ul style="list-style-type: none"><li>• Our organization directs most of the actions of risk prevention in the internal and operational environment.</li><li>• We have programs of preventive education directed to the community for electric risks.</li><li>• If requested by the community, informal lectures can be presented in schools about electric risk prevention and energy saving.</li><li>• We have worked much in neighborhoods to address the risk of the aerial electrical installation.</li></ul>	
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The results of the stakeholder analysis show that related stakeholders do work together to discuss the common topic of earthquake disaster management and to understand each stakeholder's role, contributions, conflict/controversy and strategy. By exchanging views in dynamic group situations, they reached common understanding regarding community needs such as establishment of disaster prevention and evacuation policy, initiatives for both institutions and the community. The contributions of intervention by facilitators were recognized by stakeholders themselves. Also, the results show that both civil protection and fire department were willing to provide training courses to the community. This suggests the need for improvement of the current duplicate management condition among these agencies and to clarify an effective role individually along with the organization policy. Thus, the stakeholder analysis meeting brought fruitful information of the community both internally and externally as well as questioning areas for better disaster management.

#### **4.5.2. La Vega**

The Parrish of La Vega has 122,189 inhabitants and most of the houses were constructed on the steepest mountain slopes and built by non engineered structures symbolic of Barrios (see photo). This results in physical vulnerable condition because the analysis of the seismic scenario of the 1967 Caracas (JICA Study team) indicated that the community possesses high positional of earthquake disaster damage. Although the



inhabitants have noticed their risky conditions, attempts to improve these vulnerable housing conditions and its location for disaster preparation have not been put into the community agenda.

On the other hand, a Catholic Church helps the community for improvement of basic human services like sanitation, education, etc. as well as the traditional religious services. Under the coordination of religious theme that provides a coherence for the community and direction for their global work, several community leaders have engaged in community work with dedication, including activation of neighborhood association and other community organization activities.

Generally, the community has contact with municipal Civil Protection, but contingency plan for disasters has not been prepared and few communication mechanisms in case of an emergency functions so far.

Accordingly, as major participatory techniques, Stakeholder Analysis and DIG were also conducted in La Vega also. The responses or opinions were basically similar to the case of San Bernardino regardless of urban or Barrio areas, although the community resources are totally different among these communities. They mentioned the functional role of neighborhood associations, effective

support from governmental agencies including the comment that subsidies are essential to improve community preparation. For example, in La Vega, vulnerable physical conditions economically and environmentally are vast; however, organizational resources have links with governmental and other institutions, and human resources social and culturally are strongly enough. Thus, the degree of participation and motivation of community people were pretty high reflecting the presence and role of leadership.

Reflecting the conditions in La Vega, the first Reinforcement of Risky Buildings in Barrios were attempted for promotion of the approach to other similar areas. In the next section, the results are discussed.

#### **4. 5. 3. Promotion of Reinforcement of Risky Buildings**

From the Social Study in Community Organization for Earthquake Disaster Prevention, Table S24-4.5.1 offers a set of economic parameters for household investment in barrios which include household assets from land tenure to small utensils, home improvements up to large appliances and interior finishing details. In other words, these parameters are used as indicators to estimate the economic value of different types of housing in Barrios. The concept is that larger investment in homes means that there is greater likelihood to invest in mitigation of value loss if proper education and awareness is in place. Less investment in homes implies less likelihood to invest out of their pocket in house reinforcement. The parameters reveal what could be investment factors that economically would encourage community to use in the decision-making process; it is an economic approach based only on asset and property value.

However, our approach focused on human systems and so necessarily includes other aspects besides economic assumptions. One is the value of human life that is the highest factor to be considered since the value placed on life is priceless, monetarily speaking. Research and interviews with specialized professionals with long standing experience in social and psychological aspects of barrio communities explained that in normal community livelihood, the building of self-identity is socially constructed along with all the physical improvement of habilitation. Particularly, it was pointed out that the care for children, elders and extended family can make certain members of the family (head of households) to carry on the burden of family safety, at the cost of their own nutrition, health condition and education opportunities, at large personal sacrifice, and this was particularly true for women. In terms of measuring their own risk to disasters, the tendency is to avoid thinking of themselves and their own safety, but to center their worries and sensitivity of risk on their loved ones. Understanding this rationale, the awareness raising task can use the vision of the affect on cared ones as well as on themselves, in order to help visualize the likelihood of loss in the eventual case of earthquake disasters with practically no time for preparation. The construction of self-identity and

self-value of their own lives involves a psychological process (more feasible by collective social intervention rather than individuals in barrio settings) which takes time to develop since it is based on self-esteem and self-image values. In addition, the lesson from the 1995 Kobe earthquake in which many human lives were lost in very short time due to building collapse with weak structures to the community helped show how much building structures influences the loss of human lives.

In sum, through the pilot study and reinforcement program (obviously an integrated approach which includes many factors in terms of economic decisions, the value of human lives and personal beliefs), social contexts, institutional framework and education processes were aroused. Applying real teaching materials from Kobe earthquake was understood by some of the community. Through the lessons for community's understanding toward reinforcement program, many stakeholders from various backgrounds (not only technical engineers but also soft side of specialists like community communicators, economist, sociologist, psychologist) were necessarily joined as a project team. This multidisciplinary approach guarantees in a way to be the first action for the implantation of effective and efficient reinforcement projects for the community.

#### **4.6 Results of Pilot Study of Community-Based Disaster Management-Strategy for Relocation of Community away from Risky Areas**

##### **4.6.1. Introduction**

Relocation is an option to address risk by moving away from risky areas, and this is the best way to protect peoples lives from disaster. However, most of the people who live in risky areas in Caracas belong to the lower social stratum and it is difficult for them to leave the area where they live, just to protect themselves from disaster. In the quest of a strategy, how to enable relocation project work in disaster management is proposed. The Study Team conducted a social survey with the approach as follows:

**Step 1:** A review of previous experiences in relocation in various parts of the country and particularly in Caracas.

**Step 2:** Review and analysis of Catuche community, considered one of the successful community-based disaster management efforts to identify appropriate countermeasures to relocate people from risky areas.

**Step 3:** Finally, formulation of strategic countermeasures for the relocation of people from risky areas, based on Catuche experience. These were validated through the assessments made by Los Lanos Community, a neighbourhood located by the Anauco River that was affected during the event of floods occurred in Caracas in December 1999.



#### **4. 6. 2. Revision of Relocation of Past**

There were several relocation projects in the past from 1940's to 1990's. They are categorized into: 1) relocation due to housing substitution, 2) relocation due to adverse events that have destroyed the urban structures, and 3) relocation due to the installation of new public works.

Relocation is also categorized by the distance to the new place and original place, as follows: 1) within or near the community, 2) away from the community in the new distant place with no existing community, and 3) away and toward another community.

In many cases, successful relocation process is accompanied by: 1) organized community, 2) community awareness of risk situation, and 3) understanding of the impact of the relocation to the community. Sometimes even after disaster, when the community has the initiative, the relocation would work; however, when the authority has the initiative, the community would close in on itself and not be willing to move out (see Table S24-4.6.1).

Relocation related to disasters basically happened after the community had experienced the disaster. There seems to be no evidence that shows that a community moved away from the risky place without having experienced any disaster.

#### **4. 6. 3. Catuche**

Catuche community is considered to be a successful community with its active approach for community development and disaster management that minimized the number of victims in the event of the 1999 debris flow disaster. After the disaster, the community started relocation projects from the damaged area to a nearby area. In spite of this example, the Study Team examined in detail how the community was willing to move out from where they lived to a safer place.

From the research on the community and interview with the charismatic leader Mr. Pedro Serrano, the following details were found:

As often pointed out about successful community action, Catuche has: 1) good advocacy by a Jesuit Father José Virtuoso, 2) a strong charismatic leader from the community, 3) a functional community organization which was created as a result of active community activities and afterwards has been consolidated with other religious organizations, presently forming the Catuche Social Consortium, and 4) experts as external resources, such as an architect like Cesar Martin.

With such formation of the community organization, the Catuche community has collective power as an autonomous community organization and takes actions for the community with full participation of each member of community in every activity in the community.

In addition, the key to a successful community also includes community organization with full participation of members in decision making, and collective team leaders with equality of rights and responsibility in operation of the community activities. It is also important to maintain equal partnership with professionals for technical advice. The community decides what to do and how to do it for betterment of their life there. The process of reconstruction of the Catuche community after the 1999 disaster clearly shows that the community works in this way. However, it should be noted that the path to this stage is not short, but one requiring tenacity and patience.

#### **4. 6. 4. Aspects to be Considered for the Relocation Process**

##### **(1) Institutional intervention**

Overcoming the difficulties that have had decisive effect in the success or failure of a policy, taking in consideration the experiences in favor of the relocation and/or the reinforcement housing programs of the urban neighborhoods, consider the following aspects:

- Formulation of policies relevant to administration of settlement of immigrants : how to treat with people living in the risky area, the provision of the right to live or land ownership to those living in the risky areas.
- Establishment of the institutional arrangement for relocation of the community and implementation of the relocation projects, including budgeting.
- People's participation in planning and design process of the relocation project. Otherwise, people will oppose the relocation plan.
- Transparency in use of finance for the project.
- Mutual trust between people and government is a prerequisite for the relocation project to start, otherwise the project will not.
- Sustainability of the project by political will (advocation) and continuity should be maintained in spite of government's changes.

##### **(2) Professionals**

- Professionals for technical support need to spend much time with the community and understand the community's dynamism and work on the project as a partner of the community.

- Professionals need to respect the community's participation in the planning, design, and implementation stages, and have it as open as possible to the community.

**(3) Conditions on which people would move out of the risky place where they live**

The following aspects need to be taken into account for the barrio people living on risky land to move in a voluntary way, otherwise the project will not succeed.

- If their housing is relocated within the same area or near the community.
- If they are fully aware of the risk when living in a high risk area with the presence of a river.
- If it improves their quality of life: i.e., to change their house for another more decent that offers them bigger security, when being located to a safer place, far from the river.
- If the surrounding area where they live improves: i.e., to endow the new area with suitable and sufficient services, to create or to design amusement areas, of recreation, sports, community spaces, educational areas, health services, among others.
- If they will have access to a house they own. The inhabitants of Los Lanos, didn't want to change houses they own, for others that are leased, rented or given as accommodation.
- If the community participates in the design of the relocation proposal.
- They didn't want to be relocated next to inhabitants of other barrios of different and unknown origin; the neighbours were not willing to take the risk of the future coexistence with these inhabitants. The design of the preliminary proposal and the actions to be taken should be developed in permanent consultation with the community.
- If the community has control of the financial elements that intervene in the investment, they are willing to become participants of the rational use and control of materials for the construction of the houses.

**Table S24-4.3.1 Primary and Secondary Stakeholders in the 12 de Octubre**

<b>Primary Stakeholders</b>	<b>Tasks</b>
Romelia de Cedeño	<ul style="list-style-type: none"> <li>Neighbors Association's President.</li> <li>Urban Lands Committees ' (CTU) Coordinator</li> <li>Francisco de Miranda Bolivarian Circle's Representative</li> <li>Catechist within the community and in 4 neighboring communities.</li> <li>Electoral Battle Unit (UBE)'s Patrol Car Chief</li> </ul> She has worked in the community for more than 15 years
Omaira Alvarado	<ul style="list-style-type: none"> <li>Neighbors Association Vice-president</li> <li>Catechist in the community.</li> </ul>
Jesus Manuel Gamez	<ul style="list-style-type: none"> <li>Neighbors Association's Treasurer.</li> <li>Substitute Coordinator of the Cristo Rey Sector.</li> </ul>
Teotiste Ramos	Neighbours Association's General Secretary. Brisas del Zulia Sector CTU's Coordinator UBE's Vice-president
María Elisa Barrera	Neighbours Association's Sub-secretary. CTU Cristo Rey, El Cerrito and Main Street Sector's Coordinator.
José Ibrain Colmenares	First Vowel of the Neighbours Association. Facilitator and Mission Ribas' Assistant. Attached to the UBE's logistics
Yulibeth Chacón	Second Vowel of the Neighbours Association.
Marilu Yáñez	Calle Principal Sector Neighbours Association's Coordinator Calle Principal Sector CTU's Coordinator. Attached to the UBE's Logistics
Pedro Godoy	La Farmacia Sector Neighbours Association's Coordinator
Rosa Gilma Gómez	Calle Principal Sector Neighbours Association's Coordinator Calle Principal Sector CTU's Coordinator
Raiza González	Callejón Barlovento Sector's Neighbours Association's Coordinator. CTU's Coordinator
Enrique Castro	La Escalera Sector Neighbours Association's Coordinator
Carlos Castro	Frente a la Escuela Sector Neighbours Association's Coordinator Bolivarian Circles' Coordinator
Nancy Mejías	20 de Agosto Sector Neighbours Association's Coordinator.
Jermain Guereguan	Abajo Cadenas Sector Neighbours Association's Coordinator
Roberto Gutiérrez	Los Mangos Sector CTU's Coordinator
Marcy Josefina Cadenas	La Farmacia, El Puente and El Cerrito Sector CTU's Coordinator
Julia Ramírez	Callejón Chalo Sector CTU's Coordinator
Zulay Gutiérrez	20 de Agosto Sector CTU's Coordinator Coordinator of the Neighbours Association of the same sector. Member of the extinct electoral commission. Patrol car Chief.
Ana de la Cruz Pirona	La Farmacia Sector CTU's Substitute coordinator
Francisca Garmendía	Caña de Azúcar Sector Neighbours Association's Coordinator
Guido Machado	Chapel Virgen del Carmen Parish priest

<b>Secondary Stakeholders</b>	<b>Tasks</b>
Belkis Monsón	Neighbors Association's Collaborator Attached to UBE's Information
Mirna Moreno	Neighbors Association's Collaborator
Carmen Margarita Yanez	Neighbours Association's Collaborator
Nancy Cedeño	Neighbours Association's Collaborator UBE's Member
Bolivia Orellana	Former President of the Neighbours Association
Lisbeth Medina	Neighbours Association's Collaborator
Fernanda Martínez	She manages the food's unit

**Table S24-4.3.2 Brief Descriptions of Some of Stakeholders**

- **The President of the ASO-12 Neighbours Association**

She is the President of the ASO-12 Neighbours Association; she acts as the Urban Lands Committees' General Coordinator (CTU) conformed in the Barrio. Also, she is a representative of the Francisco de Miranda Bolivarian Circle; she imparts catechesis classes within the community and in four neighbouring communities. She has worked in the community during more than fifteen years, being able to know the Barrio completely, inclusive, she has identified the most sensitive and vulnerable areas, regarding collapses and ground-slips hazards. She has worked with the church, has provided first aids services to the inhabitants of the Barrio performing as a nurse, and has offered help and has collaborated in the activities that have been carried out in the community. Thereby she is recognized as a leader inside the community, and counts with the respect and support of the Barrio's members.

- **The Vice-president of the Neighbours Association**

She acts under the position of the Neighbours Association's Vice-president. She is member of the Francisco de Miranda Bolivarian Circle, belongs to the UBE, and teaches catechesis in the community. She has been for many years working in the community and knows the whole Barrio as much as she identifies the areas that have been affected by the rains and those that show a collapse hazard.

This stakeholder counts on the community recognition; we can say that she is very supportive to the Neighbours Associations' president; she shows concern and interest for the matters of the community, and works in order to improving the conditions of the Barrio.

- **Administrator of Neighbours Association as well as Coordinator of CTU**

He is the Neighbours Association's administrator or treasurer and also CTU's coordinating substitute of the Cristo Rey Barrio's sector. He doesn't have a lot of experience working with the community; however, he shows concern and interest in the problems present in the community, apart from being willing to collaborate in the resolution of those problems. This social actor has the recognition of great part of the community, as member of the Neighbours Association and due to the tasks he has executed.

- **General Secretary of Neighbours Association and CTU Coordinator**

She performs the position of the Neighbours Associations' General Secretary; she is CTU Coordinator of the Brisas del Zulia sector and is Vice-president of the UBE. This is a stakeholder who has the recognition of the community, since she has worked there for a long time. She knows the problems suffered by it, works and collaborates in function of being able to solve them and/or look for improvements in the Barrio.

- **Sub-Secretary of the Neighbours Association and CTU Coordinator**

She acts as Sub-Secretary of the Neighbours Association and CTU Coordinator in the Cristo Rey Sector and part of the El Cerrito and Calle Principal sectors. This is a stakeholder who doesn't have a lot of trajectory in the community, however, she has participated and collaborated in diverse ways in the community, and she offers an important support to the tasks executed by the Neighbours Association.

**Table S24-4.4.1 Summary of Participatory Planning of Community-Based Early Warning**

Features	Common		Unique	
	Los Chorros	12 de Octubre	Los Chorros	12 de Octubre
1 <b>Local Message</b>	Simple and Understandable			
2 <b>Receiving message</b>	No contact, information (Current)			
	(Expectation from Institutions ) ↔		Web, Phone, e-mail	Exact Indication from PC for evacuation, Radio
3 <b>Contact to Institutions</b>	(Expectation to Institutions) Often			PC Sucre
4 <b>Leadership</b>	Division of responsibility and role established			
5 <b>Autonomy</b>	Observation			
6 <b>Female Human Resource</b>			Gradual Participation Active	Active Participation, Sensitive, time available, close to kids
7 <b>Motivation and Involvement</b>	At first pretty low, it increased because of constructive contact with the third party			

**Table S24-4.5.1 Economic Parameters of Household Investment in Barrios**

Economic parameters	<b>CRITICAL</b>	<b>Bs.</b>	<b>MODERATE</b>	<b>Bs.</b>	<b>HIGH</b>	<b>Bs.</b>
<b>Basic construction materials</b>	Wooden/metal for columns, plastic/zinc for roofs wood or tin for walls.	500,000	cement in floor, foundations, columns y slabs, zinc roof y partial. flat molding	5,000,000	foundations, columns and beams, tabelon or platabanda in roof, 2 or 3 floors, water pipes and embedded light, walls block.	9,500,000
<b>Primary public services</b>	None	0	improvements in wiring y posts, white water tubes ditch	1,000,000	street access, sewer & gray water services, public illumination , vehicular access.	3,000,000
<b>Basic appliances</b>	2 Stove kerosene / gas small mattress, chairs/stools, etc.	300,000	Fridge (9 ft), stove, beds and small mattress.	800,000	Refrigerator (+11ft), he/she cooks with oven, room games.	2,250,000
<b>Tenency of the land</b>	None	0	Bienechurias (improvements)	2,000,000	Holding of the land	6,000,000
<b>Complementa ry construction materials</b>	None	0	rustic cement cover in some brick walls, polished cement floors	2,250,000	Tile in floors and in walls, macillado in walls, lamps, wooden windows and doors, bathrooms	5,000,000
<b>Complementa ry appliances</b>	None	0	TV color (13"), basic dining and living room furniture.	1,200,000	TV color (+28 "), decoder satellite, team sound, micro-waves, complete dining and living room furniture	8,500,000
<b>TOTAL INVESTMENT</b>		<b>800,000</b>		<b>12,250,000</b>		<b>34,250,000</b>

**Table S24-4.6.1 Some Examples of Relocation Projects in Venezuela**

<b>Reasons</b> <b>Location</b>	Relocation due to Housing Substitution	Relocation due to Destruction by Adverse events	Relocation due to New public works
Within or near the community	<ul style="list-style-type: none"> <li>• El Silencio (Caracas, 40's)</li> <li>• Primero de Mayo (Calbozo, Guárico state, 80's)</li> </ul>	<ul style="list-style-type: none"> <li>• La Quebradita &amp; Nazareno (Caracas, 70's)</li> </ul>	
Transfer to non-community existing, new distant place	<ul style="list-style-type: none"> <li>• Nueva lagunillas (Caracas, 80's)</li> </ul>	<ul style="list-style-type: none"> <li>• Los Cocoteros (Maiquetía, Vargas, 90's)</li> </ul>	<ul style="list-style-type: none"> <li>• Nueva Tacagua (Lagunillas, Zulia state, 70's)</li> </ul>
Transfer toward another community	<ul style="list-style-type: none"> <li>• Urbanization 23 de Enero (Caracas, 50's)</li> <li>• Uranization Caricuao &amp; Valle-Coche (Caracas, 60's)</li> </ul>		

Source: CONAVI, Inavi, Fundacomun and the Institute of Urbanism of the UCV, Mr. Aparicio Zambrano and Mr. Marcelino, neighborhood of La Quebradita.

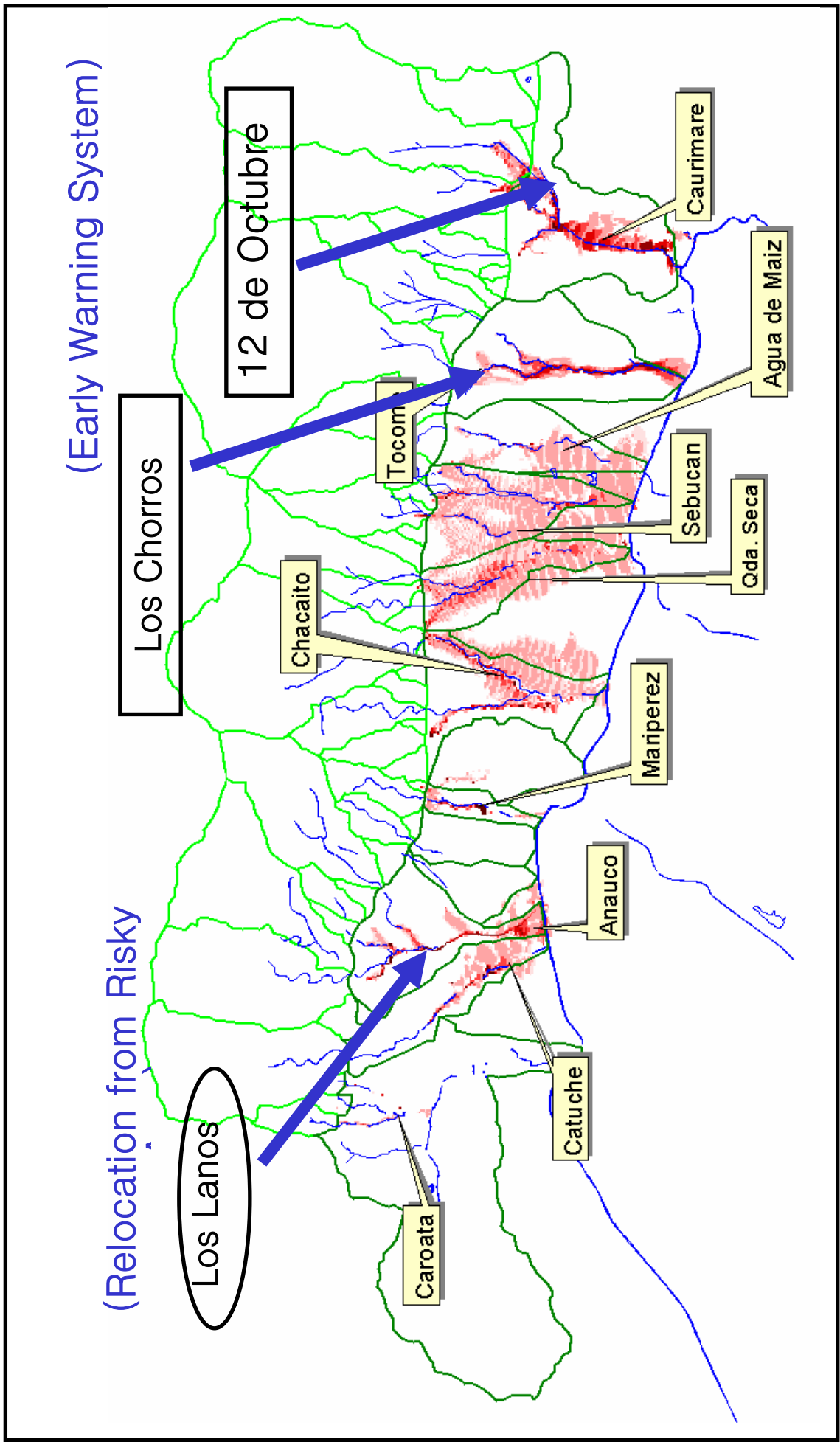


Figure S24-4.2.1 Selected Communities for Early Warning System



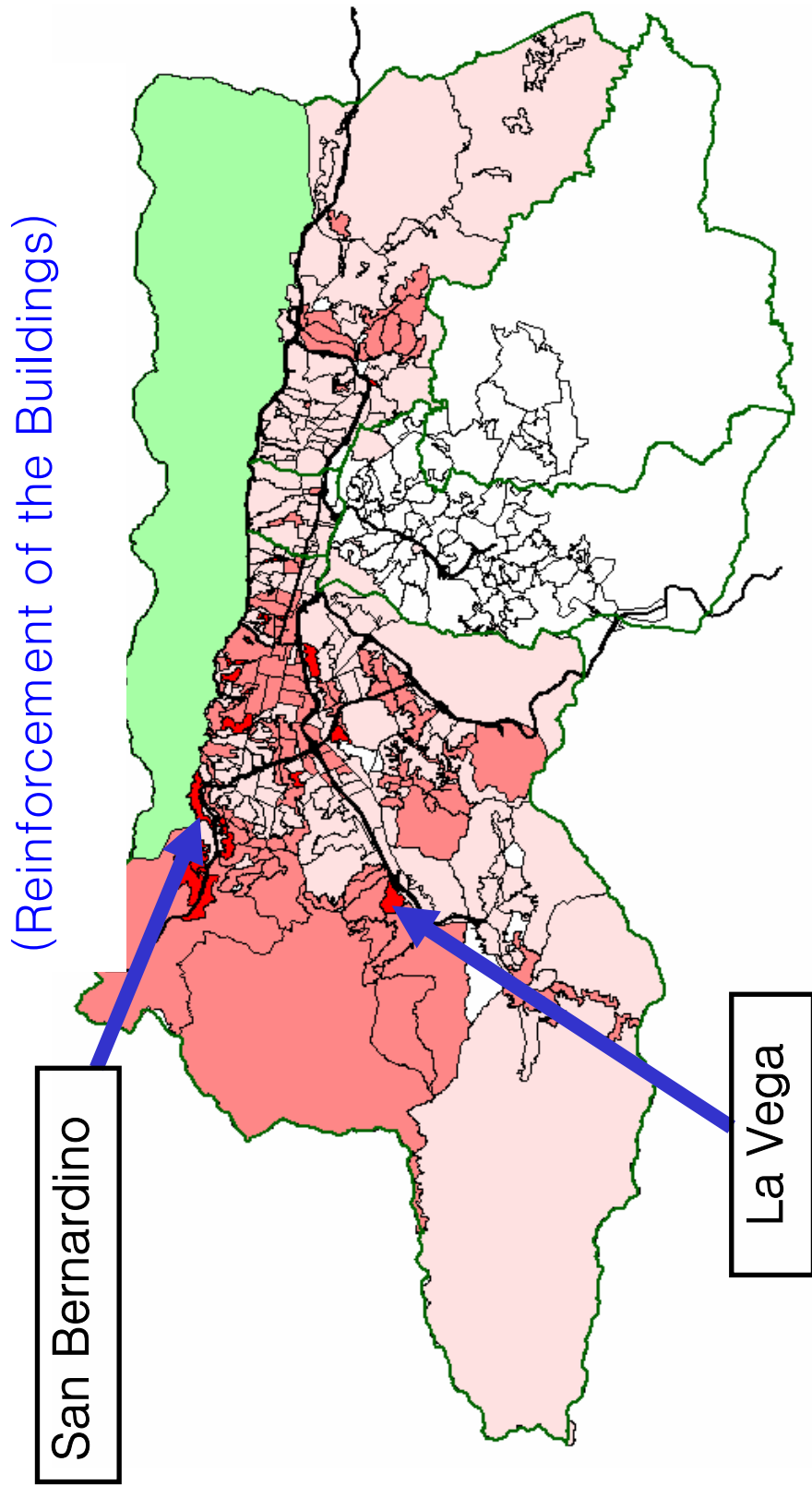


Figure S24-4.2.2 Selected Communities for Reinforcement of the Buildings

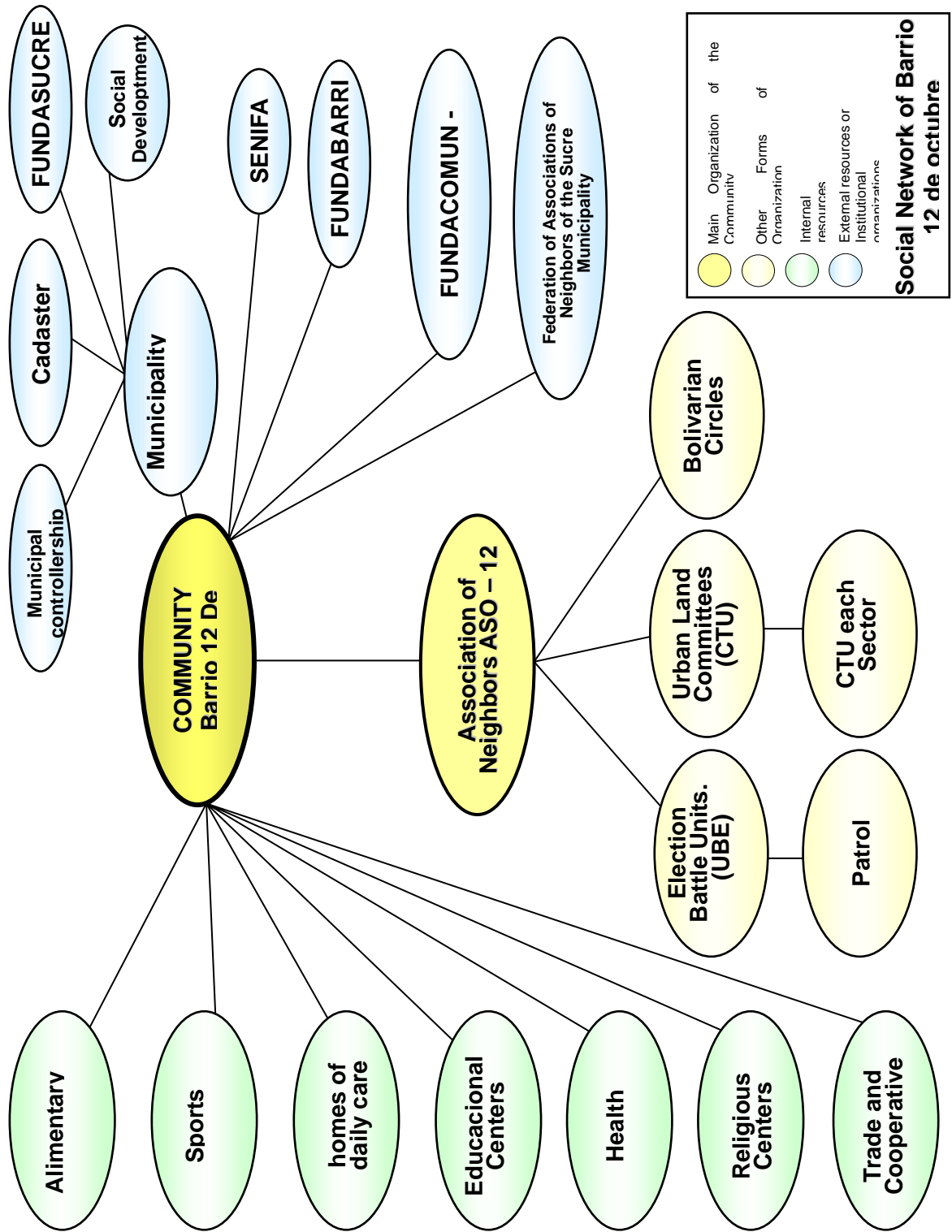
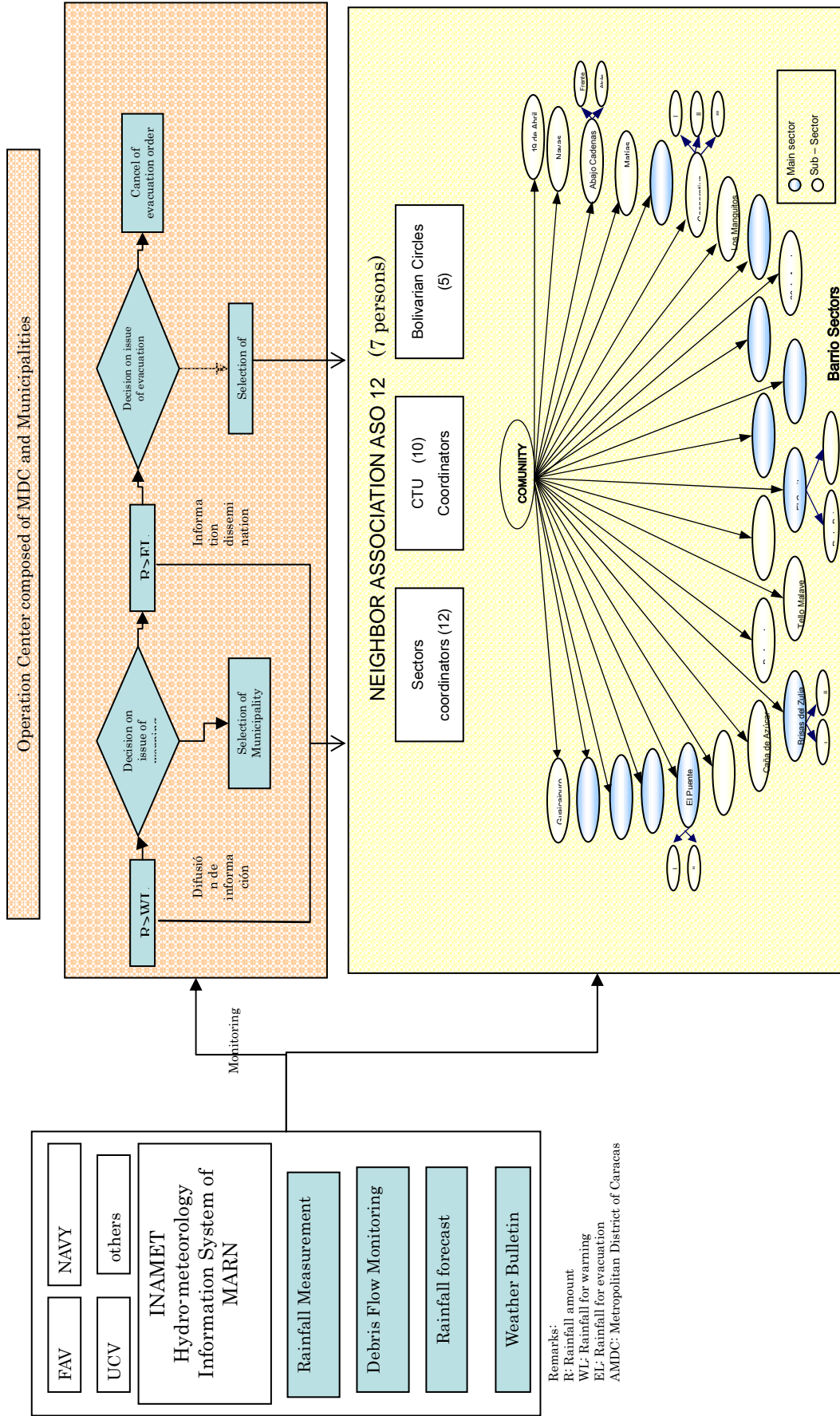


Figure S24-4.3.1 Social Network in 12 de Octubre

**Level-2: Preparedness Period until Warning and Evacuation**



**Figure S24-4.3.2**

**Proposal of Modification of Early Warning System in Preparedness Period 12 de Octubre**

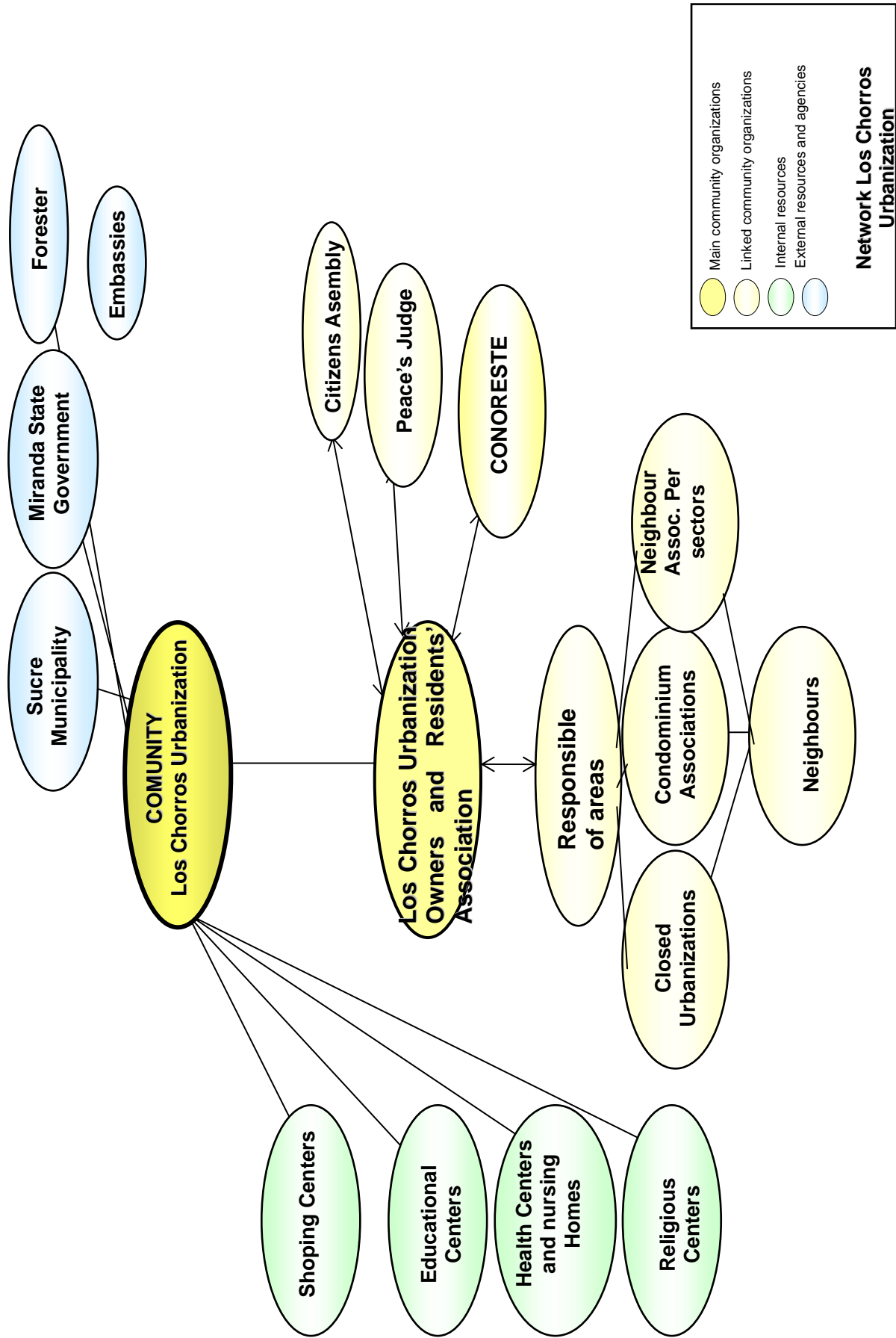
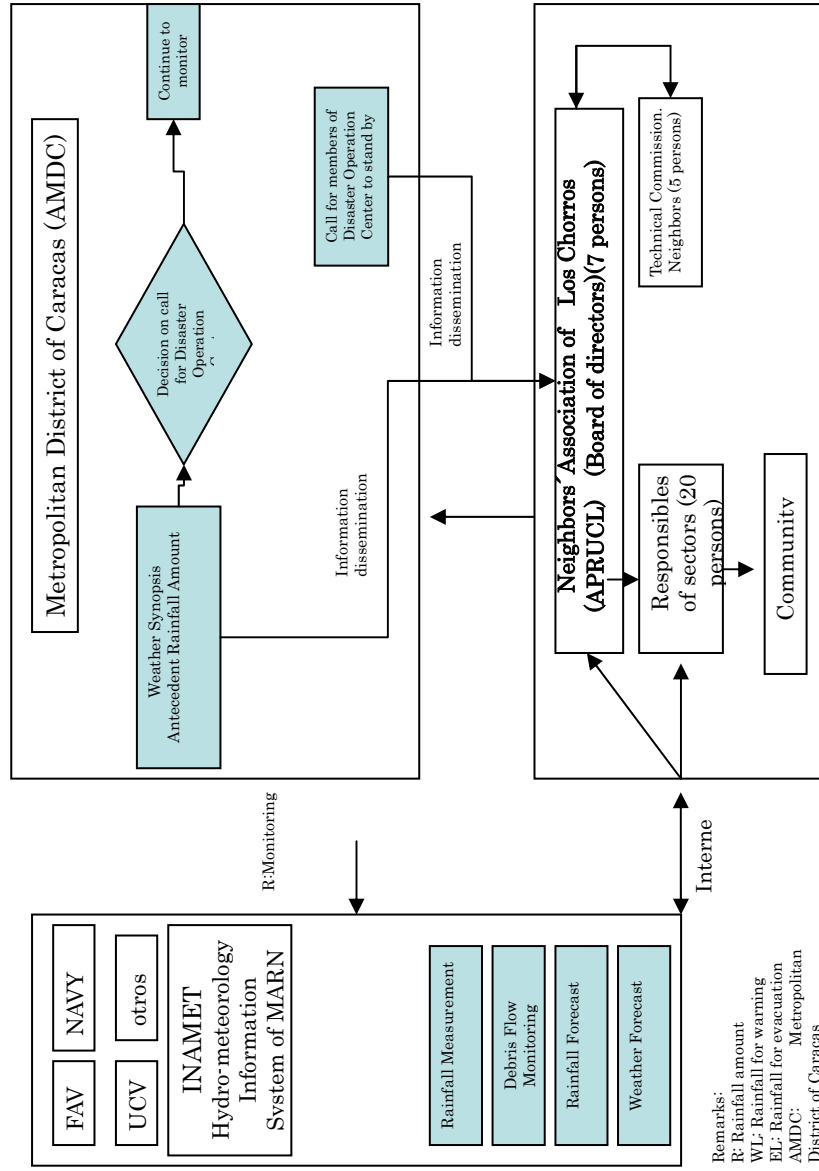


Figure S24-4 4.1 Social Network in Los Chorros

**Level-1: Normal time till Preparedness**



**Figure S24-4.3.2 Proposal of Modification of Early Warning System in Preparedness Period Los Chorros**

### Level-2: Preparedness Period until Warning and Evacuation

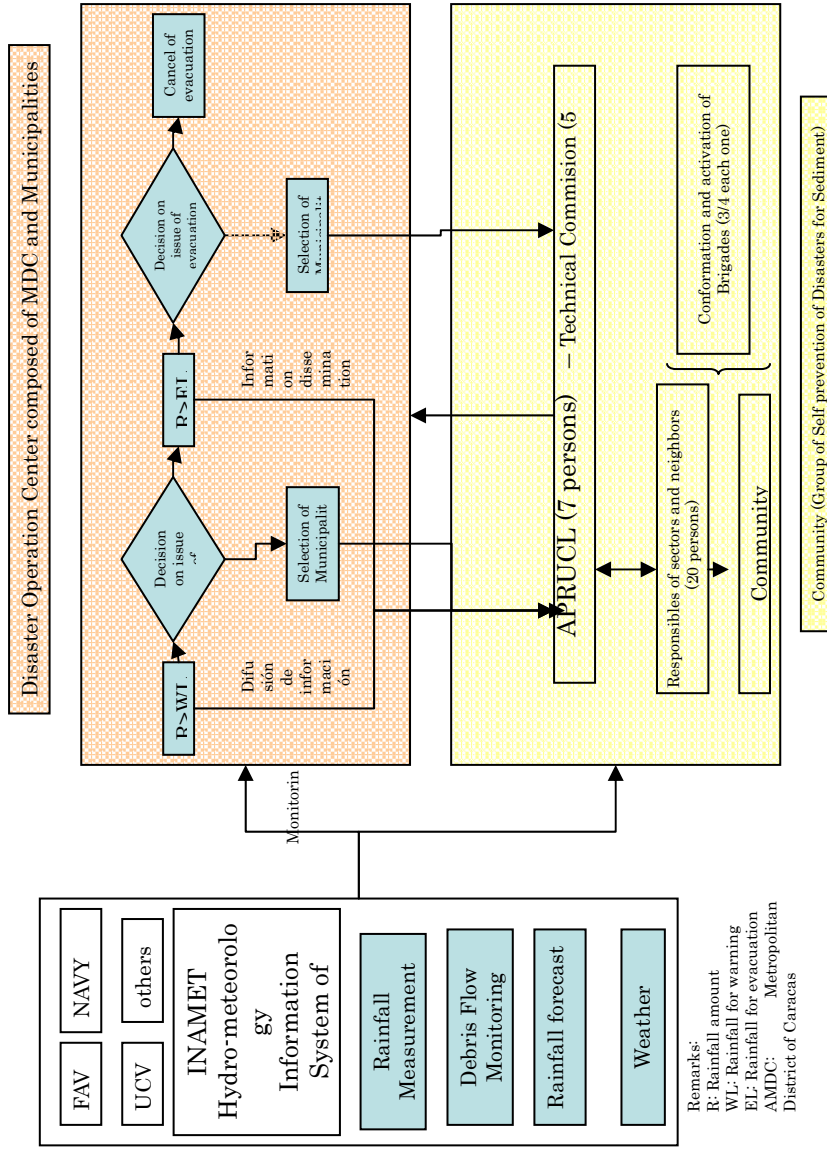


Figure S24-4.4.3 Proposal of Modification of Early Warning System in Preparedness Period Los Chorrros

## CHAPTER 5. CONCLUSION OF THE SOCIAL SURVEYS

The technical approach to disaster prevention has served mainly to disguise the root causes behind much of the vulnerability of a particular society to natural phenomena such as earthquake or devastating rain. The approach only focuses on technical analysis or offers trial ways of developing high tech techniques that have easily failed to reach efficient disaster prevention for human lives. Therefore, JICA Study worked to integrate social surveys with three major technical components. As already described, the first survey, social vulnerability survey, succeeded in identifying the enormously varied range of vulnerabilities of Caracas and attempted to clarify them by category. Holistic interpretations of root causes of vulnerability become basic concepts for workable planning of disaster prevention of Caracas as well as important sources analyzed as heterogeneous characteristics of various communities by ethnographic approach in the survey that had not been applied before. In addition, making a vulnerability map based on key indexes contributed to visually understanding the dynamics and diverse communities in Caracas.

The second social survey, a case study of successful communities of risk management enabled identifying key elements such as community capacity in targeted communities and also ascertained the process of change from existing vulnerabilities to a more preferable capacity of disaster management in community.

As the third study, pilot study of community-based disaster management applied three remedies: early warning system, reinforcement of risky buildings, and relocation. It established strategies for the implementation regarding each topic in terms of community and institutions in participatory way, and produced a manual for the community on disaster management (Reference, Data Book). Through involvement of the pilot study, targeted communities were empowered toward autonomous disaster management, expanding with some governmental agencies support of the intermediate group. In all, all process of the social surveys set efficient methodologies to strength communities for disaster management, which key elements for civil protection and related agencies to work with the community.

To sum up, the indispensable factors for diffusion of community-based disaster management in Caracas are: 1) existence of functioning community organization, 2) role of nationhood association, 3) leader with trust and skills, and communication and negotiation skills, and 4) Intermediate group which bridges community and government. The social surveys contributed as follows: 1) to provide vulnerability information reflecting human society and action, 2) to develop community empowerment for disaster management, and 3) to explore dissemination methods including education and training for the community for disaster preparedness and mitigation.

❑ Making Evacuation Routes Map in the Participatory Workshop



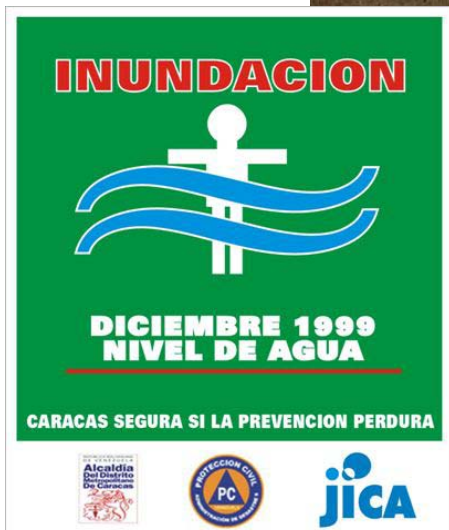
❑ JICA Study Team T-Shirts With the Slogan



❑ Slogan of the JICA Study Team Selected out of 135 Applicants

*Carcas Segura...  
Si, La Prevencion  
Perdura*

❑ Notice Board of High Water Level in 12 de Octubre Community





**S25**

**RESCUE OPERATIONS / MEDICAL SERVICE**

*“Better early alert than reconstruction later”*

*Jeymi Sivoli Blanco*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S25

RESCUE OPERATIONS / MEDICAL SERVICE

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## **S25 RESCUE OPERATIONS / MEDICAL SERVICE**

### **CHAPTER 1. OVERVIEW**

#### **1.1 Basic Country Profile**

In the last decade, living conditions in Venezuela were affected by different factors as the deepening of poverty and the increasing use of informal social and legal structures among others, with a significant increase of crime rate, educative ratio deterioration, and health services performance worsening. Some of the factors that lead to the poor performance of health assistance included the restricted capacity of governing and regulation from the State, and disintegration and incoherence at the financing, insurance and health service provision level. Moreover, the health system does not count on defined institutional re-engineering process, whether it be adequate or transparent monitoring, or accountability mechanisms among the different health levels.<sup>1</sup> is the main noteworthy point is that the health system has deficiencies to meet the needs of population; hence, whenever a disaster occurs, the system will be more weakened to face complex scenarios added to old needs.

#### **1.2 General Overview of the Response Mechanisms and the Health Sector**

In order to measure an emergency impact and provide an adequate response, 4 levels were formulated in terms of resources as follows:

- (1) Some resources locally available.
- (2) All the local resources.
- (3) Resources of superior administrative levels.
- (4) Resources at the national level.

At each of these levels, in accordance to the Disasters Administration and Civil Protection National Organization Law, there are three categories of responses to face to an emergency. The first is provided by the police and firefighters corps as organisations of primary attendance. The organisations of secondary attendance include all the public or private institutions that because of their degree of specialization and/or resources are requested to collaborate. And finally, there are the organisations of support that can provide information and resources to the two former instances, to jointly manage the emergency.<sup>2</sup>

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<sup>1</sup> Organización Panamericana de la Salud. Perfil del Sistema de Servicio de Salud de la República Bolivariana de Venezuela. Segunda Edición Mayo 2001.

<sup>2</sup> Gaceta Oficial. Ley de la Organización Nacional de Protección Civil y Administración de Desastres. Noviembre 2001.

The police are organized at the state, the main Mayor's office and the municipal levels. The Main Mayor's Office is composed by the municipalities of Libertador, Sucre, Chacao, Baruta and El Hatillo and has metropolitan police capable of action in all these districts. In addition, each of these municipalities has also its own police corps. Finally, except Libertador, the rest of municipalities of the Main Mayor's Office belong to the State of Miranda which has its state police. Neither the roles nor the responsibilities that they would have in an emergency are clearly stipulated.

When the Main Mayor's Office was created in 1999, it was decided to form a metropolitan firefighters corps which covers all the composing municipalities. Despite the growth and expansion of Caracas, the growth in number both of stations and firefighters have not kept pace. There are 21 stations that are concentrated in the Western part of the city, lodging 2,300 firefighters.

When an emergency surpasses the capacity of the organisations of primary attendance, other organisations of secondary attendance will join (Red Cross, NGO's, groups of volunteers). And when this second line is surpassed, additional organisations of support are activated (mainly Ministry of Health and Social Development – MSDS [initials in Spanish] and the Army). The responsibility of metropolitan civil protection is to obtain and provide support of medicines, materials and equipments supplies required by the organizations of primary and secondary attention.<sup>3</sup>

The Civil Protection and Disasters Management system has a national, state and municipal level. This system coordinates the work of different public organisations in relation to civil protection issues. One of these public organisations is MSDS which has a specific stipulated mission related to the health aspects of catastrophes. Currently, the national office of Civil Protection (CP) is revising the legal framework and the organization in accordance with this health mission for planning formulation.

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<sup>3</sup> Ibid

## CHAPTER 2. PRE-HOSPITAL ACTIVITIES

### 2.1 Related Agencies

There are four main actors for the pre-hospital activities: Firefighters, Civil Protection, Groups of Volunteers and Community. As already mentioned, concerning the community, relatives and neighbors will provide immediately help when facing a disaster. However, Table S25-2.1.1 shows the skills recognized by each one. The darker spaces indicate strength and the lighter spaces indicate weakness.

The capacity of response of the Metropolitan CP is considered here since they are equipped for pre-hospital activities, knowing that also xxx has a coordination role among all these actors.

The fire brigade has a military-type organization structure, which guarantees a chain of command based on preparation and training with a fluid information system that enables planning to face disasters. Concerning its resources, this brigade has 25 rescue units and 40 fire trucks to cover the needs for the next 5 years. As for firemen, the international average is 0.8-1 fireman/1,000 inhabitants; thus, they must have 5,000 firemen (now there are 2,300). Currently, according to the Fire Department, approximately 30% of the firefighters live outside Caracas. This means that in case of a disaster and if they are not in service, some time will pass until they arrive, which also will depend on the good condition of the roads to Caracas. As for the stations, according to the needs in Caracas, 30 stations are calculated as needed for the next 5 years (now there are 21).

In relation to ambulances, there is a deficit that is intended to be solved with the unification of the service among fire department, public hospitals and CP. Since the ADMC is partially in charge (central government is covering some liabilities) of the administration of most of the public hospitals, 21 ambulances are serving them. Currently, economic aid from Spain was received as equipment including ambulances.

In many cases, there are doctors working in the ambulances or as members of the pre-hospital team. This is an advantage, especially when it is difficult to have access to the emergency department of the hospital or when it is possible to make an advanced triage. Thus, once in the hospital, patients can be admitted to the department where they will receive the definite treatment, thus avoiding the emergency room that could be congested in the event of a disaster.

The Civil Protection Direction work is based on the work of the old Civil Defense at national, state and municipal levels. In each level of this institution, its officers have not had the chance to develop their careers so that many of the positions are covered by professionals that are “providing” their skills. This is a weakness of the organization due to the high rotation rate of the personnel, thus



preventing their preparation and training with long term plans. Also, the community has not yet clearly identified the functions of the new Civil Protection Direction.

The degree of organization must be highlighted inside the groups of volunteers (approximately 90), which are registered at the Metropolitan CP office. They are being organized with commissions for training (where they train in theory and practice on new volunteers), planning and operations, register and control, legal aspects, communications, among others. The quality of the provided training is high and depends on the Metropolitan CP, training personnel of foreign and national institutions. Even though the training activities help to obtain resources, these are insufficient to maintain appropriate search and rescue equipment.

There is no certification and re-certification process for all the people performing pre-hospital activities. For this purpose, it is first necessary to standardize contents and establish methodologies to be used to transfer skills. Then the organization in charge of certification and re-certification must be identified; this organization must have better qualifications than those to be evaluated by it. The CP must accomplish this function in the corresponding area, with the possibility of delegating this function to a committee formed by authorities qualified in the areas to be certified.

The immediate support of the community to help the victims in the event of disasters could be more efficient and effective if the lighter spaces of the Table S25-2.1.1 can be filled in by transferring the skills of the more qualified actors. Although in the pre-hospital activities there are more actors than those included in Table S25-2.1.1, the Table is useful to identify where the efforts and skill transfer must be directed.

## **2.2 Existing Plans**

### **2.2.1 Civil Protection**

The responsibility of CP is to obtain and provide support of medicines, materials and equipment supplies required by the organizations of primary and secondary attention in each level of the response (national, state or municipal) according to the impact requirements of an emergency.<sup>4</sup>

CP has to organize the response in each level and instance. However, at present, from the national level to the municipal level, there seem to be no plans as official documents. Some reasons are the lack of budget and personnel in charge.

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<sup>4</sup> Op cit. Gaceta Oficial

### **2. 2. 2. Ministry of Health and Social Development**

The Population Health Office includes the Emergencies and Disasters Office that recently presented an emergency plan (Figure S25-2.2.1).

In Caracas, after the decentralization process, most of the public hospitals are being administered by the Mayor's office of ADMC. MSDS has the leading role but ADMC has an executive role. Adding these aspects with the political differences between them, the plan of the Emergencies and Disasters Office is considering a response only with the medical institutions still under their administration or the ones belonging to the national government programs (Barrio Adentro, Popular Doctors' Offices, Popular Clinics), without considering the main public hospitals administered by ADMC.

### **2. 2. 3. Firefighters**

Firefighters perform official rescue operation and first aid to injured people. Another task is to provide transportation to the injured people to get to the appropriate medical center. This is an executive organisation that has to be under the coordination of CP in case of disasters.

### **2. 2. 4. Police**

At the municipal level, the police are in charge of the public order and traffic control. This is another executive organisation that has to be under the coordination of CP in case of disasters.

### **2. 2. 5. Municipality**

After the decentralization process, at the municipal level, each municipality in each sector (health, education, CP) has to have study plans, planning programs and coordination of public and private resources, as well as the execution of necessary actions to prevent, reduce and attend to emergencies and damages coming from a disasters of natural, social and technological origin, and to provide the subsequent aid and assistance to the affected population and environment.

### **2. 2. 6. Community**

When facing an emergency or big disaster, the members of the community are the first persons who take actions to support and help the victims.<sup>5</sup> The authorities involved in the Civil Protection and Disaster Management Systems are aware of this situation, thus showing that there is a change in relation to the deeply rooted idea that the State must take charge of the situation.

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<sup>5</sup> RANGEL, Angel. Crónicas de Desastres - Terremoto de Cariaco (Disasters Chronicle – Cariaco Earthquake), Venezuela. PAHO-OPS, 1999, 57 p.

### **2.3 Coordination at the Pre-Hospital Level**

Among the technical units of the different leading institutions at the pre-hospital level (such as volunteers groups, firefighters, police, the MSDS, CP, Ministry of Infrastructure, Ministry of Defense, international organisms, NGO's, Red Cross, the Army, and others), there is no effective participation or joint coordination for prevention, mitigation, and response. Although there is some sort of relationship, it is isolated and it does not include a regular program of activities coordination, or coordination is done after the adverse situation has occurred. This situation will delay an effective response at the pre-hospital level, where a quick response and reaction are needed.

There are groups of volunteers specialized in searching and rescue operations that are also trained to offer first aid and basic vital support. It must be emphasized that approximately 90 groups of volunteers are registered in the Metropolitan Civil Protection office. These groups have various commissions: training (to train new volunteers and teach them theoretical and practical aspects), planning and operations, registration and control; legal aspects; communications, among others. The training they offer is really good and has the support of the Metropolitan CP. They have trained personnel from foreign and national institutions. At the metropolitan level, the groups of volunteers have identified the leadership of the Mayor's Office through the CP of the metropolitan area in order to lead the institutionalization process of these groups thus benefiting their updating, equipping and the creation of strategic alliances so that private companies can collaborate with their activities. All these activities can and should be included in a collection of procedures that enable better coordination and communication among the groups of volunteers and CP.

Other organizations dedicated to this task, mainly from the private sector, set up mechanisms of direct cooperation with bilateral and multilateral organisms. One example was the National Meeting of Experts in Preparedness and Prevention of Disasters (May, 2003), organized by Venezuelan Red Cross, Spanish Red Cross, Social Support Service – SOCSAL [abbreviation in Spanish], National CP, the Latin American Economic System, the Humanitarian Aid Agency of the European Community, among others.

### **2.4 Disaster Scenario and Assessment**

It is assumed that an earthquake will occur in the surroundings of Caracas with similar characteristics to the one that occurred in 1967. In that event, 245 people died and 2,000 were injured from a total of approximately 1.5 million inhabitants. With the present conditions in Libertador, Chacao and Sucre areas, with 314,606 buildings and 2,740,381 inhabitants (see Figure S25-2.4.2), there would be 10,020 damaged buildings (see Figure S25-2.4.3), 603 deaths (see Figure S25-2.4.4) and 4,510 injured people (see Figure S25-2.4.5) based on the engineering analysis of this study (see Table S25-2.4.2).

The number of firemen is lower than optimal (2,300/5,000) and it must be noted that 30% of them live outside Caracas. In the event of a disaster, where the vital communication lines are damaged, the number of victims will be greater so that more firemen will be required, but they will take more time to arrive. CP coordination is really important because the participation of many other actors will be required, such as the Red Cross, the groups of volunteers, NGOs, etc.

Being conscious of these preliminary data of injured and dead people, the firefighters and the police must be mobilized mainly to the parroquias of Antimano, Sucre, La Pastora, El Recreo, and El Valle (see Figure S25-2.4.4 and S25-2.4.5). It is evident that the capacity of firefighters would be compromised, so it will be necessary to attain the III level of impact where not only the cooperation of CP is required, but also of the volunteer groups specialized in search and rescue, the Red Cross, etc.

Another variable to be considered is the mobilization capacity inside the city where many roads are narrow, with bridges susceptible to collapse, and where the buildings will suffer damages and block traffic, mainly in Antimano, Sucre, and Petare (see Figure S25-2.4.3). In normal situations, traffic jams are observed which would become worse in case of a general emergency. The fire stations are concentrated in the Western part of the city, and the accessibility to El Recreo, Chacao, Leoncio Martinez, and Petare would be hampered by the issues mentioned above, making difficult access to an estimated 900 injured persons in these areas (see Figure S25-2.4.5).

There is no community with the capacity to act as the base of the pre-hospital response. Neither are there the appropriate number of firemen to link this first phase with the hospital response, nor an organization of actors to face the disaster in a coordinated and integrated way.

ADMC through Metropolitan CP does not show its capacity to organize and manage the search and rescue activities. The firefighters and the approximately 90 volunteers groups have skills to provide search and rescue support, but are not effectively organized. Metropolitan CP does not have coordination and organization to include all the actors in the flowchart of response in case of disaster, in terms of their present condition and skills.

**Table S25-2.1.1 Capacities Matrix for Searching and Rescue**

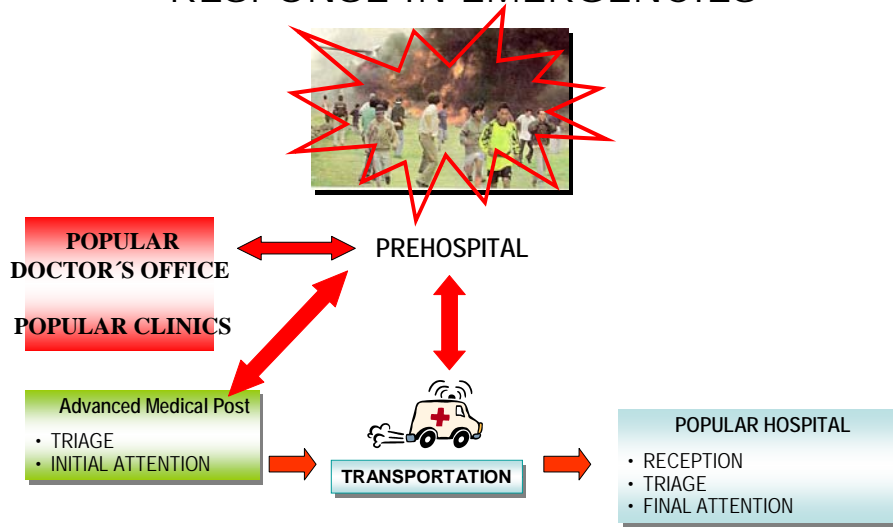
	Firemen	CP	Volunteers Groups	Community
Organization	Black	Dark Gray	Black	Light Gray
Preparation / Training	Black	Dark Gray	Black	Light Gray
Information	Black	Dark Gray	Black	Light Gray
Planning	Black	Dark Gray	Medium Gray	Light Gray
Budget	Black	Dark Gray	Medium Gray	Light Gray
Resources	Dark Gray	Dark Gray	Medium Gray	Light Gray
Communications	Black	Dark Gray	Black	Light Gray
Drills	Medium Gray	Medium Gray	Medium Gray	Light Gray

**Table S25-2.4.2 Damaged Buildings, Deaths and Injured People Assuming 1967 Earthquake in the Present Caracas.**<sup>6</sup>

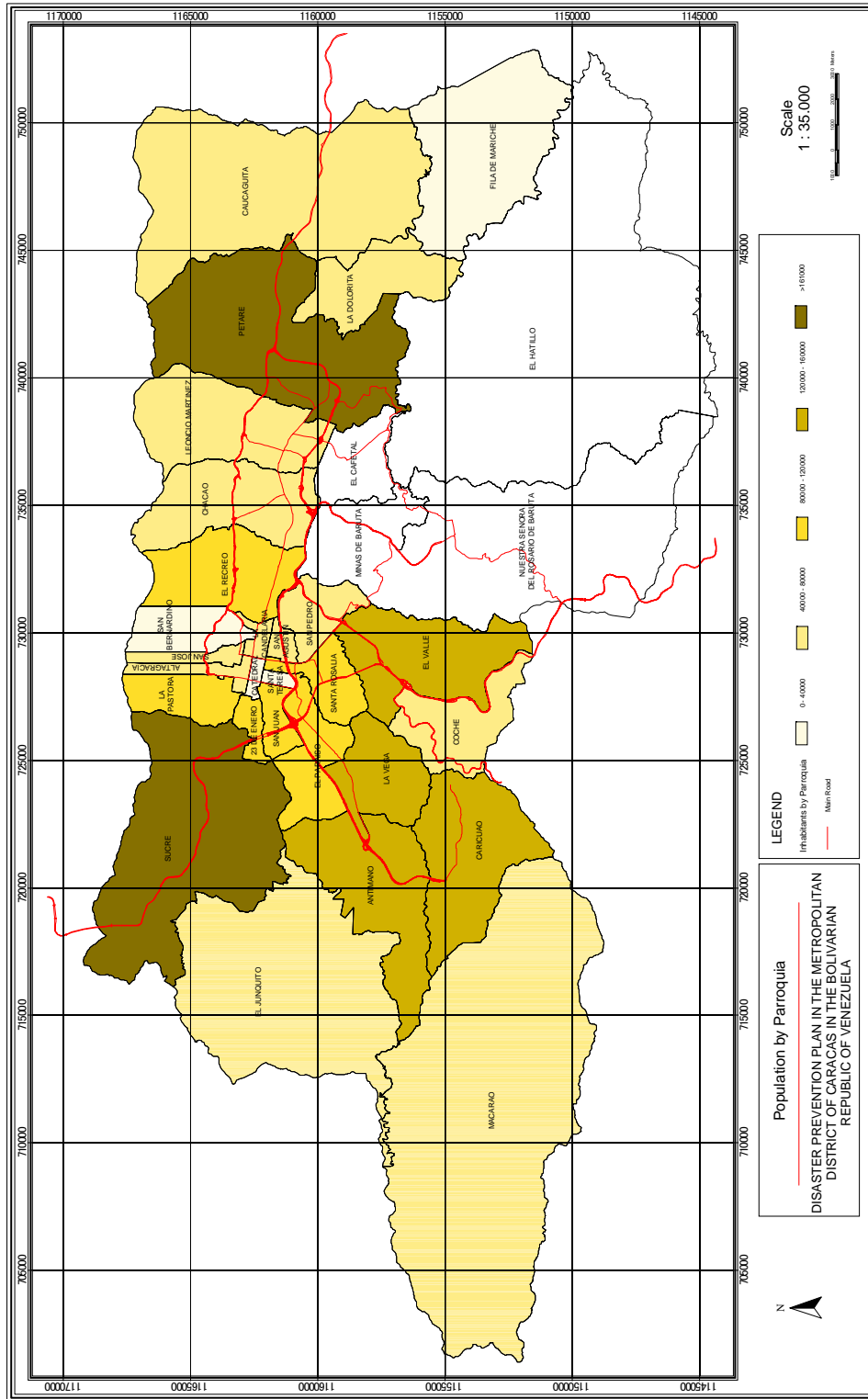
Municipality	PARROQUIA	# of Buildings	Damaged Buil.	% Building by parroquia	% Building in total	Population	Death	% Death by parroquia	% Death in total	Injured	% Injured by parroquia	% Injured in total
Liberator	23 DE ENERO	5,907	224	3.79	2.2	86,114	8	0.01	1.3	54	0.06	1.2
	ALTAGRACIA	2,066	68	3.29	0.7	44,101	10	0.02	1.7	77	0.18	1.7
	ANTIMANO	21,959	987	4.50	9.9	143,343	50	0.03	8.3	366	0.26	8.1
	CRUCIFIXO	11,174	242	2.16	2.4	160,560	9	0.01	1.5	71	0.04	1.6
	CATEDRAL	706	16	2.25	0.2	5,422	3	0.06	0.5	27	0.50	0.6
	COCHE	6,103	141	2.31	1.4	57,276	6	0.01	1.0	50	0.09	1.1
	EL JUNQUITO	10,384	347	3.34	3.5	42,658	14	0.03	2.3	108	0.25	2.4
	EL PAPAISO	9,617	316	3.29	3.2	111,354	14	0.01	2.3	111	0.10	2.5
	EL RECREO	9,588	368	3.84	3.7	107,935	40	0.04	6.6	305	0.28	6.8
	EL VALLE	17,872	701	3.92	7.0	150,970	33	0.02	5.5	251	0.17	5.6
	LA CANDELARIA	1,901	56	2.95	0.6	60,019	10	0.02	1.7	78	0.13	1.7
	LA PASTORA	11,331	479	4.23	4.8	90,005	24	0.03	4.0	182	0.20	4.0
	LA VEGA	16,210	521	3.22	5.2	137,148	24	0.02	4.0	185	0.13	4.1
	MACARAO	8,852	218	2.46	2.2	48,479	8	0.02	1.3	54	0.11	1.2
	SAN AGUSTIN	4,636	224	4.83	2.2	45,840	12	0.03	2.0	95	0.21	2.1
	SAN BERNARDINO	2,586	117	4.53	1.2	26,973	9	0.03	1.5	73	0.27	1.6
	SAN JOSE	2,626	186	7.07	1.9	40,709	12	0.03	2.0	89	0.22	2.0
	SAN JUAN	11,610	528	4.55	5.3	104,471	25	0.02	4.1	190	0.18	4.2
	SAN PEDRO	5,174	75	1.44	0.7	63,274	14	0.02	2.3	108	0.17	2.4
	SANTA ROSALIA	16,576	515	3.11	5.1	117,993	27	0.02	4.5	204	0.17	4.5
	SANTA TERESA	853	25	2.94	0.3	21,311	5	0.02	0.8	42	0.20	0.9
	SUCRE	54,448	2,330	4.28	23.3	395,139	158	0.04	26.2	1,137	0.29	25.2
	Sub-total	232,179	8,683	3.74	86.7	2,061,094	515	0.02	85.4	3,858	0.19	85.5
	Chacao	6,524	107	1.63	1.1	71,806	17	0.02	2.8	129	0.18	2.9
	CAUCAGUITA	7,533	93	1.24	0.9	55,939	3	0.01	0.5	16	0.03	0.4
	FILA DE MARIQUE	5,126	39	0.77	0.4	29,399	1	0.00	0.2	8	0.03	0.2
LA DOLORETA	9,657	122	1.26	1.2	66,625	5	0.01	0.8	37	0.06	0.8	
PETARE	46,821	874	1.87	8.7	393,900	47	0.01	7.8	351	0.09	7.8	
LEONCIO MARTINEZ	6,766	102	1.51	1.0	61,618	15	0.02	2.5	112	0.18	2.5	
Sub-total	75,903	1,230	1.62	12.3	607,481	71	0.01	11.8	523	0.09	11.6	
Sum	314,606	10,020	3.18	100.0	2,740,381	603	0.02	100.0	4,510	0.16	100.0	

<sup>6</sup> Numbers obtained in coordination with the engineering team members of the JICA study team.

# PHASES OF THE MEDICAL RESPONSE IN EMERGENCIES

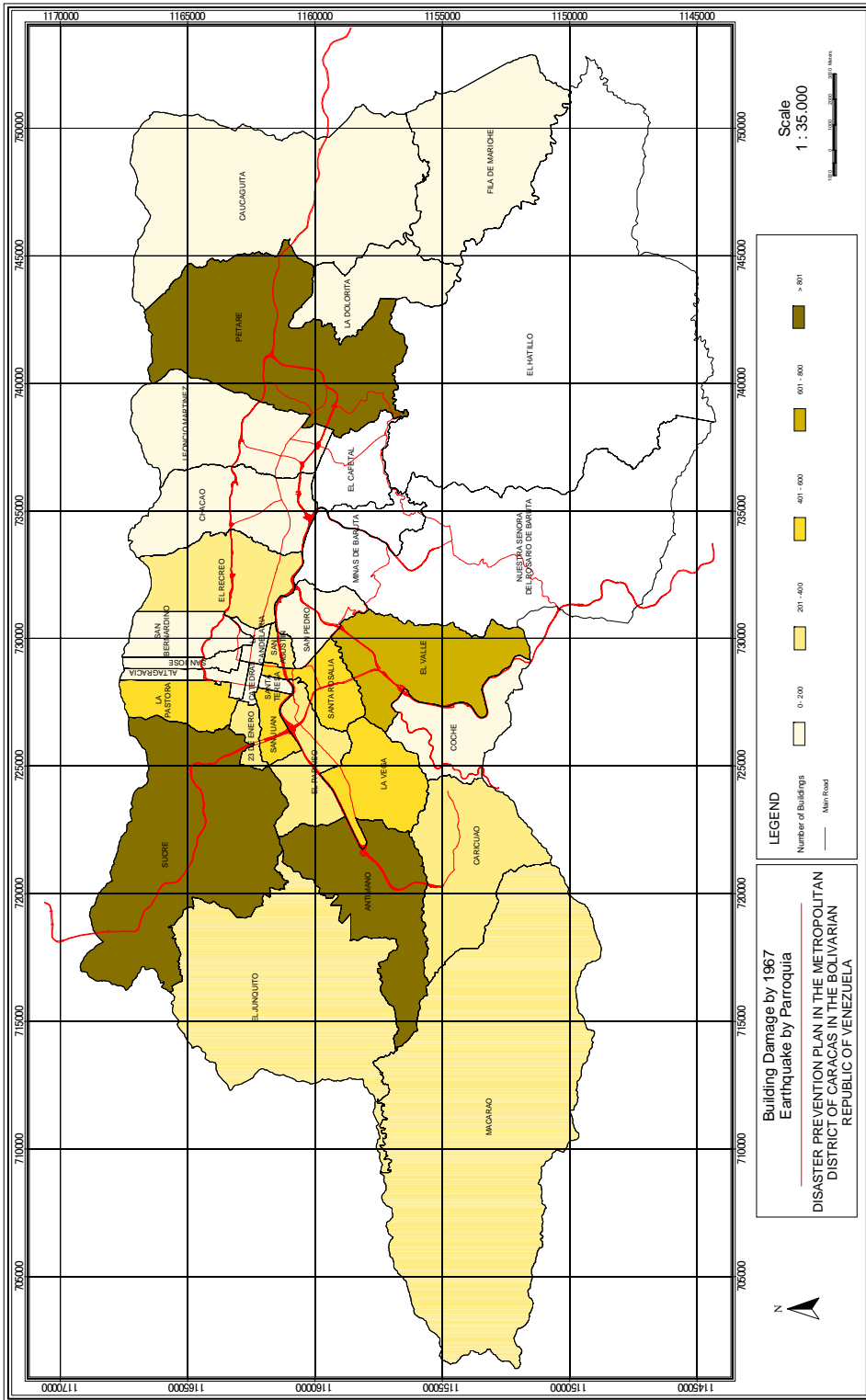


**Figure S25-2.2.1 Emergency Plan for Medical Response.**  
**Emergency and Disasters Department. MSDS**



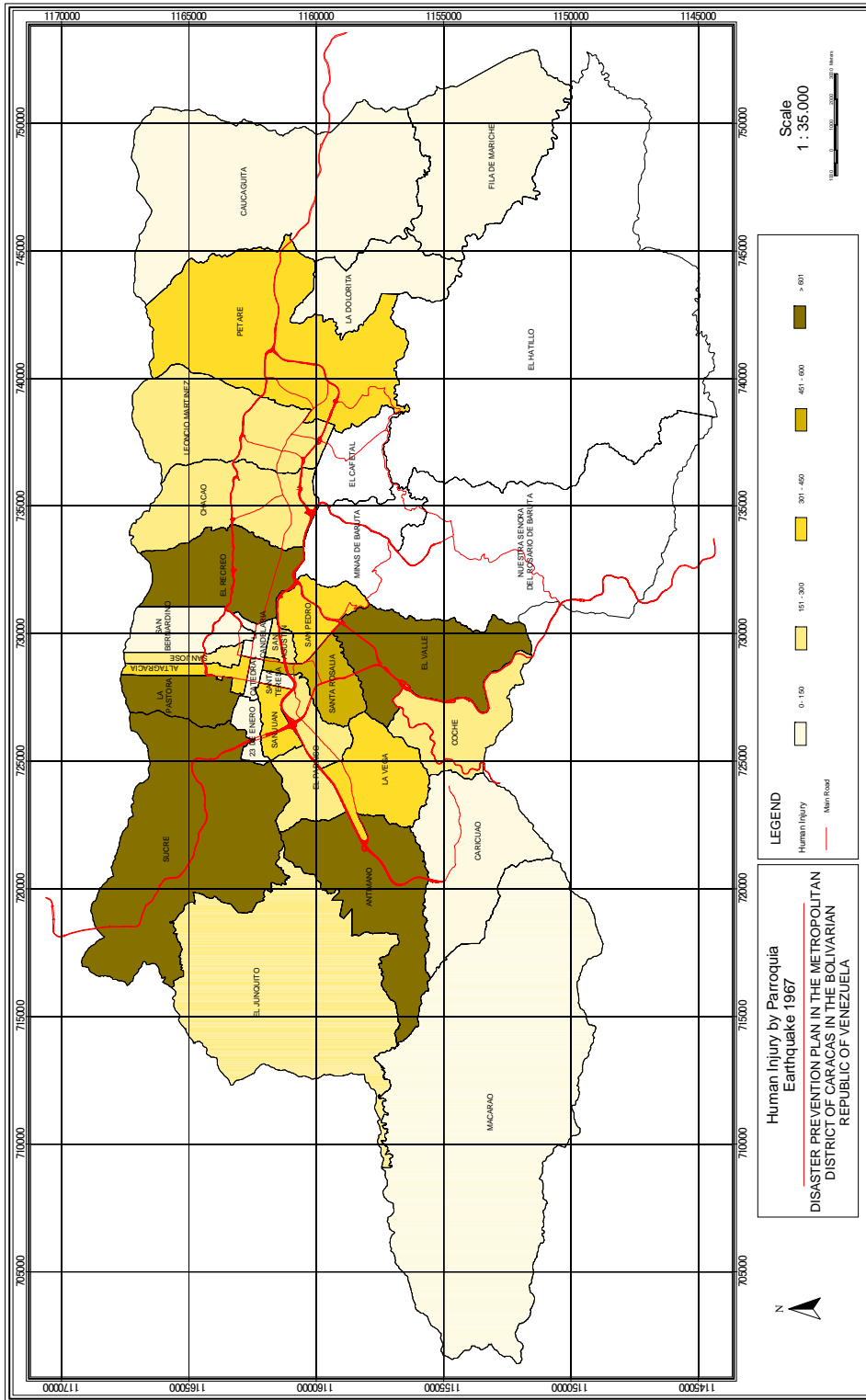
**Figure S25-2.4.2 Population by Parroquia**





**Figure S25-2.4.3 Building Damage by 1967 Earthquake by Parroquia**





**Figure S25-2.4.5 Human Injury by Parroquia Earthquake 1967**

## CHAPTER 3. HOSPITAL ACTIVITIES

### 3.1 Related Agencies

The Civil Protection and Disasters Management system has a national, state and municipal level. This system coordinates the work of different public organisations in relation to civil protection issues. One of these public organisations is MSDS which has a stipulated and specific mission related to the health aspects of catastrophes. Currently, the national office of CP is revising the legal framework and the organization in accordance with MSDS role for planning formulation.

Within the organisations of support there are some contrasts. The health sector is constituted by a private, a public, and a military subsector. The public subsector is formed by multiple institutions that operate not in an integrated, but in a disorganized way because of the decentralization process. MSDS is the ruling organisation of the health sector and has the responsibility of the formulation, design, evaluation, control and monitoring of the policies, programs and plans, and being the municipality level executive entity. At present, a technical committee of emergencies and disasters is identified that is working to elaborate the plan for emergencies and disasters of MSDS that will be used as guidelines in activities related with the risk management in this sector. On the other hand, in the military health department, due to the characteristics of its organization, contingency plans are demanded and are drilled in practice periodically. Table S25-3.1.3 shows an abstract of some aspects of the health sector.

The personnel that work at the hospitals do not know if a plan exists or not, and the motivation to use one is very low. Drills are not developed and they are neither trained nor organized for an adequate response.

Many hospitals were built with technical regulations currently superceded and others have been authorized in structures that initially were not designed for that use. Therefore, many of them do not have access ramps for evacuating the patients in litters or wheel chairs, assuming that elevators could not be used in some emergencies. In fact, much of the lands where hospitals were built were ceded for that purpose because of their low commercial value because they were located in high risk areas. Studies about the hospital infrastructure have been done, but the corrective measures frequently are not applied because of lack of budget.

In the military side, contingencies plan exists which are put into practice each time the personnel are billeted because of constant emergencies due to the current political situation that the country is going through. They have personnel, both administrative as well as assistance, trained in evacuation, fire, communication, etc. They have identified the zones for the triage of the evacuated people and areas where additional beds would be placed, separating the patients according to the gravity of the injury.

Access is further facilitated with the heliports and large peripheral zones which can be used in case of collapse of the infrastructure itself.

At the municipality level, there is an effort in Chacao. “Salud Chacao” is a program equipped with 4 ambulances and 2 vehicles to provide medical service to the neighborhoods and to attend any emergency in this area. They have 4 medical centers and one emergency room. In case of catastrophic events, the Civil and Environment Protection Institute of Chacao will activate the Risk Management Bureau in which are participating “Salud Chacao”, the fire department, and the police. They have an agreement with private clinics to provide services in case of emergency with 10 beds, including medical service for 48 hours stay free of charge.

### **3.2 Existing Plans**

#### **3.2.1. Ministry of Health and Social Development**

The Hospitals Net Office is starting an inventory process for all the national public hospitals that they expect will be ready in two months. Table S25-3.2.4 shows that the requested information is not sufficient to elaborate a National Contingency Plan. There is a model from the Health Services Organization in the Event of Disaster (Pan American Health Organization) that could provide more information. This inventory effort has to be extended to the private sector that has most of its infrastructure in the San Bernardino area which has a high seismic vulnerability.

As a secondary result of MSDS inventory effort, they plan to determine the number of medical doctors working in each medical institution. A large proportion of them are working both in an ambulatory and in a hospital for example, and the number will be inflated since the same doctor is counted twice. A cross reference information process will be necessary.

#### **3.2.2. Hospitals**

At present there are economic difficulties and the hospitals do not escape this crisis. When this occurs, generally the resources assigned to risk management are suspended. Many hospitals counted in the last decade, in a disaster plan, are not activated anymore because of the lack of resources or because the new authorities in the hospitals know nothing about what has been done before.

The hospitals only have emergency plans within their operating structure; that is, when an unexpected event occurs and the flow of people who require medical attention suddenly increases, the guard teams and spaces for adequate attention are activated. There is no consideration of events in which the hospital infrastructure itself is affected.

In May 2004, MSDS gave instructions to ADMC through a guideline to establish hospital emergency committees (Table S25-3.2.5). The guideline includes some actions to be developed as part of a contingency plan and finally recommends the elaboration for each hospital of external and internal emergency plans, and the performing of drills to evaluate them. There are no deadlines and no plans at MSDS to follow up and evaluate the process.

About mental health, there are insufficient specialized mental health resources to handle the routine demands. In disaster situations, their inadequacy becomes even more apparent. The primary care level is responsible for identifying and handling victims that show evidence of emotional problems.<sup>7</sup> There are no plans regarding mental health in disaster situations.

### **3.3 Coordination at the Hospital Level**

Among the technical units of the different leading institutions at the hospital level (such as MSDS, Ministry of Infrastructure, Ministry of Defense, international organisms, NGO's, Red Cross, the Army, utility companies, and others), there is no effective participation or joint coordination for prevention, mitigation, and response. Although there is some sort of relationship, it is isolated and it does not include a regular program of activities coordination, or coordination is done after the adverse situation has occurred. This situation delays an effective response.

During the last decade, the Planning Administration for Disasters Cases of the Metropolitan Firefighters Corps of Caracas worked with the hospitals of MSDS of Caracas, to develop risk managing plans of which approximately 45% were implemented. Currently, the new authorities of the hospitals are not informed about the existence of those plans, due to the constant rotation of the governing personnel because of political circumstances.

The hospitals are not organized as a network for facing situations of disaster. At present, if a serious event occurs, hospitals are only in the position to coordinate at the time of the disaster, without having an action plan and without knowing the real capacity of the system. Even though there are periodic meetings of the hospital authorities, at these meetings this topic is not discussed. At most of them, they do not have disaster plans, and the supplies for emergencies are not considered.

International organizations frequently work directly with the hospitals, for example proposing outlines but without the knowledge of the superior level about the developed plans or works or if they are in accordance with the proper sector plan in case there is one. Although there is no regulation regarding technical cooperation, official channels are not respected.

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<sup>7</sup> Disasters Preparedness and Mitigation - Issue No. 36 - October, 1988 (Pan American Health Organization (PAHO))

### 3.4 Disaster Scenario and Assessment

The same scenario as for the pre-hospital level is considered. It is assumed that an earthquake will occur in the surroundings of Caracas with similar characteristics to the one that occurred in 1967. With the present conditions in Libertador, Chacao and Sucre areas, with 314,606 buildings and 2,740,381 inhabitants (see Figure S25-3.4.2), there would be 10,020 damaged buildings (see Figure S25-3.4.3), 603 deaths (see Figure S25-3.4.4) and 4,510 injured people (see Figure S25-3.4.5) based on the engineering analysis of this study (see Table S25-3.4.2).

After an earthquake, it is possible that people with small injuries, meaning those that do not require admittance in a hospital, exceed the number of people with major injuries at a 10:1 rate.<sup>8</sup> In Caracas, there are 8,876 beds<sup>9</sup> and the average occupation percentage is 53%,<sup>10</sup> which means that 4,170 beds would be available. The structural and non structural deficiencies in the hospitals must be considered and the fact that most of them are constructed over geological rifts, so that the real number of beds available would be lower than calculated.

In case of a disaster, all the hospitals and ambulatories have to be considered in the response including those from MSDS, Venezuelan Institute of Social Security – IVSS [abbreviation in Spanish], Ministry of Defense, Prevention and Social Assistance Institute for the Education Ministry personnel – IPASME [abbreviation in Spanish] and other organisations such as CANTV (the telephone company), Luz Eléctrica, and the Journalists Association (see Tables S25-3.4.6 and S25-3.4.7).<sup>11</sup> All those located in the Caracas Metropolitan District area could be considered, even though the study refers to three of its municipalities, because the health centers are not equitably distributed and the effects of an earthquake would not be limited to only one municipality but would affect them as a whole.

Figure S25-3.4.6 shows how the flow of people would be upon hospitals. It must be considered that most hospitals and ambulatories are concentrated in the municipality of Libertador (see Tables S25-3.4.6 and S25-3.4.7). The ambulatories can serve as triage and treatment centers for people with small injuries to avoid the saturation of hospital services.

Focusing the analysis only on Libertador, Chacao, and Sucre municipalities, there are three hospitals located in Sucre and Libertador (Chacao does not have hospitals). In Sucre the number of persons who will need a bed exceed the hospital capacity there. And in Libertador, where the largest number of injured people will come from, there are two hospitals that could cover the demand (see Tables S25-3.4.8 and S25-3.4.9).

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<sup>8</sup> SEAMAN, John: Epidemiología de Desastres Naturales (Natural Disasters Epidemiology) (1984, p.161). Panamerican Health Organization.

<sup>9</sup> [www.msdm.gov.ve](http://www.msdm.gov.ve)

<sup>10</sup> Ibid

<sup>11</sup> Ibid

The private sector was not considered, and they are located mainly in the San Bernardino area which has a high seismic risk. The current data available of this sector is small, but any resources must be considered as support in case of events with impacts of III and IV levels.

There is no organized network between each hospital and the ambulatories (mainly in Libertador) where the triage would be made. The ambulatories do not know to which hospital the patients have to be transferred, based on the means of transportation and communication.

Although the number of beds and personnel would cover the emergency needs in terms of quantity (notice that this scenario is located in part of Caracas), it is not known if that service would be provided under proper conditions (in term of quality) because there are external factors that would interfere with the response capacity. In addition, there is no community with the capacity to function as the base of the pre-hospital response.

The number of physicians is approximately 54,000 in the whole Venezuelan territory, and 14,676 nurses.<sup>12</sup> Quantity of medical personnel in the Caracas area is not the only consideration; it is also necessary to assure a good communication network to achieve allocation of the necessary personnel at the appropriate place as soon as possible.

There are many deficiencies in the health sector triggered by the economic crisis. If the requirements produced by a disaster were added, there would be no capacity for an adequate response. Considering an earthquake scenario, assuming at least 1967 scenario, it is necessary to organize a certain number of ambulatories as the first line of medical response and also hospitals to cover the requirements where there would be 4,510 injured persons, and from this number, 451 persons would need to be hospitalized. At present, there is no plan to prepare the medical response in case of disaster in Caracas.

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<sup>12</sup> La Salud en las Américas, edición de 1998, Volumen II, page 584




**Table S25-3.1.3 MSDS State of Advances in Disaster Management<sup>13</sup>**

<b>PROGRAM NAME</b>	<b>Transitory phase. Coordination between the different MSDS structures in an Emergency Committee.</b>
Full time staff (Numbers and specialties)	¿?
Operative budget US\$ thousands from public funds and international cooperation	¿?
Hierarchy position	Minister office
Disaster local offices (number and geographical influence)	Same structure like central level
<b>PREPAREDNESS</b>	
Sector Plan last revision	Pre Andean Strategic Social Plan
Provincial Plan last revision	In process
Hospitals with updated Disaster Plans, number and %	Not available
Hospitals with annual drills, numbers	Yes. Army hospitals
Hospitals with pre-hospital drills, number and %	Yes. Army hospitals, Venezuelan Red Cross hospitals, Vargas Hospital. Caracas.
Health teams for disaster response	MSDS, Civil Protection, Red Cross, Firefighters, Universities
Computer equipments availability	Yes. Developed and equipped by the Computation Department: OTIC
Internet Access	Yes. Different departments from the MSDS connected in network. MSDS web page: <a href="http://www.msds.gov.ve">http://www.msds.gov.ve</a> . E-mails availability at different hierarchy levels
Own telecommunication systems (type and quantity)	Yes. Hospitals network connected with the 171 emergency services. Portable systems in the administrative area.
Own vehicles	Pool of vehicles
<b>MITIGATION</b>	
Vulnerability diagnosis (number of hospitals)	Yes. Seven hospitals
Reinforcement (number of hospitals)	Yes. Two hospitals
Disaster building code	Yes. COVENIN code updated
Vulnerability studies in water suppliers	Yes. Three systems. Hydrologic Contingency Plan decree
Disaster inclusion in MSDS planning	Yes. Social Strategic Plan
<b>TRAINING</b>	
University career for specialists	Yes
University postgraduated programs (40 hours)	Yes. Central University of Venezuela, Los Andes University, Simon Bolívar University.
University pregraduated programs (40 hours)	Yes. Los Andes University, Central University of Venezuela, Andres Bello Catholic University
Training courses in mass casualties management (numbers of trained personnel)	Yes. Firefighters National College; Polytechnic Institute. Numbers unavailable.
Trained officials	Unavailable. Estimated in more than 200.

<sup>13</sup> Information from venezuelan PAHO office

Table S25-3.2.4 Registration from of Hospitals, MSDS



**MSDS**  
 INSTITUCION MEXICANA DE SALUD  
 MINISTERIO DE SALUD Y DESARROLLO SOCIAL  
 DIRECCION GENERAL DE SALUD PARA EL CIUDADANO  
 REGISTRO DE ESTABLECIMIENTOS DE SALUD  
 REGISTRO NACIONAL DE HOSPITALARIOS

FECHA DE LA SOLICITUD: DIA: \_\_\_\_\_ MES: \_\_\_\_\_ AÑO: \_\_\_\_\_

**CEDEULA DE REGISTRO DE ESTABLECIMIENTOS HOSPITALARIOS**

**I. DATOS GENERALES: (Para ser llenado por el Director del Hospital)**

NOMBRE DEL HOSPITAL:		CIUDAD:		MUNICIPIO:		ESTADO:	
ENTIDAD FEDERAL:		DIRECCION:		MUNICIPIO:		ESTADO:	
NUMERO TELEFONICO:		DIRECCION DE CORREO ELECTRONICO:		VOLVUE DE RADIO DE FRECUENCIA MODULADA:		DE DENOMINACION:	
ACTIVIDADES DOCENTES:		RESIDENCIA PROGRAMADA ASISTENCIAL:		SI:		OTRAS (ESPECIFIQUE):	
POSTGRADO MINYREGISTRADO:		NO:		SI:		OTRAS (ESPECIFIQUE):	
CLASIFICACION GENERAL:		TIPO I:		TIPO II:		TIPO III:	
TIPO I:		TIPO II:		TIPO III:		TIPO IV:	
DESCRIPCION ADMINISTRATIVA:		MDS:		MDS:		MDS:	
AREA DE TUBERNO (EN METROS CUADRADOS):		AREA DE CONSTRUCCION (EN METROS CUADRADOS):		AREA DE TUBERNO (EN METROS CUADRADOS):		AREA DE CONSTRUCCION (EN METROS CUADRADOS):	
REQUIER MODIFICACIONES ADICIONALES:		SI:		NO:		REQUIER MODIFICACIONES ADICIONALES:	
TIPO AREA PARA AMPLIACION:		SI:		NO:		TIPO AREA PARA AMPLIACION:	
ASIGNACION MANUAL PRESUPUESTARIA BS. MSDS:		SI:		NO:		ASIGNACION MANUAL PRESUPUESTARIA BS. MSDS:	
SEÑALA LA CLASIFICACION EN SU UNIDAD ADMINISTRATIVA:		SI:		NO:		SEÑALA LA CLASIFICACION EN SU UNIDAD ADMINISTRATIVA:	
PERSONAL MEDICO:		RESIDENTES:		CIRULANOS:		PERSONAL MEDICO:	
AMBULATORIOS:		RURALES:		URBANA:		AMBULATORIOS:	
HOSPITALES:		I:		II:		HOSPITALES:	
RECEPTORES OPCIONALES:		PSICHIATRICOS:		DERMATOLOGICOS:		RECEPTORES OPCIONALES:	
PSICHIATRICOS:		DERMATOLOGICOS:		PSICHIATRICOS:		DERMATOLOGICOS:	
MATERIANTES:		MATERIANTES:		MATERIANTES:		MATERIANTES:	
SERIANTES:		SERIANTES:		SERIANTES:		SERIANTES:	
MAT. INFANTIL:		MAT. INFANTIL:		MAT. INFANTIL:		MAT. INFANTIL:	
OTROS:		OTROS:		OTROS:		OTROS:	

**Table S25-3.2.5 MSDS Proposal for the Health System in the Contingency**

REPUBLICA BOLIVARIANA DE VENEZUELA

**MSDS**  
MINISTERIO DE SALUD Y DESARROLLO SOCIAL

Dirección General de Salud Poblacional  
RED NACIONAL DE HOSPITALIZACIÓN

Nº G.H. -----

**ACCIONES A DESARROLLAR EN EL SISTEMA DE SALUD EN PLAN DE CONTINGENCIA.**

1. Conformar el Comité de Reducción de Vulnerabilidad en establecimientos de salud en casos de Emergencias y Desastres.
2. Identificación del Directorio de la Corporación, Fundación, Dirección Regional Secretaría de Salud de la Entidad Federal, (MSDS, IVSS, IPASME, Secretaria de Salud Regional y Local), disponibilidad por escrito de direcciones y teléfonos.
3. Identificación del personal directivo de cada hospital (médico director, subdirector, médico administrador, enfermera jefe, jefe de mantenimiento). Así como dirección, teléfono, correo electrónico, entre otros.
4. Levantamiento de censo de recursos humanos por unidad en el área asistencial y de servicios generales.
5. Constitución e integración de equipos médicos (cirujanos, traumatólogos, anestesiólogos, enfermeras circulantes, instrumentistas, camareras). Programación del trabajo de los equipos designados.
6. Inventario y actualización periódica de medicinas, material médico-quirúrgicos, reactivos, gases anestésicos, gas butano, alimentos, agua potable, entre otros.
7. Inventario de hemoderivados y equipos de conservación y análisis de sangre.
8. Redes de apoyo externo (bomberos, policía, tránsito, protección civil, ONG, entre otros)
9. Identificación de fuentes proveedoras de suministros y materiales hospitalarios.
10. Inventario y actualización periódica de recursos materiales en las áreas de quirófanos, sala de recuperación, emergencia de adultos y de pediatría, área obstétrica y otros servicios críticos.
11. Identificación de amenazas internas tipificadas en red eléctrica, suministro de agua, red telefónica, gas natural, gases medicinales, cableados, calderas, planta eléctrica, entre otras.
12. Instrucciones para extremar el resguardo e integridad de áreas estratégicas del hospital (tanques de agua potable, tanques de oxígeno, bombonas de gas, tanque de gasoil, planta eléctrica, hidroneumático, ascensores, entre otras).
13. Inventario del parque automotor y equipos de comunicación.
14. Identificación de amenazas externas (ríos, aeropuertos cercanos, quebradas, terrenos inestables entre otros).
15. Situación de sistemas de alarmas y alerta.
16. Envío de información diaria de las novedades y emergencias surgidas en las últimas 24 horas precedentes a la unidad que se le indique.

Posteriormente se procede a:

- ❖ Elaborar Plan de Emergencias Externas y Emergencias Internas
- ❖ Efectuar simulacros del Plan de Contingencia con su respectiva evaluación y ajustes.

COORDINACIÓN GERENCIA DE HOSPITALES, CENTRO SIMÓN BOLÍVAR, EDF. SUR, PISO 8, OFC. 819, EL SILENCIO,  
PORTAL MUNICIPAL  
TLFN. 0212-4080607/4080601/4080602  
CORREO ELECTRONICO: GERENCIAHOSP.MSDS@HOTMAIL.COM/GERENCIAHOSP.MSDS@YAHOO.COM

**Table S25-3.4.6 Hospitals from MSDS and Other Organisms in the Metropolitan Area of Caracas (Libertador, Baruta, Chacao, El Hatillo y Sucre)**

Municipality	Hospitals <sup>14</sup>				Total
	Type I	Type II	Type III	Type IV	
<b>Libertador</b>	2	5	6	9	22
<b>Baruta</b>	-	-	-	-	-
<b>Chacao</b>	-	-	-	-	-
<b>El Hatillo</b>	-	-	-	-	-
<b>Sucre</b>	-	2	-	1	3
<b>Total</b>	2	7	6	10	25

**Table S25-3.4.7 Ambulatories Placed in the Metropolitan Area of Caracas (Libertador, Baruta, Chacao, El Hatillo y Sucre)**

Municipality	Ambulatories <sup>15</sup>
<b>Libertador</b>	120
<b>Baruta</b>	9
<b>Chacao</b>	1
<b>El Hatillo</b>	5
<b>Sucre</b>	13
<b>Total</b>	<b>148</b>

<sup>14</sup> Hospitals Type I are located in populations up to 20,000 inhabitants, with a demographic influence area up to 60,000 inh. They have between 20 and 50 beds and are organized to provide services in medicine, surgery, pediatrics, gynecology and obstetrics. Hospitals Type II are located in populations with more than 20,000 inh., with a demographic influence area up to 100,000 inh. They have between 50 and 150 beds and are organized to provide services of major complexities than the previous level. Hospitals Type III are located in populations with more than 60,000 inh., with a demographic influence area up to 400,000 inh. They have between 150 and 300 beds and are organized to provide services of major complexities than the previous level. Hospitals Type IV are located in populations with more than 100,000 inh., with a demographic influence area over 1,000,000 inh. They have more than 300 beds and are organized to provide services of major complexities than the previous level.

<sup>15</sup> An ambulatory is the first level of health service, and it does not have beds which constitute the main difference with a hospital.

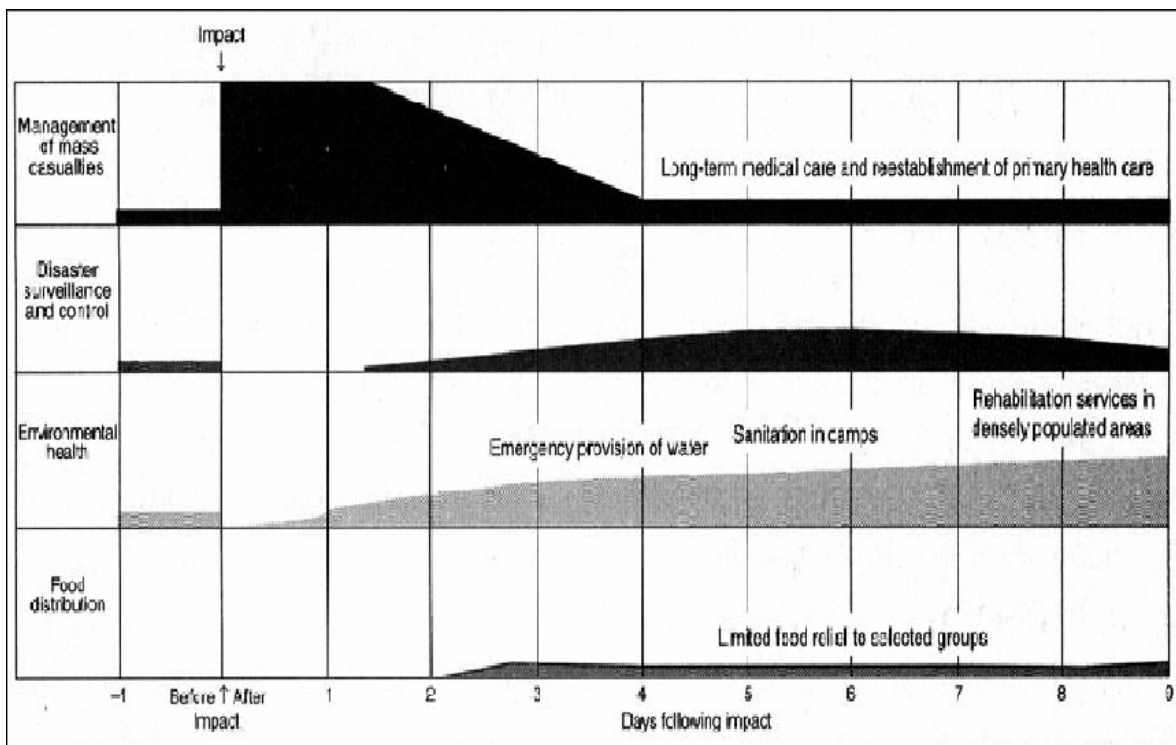
**Table S25-3.4.8 Number of Injured People and Needed Beds.<sup>16</sup>**

Municipality	Injured people	% by municipality	% hospitalized (*)	Needed beds
Libertador	3858	86	10	386
Chacao	129	3	10	13
Sucre	523	12	10	52
	4510	100		451

**Table S25-3.4.9 Hospitals that will Cover Number of Needed Beds, Considering their Location and Total Capacity.**

Hospital	Municipality	Total bed capacity	Functional beds	Occupied beds (*)	Free beds
Dr. Jose Ignacio Baldo	Libertador	716	523	277	246
Dr. Jose Gregorio Hernandez	Libertador	518	409	217	192
Dr. Perez de Leon	Sucre	78	68	36	32
		1312	1000	530	470

\* Using a rate of 53% (www.msds.gov.ve)



**Figure S25-3.4.6 Changing Needs and Priorities Following Earthquakes<sup>17</sup>**

<sup>16</sup> Op cit. SEAMAN, John

<sup>17</sup> Natural Disasters - Protecting the Public's Health (PAHO-OPS, 2000, 133 p.)

## CHAPTER 4.EVACUATION/TEMPORARY SHELTER

### 4.1 Epidemiology

Among different countries, the pattern of injury observed seems to be relatively specific for the type of disaster. In case of earthquakes, the main injuries are fractures, which uniformly affect any part of the body. Also serious injuries without fractures or that are added to them seem to be frequent.<sup>18</sup> After an earthquake it is likely that small wounds which do not need entrance into a hospital surpass the number of serious injuries in a ratio of 10:1.<sup>19</sup>

After an earthquake there is a high probability that the number of injured is higher than the number of deaths; however, in the case of flows, it is possible that the number of death people exceeds the injured ones. Therefore the number of serious injuries caused by flows in relation to the ones produced by earthquake probably is small (see Table S25-4.1.10).

At the internal level could be burst bladder and wounds of urinary ducts, depending on the tour of the earthquake occurrence because during the night casualties have the bladder full<sup>20</sup>. Other injuries are because of building flattening.<sup>21</sup>

With the rare exception of earthquakes followed by serious fires, the great majority of injuries appear during the main impact of the disaster. The period when urgent services are needed varies in accordance with the extent of the affected area and its communications. Probably it is limited to the first week after the calamity, and more exactly to the first 3 to 5 days.<sup>22</sup>

It must be kept in mind that the death and injury affect diverse groups in different ways, by age and sex, and it seems that of adults in an economically active age, particularly men are the ones who are saved.<sup>23</sup>

Currently in Venezuela there are diseases transmitted by vectors such as malaria, Chagas disease and mainly dengue. All the cases are compulsory to be informed and the surveillance continues in case of disaster.<sup>24</sup>

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<sup>18</sup> Op cit. SEAMAN, John

<sup>19</sup> Ibid

<sup>20</sup> LONG, E.C.: Sermons in stones - some medical aspects of the earthquake in Guatemala. St. Mary's Hospital Gazette, LXXXIII, 2; pp. 6-9 (London 1977).

<sup>21</sup> WHITTAKER, R.; FAREED, D.; GREEN, P.; BARRY, P.; BERGE, A.: "Fletes-Barrios earthquake disaster in Nicaragua - reflections on the initial management of massive casualties." J. Trauma 14: 37-43 (1974).

<sup>22</sup> Op cit. SEAMAN, John

<sup>23</sup> Ibid

<sup>24</sup> OMS, OPS y MSDS. Indicadores Básicos de Salud de la República Bolivariana de Venezuela. 2001.

## **4.2 Sanitation and Sanitary Engineering**

The local suppliers of drinking water do not participate in a regular and updated contingency plan in cases of disasters. There is no supplying procedure for hospitals, temporary shelters and other strategic places.

Currently the service of solid waste management is being assumed by the Mayor of the Metropolitan District of Caracas. However, there is no plan for the management of wastes in case of disasters and their final disposal.

For national and international humanitarian aid management, different institutions that work in disaster management have personnel trained in the Humanitarian Supply Management System of the PAHO/WHO (SUMA). This is a tool to help the national authorities manage the information in order to avoid chaos that frequently is provoked by non coordinated humanitarian assistance.

## **4.3 Temporary Settlements**

In necessary cases, spaces such as public parks, schools, universities, among others would be used, but at present they have not duly been identified. There is no plan of basic services supply and there is no knowledge of the current capacity for sheltering casualties.

In previous situations, it was preferred to depend on institutions such as Red Cross for temporary settlement administration, including health problems management and food and basic services supply, through coordination with the private sector and the utility companies.

## **4.4 Disaster Scenario and Assessment**

With the decentralization process, ADMC is in charge to coordinate the direct administration of help, and according to the 1967 scenario there could be 45,000 persons needing support. Considering the scenario of 1967 earthquake, including number of affected buildings, persons who need shelters, injured people, deaths and the present capacity of response, these subjects should be developed to meet at least minimum standards: <sup>25</sup>

- Considering that 16 metric tons of food sustains 1,000 people for one month (30,000 persons.day), to support 45,000 for three days as minimum<sup>26</sup> (135,000 persons.day), 72 metric tons of food will be needed. <sup>27</sup>

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<sup>25</sup> The Sphere Project - Humanitarian Charter and Minimum Standards in Disaster Response (Sphere Project / Proyecto Esfera, 2000, 330 p.)

<sup>26</sup> Op cit. SEAMAN, John

<sup>27</sup> Emergency Health Management after Natural Disaster (Pan American Health Organization (PAHO) / Organización Panamericana de la Salud (OPS), 1981, 67 p.)

- To store one metric ton of food, about two cubic meters of space is needed. For 72 metric tons, 144 cubic meters of space will be required. Proper storage is extremely important to avoid food losses due to rain, pests, or looting.<sup>28</sup>

If the calculated amount of food required exceeds the immediate local availability and it is anticipated that food will have to be distributed for several months, steps have not been officially designed to obtain food from elsewhere in the country or abroad. A rough estimate of local food transport requirements is not available.

Venezuela has normal operating stocks of drugs and other medical supplies in hospital stores, government and commercial warehouses, and military stockpiles. These supplies in and outside the affected area are often large enough to meet immediate drug needs in the emergency period, for even if warehouses have been damaged, some stock may still be salvageable.

Localized shortages could originate in the emergency period because of the difficulty of locating and transporting material within the disaster area or the disproportionately high consumption of items such as x-ray film, casting plaster, and dressings.

An inventory of the types of supplies available and their location and condition is not available for the effective mobilization of all local sources of medicine and medical supplies. There are no identified authorities to purchase or requisition them from private suppliers, and reallocate budgeted funds to meet immediate needs.

**Table S25-4.1.1 Earthquake and Landslide Effects at Short Term**

<b>EFFECTS</b>	<b>Earthquake</b>	<b>Landslide</b>
<b>Deaths</b>	Moderate	Many
<b>Severe injuries requiring extensive treatment</b>	Many	Few
<b>Increased risk of communicable diseases</b>	Potential risk following all major disasters (Probability rising with overcrowding and deteriorating sanitation)	
<b>Damage to health facilities</b>	Severe (structure and equipment)	Severe but localized
<b>Damage to water systems</b>	Severe	Severe but localized
<b>Food shortage</b>	Rare	Rare
<b>Major population movements</b>	Rare	Common

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<sup>28</sup> Ibid



## **CHAPTER 5. RECOMMENDATIONS**

### **5.1 Pre-hospital Level**

Efforts have been made to improve the capacity of Metropolitan CP to manage the search and rescue activities, considering that the bomberos and approximately 90 volunteers groups in capacity to provide search and rescue support are not effectively organized.

To coordinate, organize and include all the actors in the flowchart of response in case of disaster, according with their present conditions and capacities, the following recommendations are made:

- Bomberos and volunteers groups should be organized according to the risk maps (area of influence) and their specialties as follows: training (to train new volunteers and teach them theoretical and practical aspects); planning and operations; registration and control; legal aspects; communications, among others.
- Measures to provide leadership capacity to Metropolitan CP to coordinate all search and rescue activities, should also be included. As a result, there will be an institutionalization process for these groups thus benefiting their updating (through training activities, drills and simulation exercises), equipping and the creation of strategic alliances so that private companies can collaborate with these activities.

Qualified actors in search and rescue should be identified to support Metropolitan CP in conducting the process of certification and re-certification process for all the people performing these activities. For this purpose, will be also necessary to standardize contents and establish methodologies to be used to transfer skills.

### **5.2 Hospital Level**

Considering an earthquake scenario, assuming at least 1967 scenario, it is necessary to organize a certain number of ambulatories as the first line of medical response and hospitals to cover the requirements where there would be 4,510 injured persons, and from this number, 451 persons would need to be hospitalized. At present, there is no plan to prepare the medical response in case of disaster in Caracas.

There are three hospitals strategically located in Sucre and Libertador: Dr. Perez de Leon, Dr. Jose Ignacio Baldo and Dr. Jose Gregorio Hernandez. In Sucre, the numbers of persons who will need a bed exceed the hospital capacity there. Also there are two big hospitals in Libertador where the largest number of injured people will come from. Each hospital has to work with a network of ambulatories in charge of the triage.

To provide appropriate medical service, the following actions should be developed:

- To organize a network between each hospital and the ambulatories where the triage will be made. Each ambulatory included in a network should know to which hospital the patients have to be transferred, considering the mean of transportation and communication.
- To evaluate the hospital's autonomy in terms of its services and its source of electricity, gas, water, food, and medical supplies.
- To implement an efficient system of alerts and staff assignments.
- To organize a unified medical command.
- To plan the conversion of all usable space into clearly defined areas for efficient triage, for patient observation, and for immediate care.
- To plan the prompt removal of casualties when necessary to the places where medical care facilities are more appropriate and definitive.
- To maintain and update a special medical census for disaster cases.
- To plan procedures for prompt transfer of patients within the hospital.
- To organize security arrangements to keep curious persons from entering triage areas and to protect staff from hostile actions.
- To specify evacuation procedures and routes.
- To establish a public information center. The local police, rescue groups, and ambulance teams will need to be informed of the resources of each hospital. Also the public will need to be informed about what to do in case they were injured.

### **5.3 Complementary Recommendations**

#### **5.3.1. Mental Care And Support Skills In Disaster Situation**

One aspect that frequently is overlooked is to provide professional mental care, psychological and counseling skills for the rehabilitation stage by social workers, doctors, nurses, teachers, civil volunteers, and other possible actors with some experiences in specific field.

In addition to physical recovery from disaster damage, the role of mental care, psychological help and counseling to victims is extremely crucial as previous disasters like Hanshi-Awaji (Japan) and Bam

(Iran) have proved. Therefore, specialists of mental care, psychological help and counseling for disaster from different background should be nurtured with specific skills particularly for the rehabilitation stage of disaster management.

The following skills are recommended to be mastered:

- To mitigate impact of trauma and understand stress of suffers from disaster to recovery.
- To encourage suffers own problem-solving skills and support copying skills for recovery through communication.
- To counsel and provide advice on suffers problems such as health care, housing, and economic assistance, living issue in temporal shelter, employ opportunity, etc.

A noteworthy point is that the psychological and counseling to victims is targeted and composed not only by technical professionals. Civil volunteers with some training can also help to provide mental care.

In addition, it is also considered to exchange specialists with places in countries which have experienced disasters like Kobe prefecture in Japan.

### **5. 3. 2. Stockpiling of Food, Water and Goods**

Since ADMC does not have any plan to organize the administration of help, structured plans like the Sphere Project should be considered. This project permits adopting minimum standards in disaster response for: water supply and sanitation, nutrition, food aid, shelter and site planning, and health services.

With the decentralization process, ADMC is in charge to coordinate the direct administration of help, and according to the 1967 scenario, there could be 45,000 persons needing support. ADMC implementing the Sphere project will have the capacity to organize the response of assistance provided to people affected by disasters, and to enhance the accountability of the humanitarian system in disaster response.

The project will be based on the scenario of 1967 earthquake, including number of affected buildings, persons needing shelters, injured people, deaths and the present capacity of response. For this purpose, these subjects will be developed considering minimum standards (see Table S25-5.3.11 and S25-5.3.12):

- Water supply and sanitation: There will be a necessity of 2,025,000 liters for 3 days. Other aspects will be excreta disposal, disease vector control, solid waste management, drainage, and hygiene promotion.
- Nutrition and food aid: The necessity of kilocalories will be 283,500,000 [(6,300 kcal/person) 45,000persons]. Guidelines to evaluate the requirements and target population, and the management of the resources (logistics and distribution).
- Shelter and site planning. The aspects to be covered will be housing, clothing, household items, site selection and planning.
- Health services. A checklist will be used for Initial Health Assessment. Measles control and other health services will be implemented according to a weekly surveillance report.

### **5.3.3. Continuity And Sustainability**

Currently, political vulnerability is added to economic and social vulnerability. There are public and private efforts working on the risk management issue, but when planning and plans are starting to be formulated, the authorities are changed and all the work is stopped halfway. Many resources have been wasted because of this volatility in the posts in the public sector.

To follow all the activities and efforts related with the risk management, an evaluating workshop should be organized yearly by the National CP office. This activity should be inserted in the annual program of the institution with the respective budget, and will evaluate all the actions to integrally manage the risk.

The participants should be a high level representative of each Ministry of the National Executive, a representative of the Governors, a representative of the Mayors, Metropolitan CP, the Fire Department National Coordinator, a representative of the Policemen National Council, a representative of PAHO, and the representatives of the NGO's. This is to guarantee political decision and support to any effort. If the authorities are changed, the new ones should continue and follow the commitment institutionally adopted during the last evaluating workshop and that will be followed and evaluated in the next workshop.

Other participants should be middle level officials of the above mentioned institutions. They have longer permanency at their post than the high authorities, and in most cases, they are the technical experts. This is to guarantee the technical support and the high level authorities will be receiving expert advice from them which will permit the continuity of the efforts in the framework of the evaluating workshop.

International Organizations with long permanence in the country, multilateral agencies and other international NGOs with recognized background should participate with their experience. The multilateral and other funding agencies, for example, could consider the results, conclusions and recommendations of the evaluating workshops to structure and to fund plans and projects related with risk management. The conditions for disbursing budgets by these multilateral or funding agencies could be addressed in the commitments of all the institutions participating in the yearly evaluating workshop.

**Table S25-5.3.11 Key Indicators About Water<sup>29</sup>**

• At least 15 litres of water per person per day is collected.
• Flow at each water collection point is at least 0.125 litres per second.
• There is at least 1 water point per 250 people.
• The maximum distance from any shelter to the nearest water point is 500 metres.

**Table 25-5.3.12 Nutritional Requirements<sup>30</sup>**

Nutrient	Mean population requirements
Energy	2,100 kcals
Protein	10-12% total energy (52-63g), but <15%
Fat	17% of total energy (40g)
Vitamin A	1,666 IU (or 0.5 mg Retinol Equivalents)
Thiamine (B <sup>1</sup> )	0.9 mg (or 0.4 mg per 1,000 kcal intake)
Riboflavin (B <sup>2</sup> )	1.4 mg (or 0.6 mg per 1,000 kcal intake)
Niacin (B <sup>3</sup> )	12.0 mg (or 6.6 mg per 1,000 kcal intake)
Vitamin C	28.0 mg
Vitamin D	3.2 - 3.8 mg calciferol
Iron	22 mg (low bioavailability (ie 5-9%))
Iodine	150 mg

<sup>29</sup> Adapted from: WHO (1997, draft) and WFP/UNHCR (December 1997).

<sup>30</sup> Ibid

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**ENVIRONMENTAL CONSIDERATION**

*“Better to construct prevention than to repair disasters”*

*Jeymi Sivoli Blanco*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S26

ENVIRONMENTAL CONSIDERATION

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## **S-26 ENVIRONMENTAL CONSIDERATION**

### **CHAPTER 1.OVERVIEW**

During the Master Plan preparation period, the Study Team screened the proposed projects in accordance with the JICA Guidelines blending with the new Guidelines for Environmental and social considerations to be issued in April of 2004. The Study Team subsequently performed scoping sessions with relevant authorities, in which major environmental issues were identified. This part of the report presents Initial Environmental Examination of the proposed Master Plan.

The targeted study area stretches over the northern part of Metropolitan District of Caracas city including Libertador, Chacao, Sucre municipalities and El Ávila Mountain. El Ávila Mountain was declared a national park in 1958 thus creating interest in its protection. The park, having a high diversity of fauna and flora, is considered a fragile ecosystem in part because high annual rainfall is concentrated from brief but violent storms. The Metropolitan District of Caracas is the capital of the country with 3 million inhabitants; it has undergone rapid population growth in the past 50 years. The study area is a heterogeneous urban part of the country, in which the poor and rich live with their different levels of assets; there are significant intra-urban differentials in social and environmental conditions. A large part of the targeted communities, Barrios, are substandard overcrowded settlements with a lack of adequate services; they are founded on marginal or environmentally hazardous lands mostly owned by the government, such as along rivers and other precarious living environments. The river channels targeted in the sediment disaster study rise as small streams in the El Ávila National Park and flow down the steep sloping hillsides of the mountain. They then flow through densely populated part joining with some streams and swallowing sewage discharged from the residents before entering the Guaire River extending at the southern border of the study area.

The objectives of the proposed projects included in the Plan is to protect human life from earthquake and sediment disasters, and to protect private as well as public assets in disaster-prone communities of Metropolitan District of Caracas city positioned at the core of politics and economy of the country. A key characteristic is the wide array of infrastructure investment combined with various non-structural measures. Physical investment includes: 1) building reinforcement ensuring earthquakes resistance and 2) numerous debris flow control structures including construction of dams spread over the watersheds on the hillsides of El Ávila National Park and channel works in the downstream of the river where densely populated residential areas are developed.

Analysis of the preliminary proposals indicates the following:

- (i) Potential significant environmental and social impacts are anticipated in some of the sub-projects, particularly in those involving debris flow control structures.

- (ii) The major potential project impacts of sediment control structures include the possibility of relocations of some hundreds households, ecological impacts resulted from anticipated changes in water quality by the physical investment in El Ávila National Park and temporal traffic disruption in residential area.
- (ii) The impact will have long-term direct effects on the livelihood of the population, resulting in hardship and impoverishment unless appropriate measures are carefully planned and carried out. A project specific guideline needs to be developed by undertaking social survey to minimize adverse effects on the livelihood of the project-affected persons (PAPs).

Other issues associated particularly with debris flow control structures are: (i) surface water hydrology (ii) direct impact of construction works in urban settings and (iii) other offsite impacts of construction works. Although dam construction projects frequently induce alteration of hydrology and resultant changes in sedimentation pattern downstream of the structure, the expected extent of the impact is judged limited because: 1) open type structure was incorporated in the structure design, by which changes in sedimentation pattern will be minimized and 2) the volume of sediment supplied from the watershed of one mountain stream is limited in comparison with total volume of sediment flowing down the Guaire river. However, the Social Environmental Consideration Study (SEC study) performed in the subsequent period is to include an assessment of the issue through interviews with downstream residents as it is expected to emerge in the long run as a cumulative impact if the project is multiplied to other targeted watersheds.

## CHAPTER 2. INTRODUCTION

### 2.1 Objectives of IEE

The objective of Initial Environmental Examination (IEE) of the plan is to enable early determination of the potential magnitude of impacts and hence the depth of study required in the succeeding study period. IEE will help design the project to be environmentally sound and socially acceptable<sup>1</sup> in its nature by incorporating environmental dimensions into the project design in compliance with national environmental regulations as well as those of possible funding institutions. IEE is performed by two distinctive but interrelated processes of screening and scoping. Screening is undertaken to decide whether a proposed project has likely impacts assessed by environmental and social considerations study. Scoping is the process used for defining what can and what cannot be accomplished during a particular environmental study. This includes: defining the geographic boundary of a study in relation to possible impacts, identifying the time constraints and time horizons of the study, and identifying the skills and human resources needed to undertake the study.

### 2.2 Methodology

Since JICA's new Guidelines have been under preparation during the Study period, the Study Team screened the proposed projects in accordance with the Guidelines for Environmental Consideration blended with the new Guidelines for Environmental and Social Considerations. In this context, examining the type, location, sensitivity, and scale of the proposed projects, as well as the nature and magnitude of its potential impacts, the proposed projects were assigned with one of three categories (A, B or C), reflecting the potential environmental risk associated with the project. Category A project is likely to have significant adverse impacts; on the other hand, Category B project is likely to have less adverse impacts than those of Category A project. Category C project is likely to have minimal or no adverse impacts. This classification was made according to the component with the potentially most serious adverse effects. Other definitions of category follow the new JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS with due consideration of OP4.01 of the World Bank.

A field reconnaissance along with interview survey with concerned authorities were undertaken from January 27<sup>th</sup> until February 21<sup>st</sup> 2004, a period of 24 days. During the field study in Caracas, relevant information and publications were collected, and then further reviewed and analyzed in Japan. A scoping session was organized on February 12<sup>th</sup> with participation of members of the Environmental Committee of the study including the officers responsible environmental management of metropolitan

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<sup>1</sup> The term environment herein is not limitedly used to indicate the natural resources but broadly defined as socioeconomic as well as natural resources in and around the project area.

government, municipal governments and INPARQUES. This was further discussed with officers of the Ministry of Environment and Natural Resources. The findings of the session were discussed with the Team's engineers to incorporate environmental dimensions into the project designing.

### **2.3 Guidelines**

The Guidelines referred in this study include the following:

- JICA Guidelines for Environmental Consideration, 1992
- Draft Japan International Cooperation Agency Guidelines for Environmental and Social Considerations.

## **CHAPTER 3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

### **3.1 Introduction**

This section reviews environmental legislation, guidelines, and regulations that have relevance with the proposed projects at the national as well as state and municipal levels.

### **3.2 Institutional Settings**

MARN, created under Organic Law of Central Administration in 1976, has overall authority for the administration and implementation of government policies, laws and regulations related to the environment, including environmental assessment, sustainable development and pollution control. It is also responsible for management of much of the publicly owned natural resources, including inland waters, forests and protected areas. MARN has two arms directly pertaining to environmental clearance: 1) the Direction of Environmental Quality under the Direction General of Environmental Quality and 2) the Direction of Territorial Ordinance under the Direction General of Planning and Environmental Ordinance. In addition, MARN's delegations in each state, the State Directorate of the Environment (Dirección Estatal Ambiental), and in the Capital District it is the Capital District State Directorate of the Environment (Dirección Estatal Ambiental Distrito Capital) act as liaison between project proponents and MARN, which provide technical services to municipal governments in addressing environmental issues.

The 1988 Organic Law of Municipal Regime (Ley Orgánica del Régimen Municipal) defines the environmental competence of the municipalities, and the 1989 Organic Law on Decentralization (Ley Orgánica de Descentralización, Delimitación y Transferencia de Competencias) and promotes the transfer of competence and responsibilities from the national level to the state and local levels. At the

regional level, environmental authority lies in the environmental directorate of municipal governments. The environmental directorate of the Metropolitan government positions as coordinating agency between MARN and municipal governments or among municipal governments, which was recently merged with urban planning directorate (see Fig. S26-3.4.1). Within the Metropolitan District most of the Municipalities have Autonomous Institutes for environmental administration (Environmental Maintenance, Protection and Rehabilitation Institute (IMAPSAS, Instituto de Mantenimiento, Proteccion y Saneamiento Ambiental) of Alcaldia Sucre, Municipal Autonomous Institute for Civil and Environment Protection (IPCA, Instituto Autonomo municipal de Proteccion Civil y Ambiente) of Alcaldia Chacao, Autonomous Institute of Environmental Managment (IAGA, Instituto Autonomo de Gestion Ambiental) of Alcaldia El Hatillo).

The National Institute of Parks (INPARQUES), created in 1978 is an autonomous institute attributed to MARN administering national parks, natural monuments and urban/recreational parks. El Avila National Park, extending over the north of the study area is consequently administered by INPARQUES which has the authority to issue the environmental authorizations for the activities derived from the projects to be executed inside the park.

### **3.3 Environmental Impact Assessment Requirement of the Project**

The Venezuelan EIA guidelines (DECREE 1257, Article 6 "Norms regarding the Evaluation of Activities Susceptible to Environment Degradation") stipulate the groups of physical investments that need environmental clearance, establishing the lineaments to carry out the Environmental Impact Assessment. However, the article was superceded with the Article 129 of the new constitution promulgated in 1999, which widened the scope of this study by establishing article 129 where it states that *"All the activities susceptible of generating damages to the ecosystems should be accompanied beforehand by environmental and socio-cultural impact assessments"*, implying that all physical investment will be screened for environmental impact assessment.

### **3.4 Environmental Impact Assessment Process**

A project proponent proceeds to obtain two kinds of permissions through environmental authorization of proposed projects (Fig.S26- 3.4.2). One is the Authorization for the Occupation of Territory (AOT) that is stipulated in the Organic Law for Territory Ordinance (LOPOT, Ley Orgánica para la Ordenación del Territorio). The other is the Authorization for the Affectation of Resources (AR) provided in the Organic Law of the Environment (Ley Orgánica del Ambiente) which covers resource impact in English. A project proponent is required, in accordance with Article 4 of the country's EIA guidelines, to notify MARN by initially submitting "Document of Intention"<sup>2</sup>. The competent

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<sup>2</sup> See Annex for the content of the document

authority to which the document is presented is either INPARQUE for the project proposals in the national park or the State Environmental Direction (SED) in Caracas for those in other part of study area. Within 30 consecutive days after receipt of the Document of Intention, MARN, INPARQUE or SED in this case, will establish a general instruction for a relevant environmental evaluation, most probably consisting of an Environmental Impact Study. On this occasion, INPARQUE interacts with SED for further review of environmental dimensions of proposed projects, while, SED will liaise with: 1) the Direction of Environmental Quality and 2) the Direction of Territorial Ordinance of the Ministry for national level projects and with Metropolitan and Municipal governments for local level projects.

The scope and content of the Environmental Impact Study is determined by defining TOR that is initially drafted by project proponent based on the instruction presented by the Ministry. The TOR proposal will be revised and approved within 45 days after the presentation of TOR by the project proponent. The Environmental Impact Study would normally include the following information: (i) a preliminary description of the project's environment, design, location and foreseeable development; (ii) a definition of the area to be affected by the project; (iii) a description of the project's possible ecological impact; (iv) information as to the scope and methodology of the study, given the information at its disposal, adding a description of preventive and corrective measures, an analysis of the different designs, sites and technological options, programs, an environmental supervision plan and a summary of the study; (v) a working plan; and (vi) and identification of the working team, naming the consultant performing the study. The proposal in question will be approved or rejected by the MARN within 45 consecutive days following filing. If the project is approved, it must adhere at every stage of its development to the parameters and conditions established by the MARN. The Ministry issues authorization of Occupation of Territory upon the approval of Environmental Study within 60 days from the presentation of the result by the project proponent. The proponent further proceeds to obtain Environmental Impact Clearance or Affectation of Resource (AR) from the Ministry.

### **3.5 Environmental Legislations**

#### **3.5.1. Overall Framework**

In Venezuela a wide system of environmental legislation has been developed. The New Constitution states that responsibility of protecting and conserving natural resources lies in the State in Article 127. It further provides in Article 129 that any activity likely to cause damage to the environment is subject to a study on its possible environmental and social impacts.

The Organic Law on the Environment (Ley Organica del Ambiente) sets forth the medium- and long-term environmental goals, while, the Organic Zoning Law (Ley Organica para la Ordenacion del



Territorio - LOOT) mandates extensive land zoning and planning at the national, regional and local levels, which pertains to authorization of Occupation of Territory (OT). Penal Environmental Law, Ley Penal del Ambiente, Decree 1257 published in 1992, related to “*Norms regarding the Evaluation of Activities Susceptible of causing Environmental Degradation*”, establishes the crimes, infractions and sanctions for acts that cause environment degradation. On the other hand, the Organic Law of the Environment, in agreement with the so-called Technical Norms constituted by the Ordinances and Regulations regulating the environmental matter establish the infractions and administrative sanctions referring to administrative responsibility.

The regulations, legislations and policy guidelines that may have close relevance with the plan are summarized in the Table S26-3.5.1.

### **3. 5. 2. Natural Environment**

#### **(1) Water Quality and Effluent Discharge (Decree 883)**

(Normas Para la Clasificacion y el Control de la Calidad de los Cuerpos de Agua y Vertidos o Efluentes Liquidos)

It establishes the classification of water bodies and liquid effluents standards. Liquid effluent discharge must meet effluent standard set forth in the decree and by MARN. Pursuant to the Penal Environmental Law, the uncontrolled disposal of liquid effluents could be a criminal act, even if the disposal does not result in damage to the environment. Under Decree 883, fluid effluents must be measured every three months and the figures filed at MARN.

#### **(2) Air Quality Standards (Decree 638)**

(Normas Sobre Calidad Del Aire y Control de la Contaminacion Atmosferica)

The decree establishes air quality standards, emission limits and classification of air quality with the primary objective of controlling air quality. Project activities that may have potential source of air pollution must obtain prior authorization from MARN.

#### **(3) Noise Standards (Decree 370 )**

(Reglamento N° 5 de la Ley Organica del Ambiente Relativo a Ruidos Molestos y Nocivos)

The primary objective of the decree is to regulate activities that may have noise pollution. Article 10 sets forth allowable noise level in the areas in proximity to hospitals, educational facilities, residential area, and commercial area. Exceptions to regulation are stated in article

23 authorizing MARN to admit exceptions for temporally noise pollution. Noise pollution regulation for land transport is stipulated in articles 11 to 14.

This decree was revoked by Decree 2.217, published in the Official Gazette of the Bolivarian Republic of Venezuela, N° 4.418, of 27/04/92.

### **3. 5. 3. Social Environment**

#### **(1) Declaration of Protected Area**

(Ley Forestal de Suelos y Aguas)

The law governs the conservation, development and use of the forest, soil and water resources. Article 17 of the law sets forth protected areas along riverbanks. Item 3 of the article states that 25 m from riverbank of permanent or intermittent non-navigable watercourses is declared as protected area.

#### **(2) Expropriation Law**

“Law of Expropriation for Public or Social Purpose” was issued on July 1, 2002, in Official Gazette No. 37.475 superseding the previous law passed on October 16, 1947. The new expropriation law regulates the mandatory expropriation of property owned by private individuals for public purpose and social interest. Article 2 of the law defines “Expropriation” as the public action where mandatory transfer of property ownership by the State is performed with timely and fair compensation for public purpose and social interest. The works of public purpose are those undertaken by the Republic, states, Capital (Metropolitan) District, municipalities, autonomous institutes, private persons or duly authorized corporations to perform such works for the Republic in general, its States or Municipalities for achieving common interest of the society.

The country’s expropriation law is generally expected to ensure fair and equitable compensation to those who are adversely affected by the proposed project. However, for the affected families who are living in Barrio, restoration of household productive assets, or standard or quality of life, is not fully expected since cash compensation by the designated valuation method would not enable them to acquire real estate with corresponding value of formal residential area in proximity to their current houses.

**Table S26-3.5.1 Environmental Legislations of Venezuela**

Legal Instrument	Year	Relevance to the Project	Sections in report
National Constitution	1999	Establishes in Article 127 the environmental rights that stipulate the state's responsibility in protecting and conserving its territory's natural resources. Provides in Article 129 that any activity likely to cause damage to the environment is subject to a study on its possible environmental and social impacts.	3.3 3.5.1
Organic Law of the Environment	1976	Establishes guiding principles for environmental conservation, including the creation and protection of forest reserves and use of natural resources	3.5.1
Organic Zoning Law	1983	Establishes processes for national land-use zoning, Establishes the requirement to carry out land-use zoning, and Establishes administrative procedures for planning in protected areas	3.4 3.5.1
Penal Environmental Law	1992	Establishes penalties for acts that degrade the environment including minimum wage, and jail sentences, Punishes public sector employees who grant permission for activities that damage the environment without an environmental impact assessment	3.5.1
Law of Forests, Soils and Water	1965	Regulates conservation and use of natural resources found in forests Prohibits extractive activities in national parks Establishes protected zones for major watersheds Prohibits deforestation or annexation of forest reserves without prior approval from congress	3.5.3
Law of Expropriation for Public or Social Purpose	2002	Set forth rules of the mandatory expropriation of property owned by private individuals for public purpose and social interest	3.5.3
DECREE 883	1995	Establish rules for classifying and managing quality of water bodies and effluent standards	3.5.2
DECREE 638	1995	Establish rules for air quality and atmospheric contamination control	3.5.2
DECREE 370	1979	Regulate noise standard and control measures	3.5.2
DECREE 2334	1992	Zoning Plan and Use Regulation of El Avila National Park	4.2
DECREE 276	1989	Defines administration and management of national parks and natural monuments, Prohibits certain activities, such as mining, in national parks or natural monuments	4.2
DECREE 1257	1996	Establishes regulations for developing environmental impact assessments	3.4

**Table S26-3.5.2 Expropriation is Undertaken in the Following Procedures**

STEPS	ARTICLE	DESCRIPTION
Declaration of Public Utility	13,14	The national assembly and, in their recess, the delegate commission, declares that a work is of public utility, whenever all or part of the budget is disbursed from national funds. When they are works that correspond to the administration of state, the legislative council of the states proceeds in the same manner. In the municipalities the declaration of public or social utility is always attribution of the respective council municipal.
Issuance of Expropriation Ordinance	5	An expropriation ordinance contains declaration that the work requires the mandatory acquisition of the full or partial goods.
Amicable Agreement Court Proceedings	22	Once the expropriation ordinance is published, the entity of expropriation proceeds to the step of acquisition by way of the friendly arrangement. The valuation of property to be expropriated is performed by an evaluation committee comprising of three experts. Upon completion of appraisal, it will be notified to the proprietor or their legal representative in writing. When both sides are not able to reach an agreement, the entity expropriator will go to the judicial settlement. The competent authority will be the court of first instance where the property is located. As for appeal to a higher court, it will be made to the supreme court.
Compensation Full or partial transfer of the property at a fair price.	36-44	Appraisal of property is based on (i) fiscal value of the declared property or accepted tacitly by the proprietor; (ii) the publicly assessed value, carried out at least six months before the expropriation ordinance; and, (iii) the prices means of that similar properties have been sold, in the last twelve months starting from the date of elaboration of the evaluation. In the event of expropriation of properties with industrial establishments, among other damages, it will be reimbursed for the sales loss and for the withdrawal, the transfer and reassignment of the new industrial headquarters. Besides the declaration of tax on the rent that demonstrates the declared net utility of the three last previous fiscal exercises, counted from the moment of elaboration of the evaluation report as well as any other proven expense that is direct and immediate consequence of the expropriation.

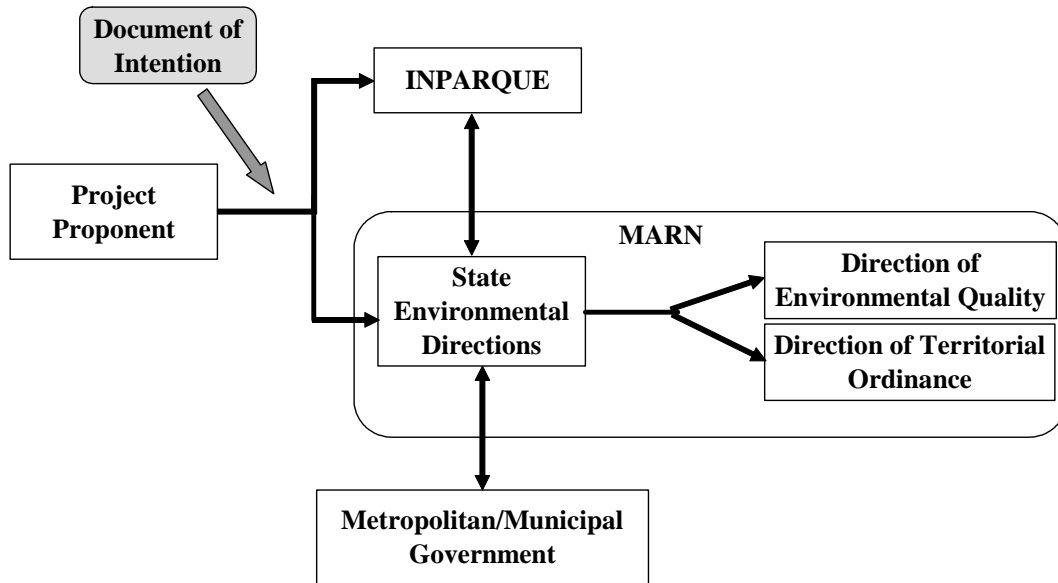


Figure S26-3.4.1 Initial Steps for EIA Clearance

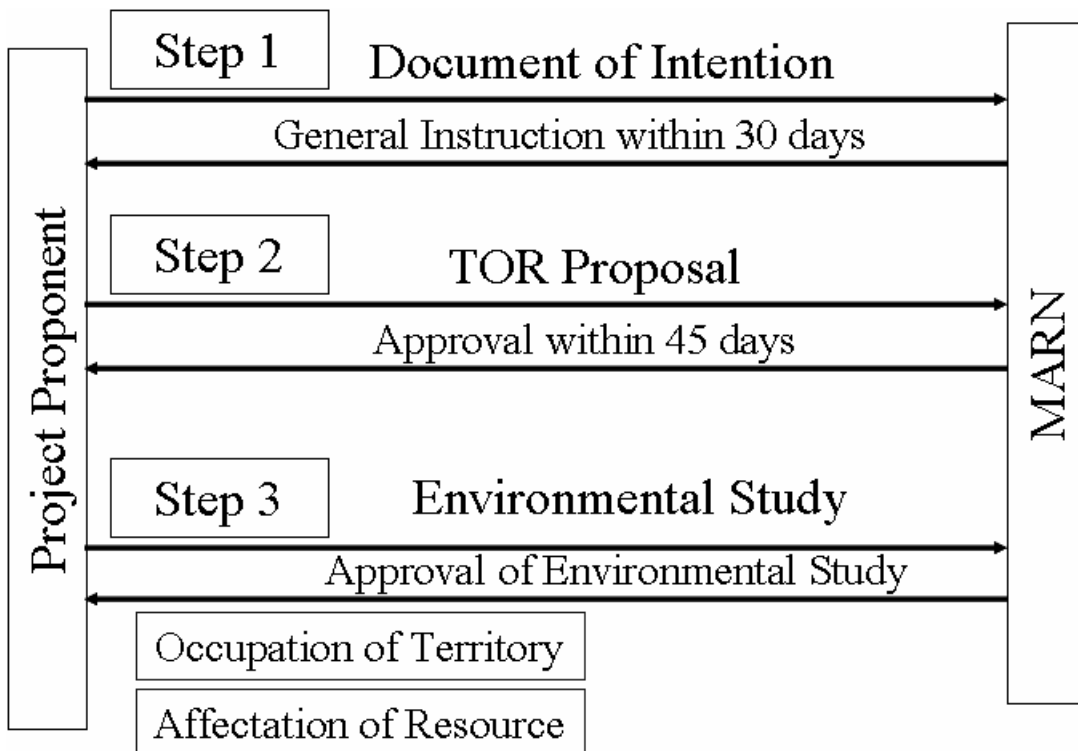


Figure S26-3.4.2 Environmental Impact Assessment Process

## CHAPTER 4. CURRENT ENVIRONMENTAL CONDITIONS

### 4.1 Introduction

The target area for intervention stretches from the steep mountainous hill slope of El Ávila National Park to the densely populated urban fringe of the city of Caracas including three municipalities (Libertador, Sucre and Chacao).

### 4.2 El Ávila National Park

El Ávila National Park is located along the northern stretch of the study area. It is a protected forest in mountain regions that are considered as fragile ecosystems, in part because high annual rainfall is concentrated in brief but violent storms. El Ávila was declared as a park in 1958, thus creating interest in its protection. These mountains now serve both as recreational area and as a buffer to pollution and urban expansion. El Ávila has always been an important resource for the inhabitants of Caracas, who use the area for a variety of activities, some of which have threatened its conservation.

The park follows a mountain range 80 km long and approximately 16 km wide. It has an area of over 81,800 ha encompassing a wide variety of ecosystems that vary along the altitude gradient from 120 m above sea level on the northern slope to 2,765 m above sea level at Naiguatá peak. From 1,200 to 1,600 m on the southern slope facing the city of Caracas, the forests are mainly sub-mountainous evergreen forests. Due to constant condensation by cooling of the air masses and the decrease of atmospheric pressure, cloud forests dominate between 1,500 and 2,200 m above sea level.

This park has a high diversity of fauna and flora<sup>3</sup>. More than 100 butterfly species, approximately 120 mammal species, 20 amphibians, 30 reptiles and 500 bird species (36% of Venezuela avifauna) have been documented. Nine bird species are endemic to Venezuela and three threatened bird species live in this park. In addition, more than 1,800 plant species from diverse taxonomic groups can be observed. Several of these plants are endemic to the Cordillera de la Costa mountain range with some endemic to the park itself. Nine bird species are endemic to Venezuela. Some locally and globally endangered bird species live in El Ávila as well, including the helmeted curassow (*Pauxi pauxi*), fasciated tiger-heron (*Tigrisoma fasciatum*) and black-and-white hawk-eagle (*Spizastur melanoleucus*) (Rodríguez & Rojas-Suárez 1999, Birdlife International 2000).

El Ávila can be classified as vulnerable ecosystem because there is a risk that the diverse threats it faces will increasingly threaten its biodiversity. The most immediate threats to the park include forest fires and illegal settlements in the area in proximity to the city of Caracas. However, the concentration of resources and vigilance in those areas closest to the city has resulted in more

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<sup>3</sup> <http://www.parkswatch.org/parkprofiles/avila/avila.shtml#threats>

problems in the more isolated northern slope and eastern sector of El Ávila. Other threats include the presence of exotic plants, the cable car and poaching.

The park is managed by the National Institute of Parks (INPARQUES), the government agency in charge of Venezuela's national parks and monuments. The zoning plan for El Ávila is set forth in Plan of Ordinance and Regulation for the Use of El Avila National Park contained in Decree N° 2.334 of 06/06/92, published in the Official Gazette of the Bolivarian Republic of Venezuela N° 4.548 of 26/03/93, dictated by the president of the Republic in the Ministerial Council (National Executive). It includes definitions of 11 different management zones within the park and regulations for permitted activities, which is summarized in the Table S26-4.2.1.

### **4.3 Residential Area**

The Metropolitan Caracas is the capital of the country with 3.1 million inhabitants that has undergone rapid population growth in the past 50 years. The study area has 2.7 million population, among which 75 % of the population lives in Libertador, 22% in Sucre and 3% in Chacao municipalities. The area is heterogeneous urban part of the country, in which the poor and rich live with their different levels of assets, and there are significant intra-urban differentials in social and environmental conditions.

The communities in the study area are developed in alluvial fans that are gently sloping, cone-to fan-shaped landforms created over thousands to millions of years by deposition of eroded sediment at the base of mountain ranges. Located at the base of steep mountains that rise to elevations of more than 2,000 meters, the population is highly vulnerable to rainfall-induced landslides exposing them to risk of a big loss of life and property damage.

A large part of the targeted communities, Barrios, are substandard overcrowded settlements with lack of adequate services, which are found on marginal or environmentally hazardous lands mostly owned by the government, such as along rivers and other precarious living environments. The formation of the barrios in Caracas<sup>4</sup> is a function of large segments of the population having incomes too low to permit access to the formal housing markets. Consequently, the poor of the city have resorted to invading publicly owned land in the presence of weak enforcement of property rights, and, on a much smaller scale, private land both in the City proper, and the urban periphery. Over time, these squatters have gradually built their houses and communities in a rhythm dictated by the needs of their family cycles and by the possibilities provided and limited by their fluctuating incomes. Gradually, the introduction of a few urban services also came, albeit with standards well below those of formal urban areas, constructed both by the poor themselves.

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<sup>4</sup> This part of the report largely owes to Project Appraisal Document for A Caracas Slum-Upgrading Project September 28, 1998, The World Bank

Victims of the 1999's disaster in Barrios have improvised shelters in the proximity of rivers or culverts that were stricken by the sediment disaster. A random interview with residents in the catchments of Agua Salud in Libertador municipality indicated that: i) slum development has a rather longer history as compared with those in Asia; and therefore ii) the inhabitants have attachment to the community in which they live, iii) they have limited access to credit to facilitate housing rehabilitation and iv) the victims who survived generally have little concern toward their own risk. The combination of these factors and their limited income may have impeded their decision to move away from the disaster prone area.

**Table S26-4.2.1 Zoning of El Ávila National Park**

Zone	Description
Integral Protection Zone	The areas that require strict protection. Access is restricted to INPARQUES personnel for monitoring and scientists for research. The sub-páramo and cloud forest are included in this category.
Primitive and Wilderness Zone	The areas that can tolerate moderate usage. Access is restricted, devoted to authorized activities like scientific research, monitoring and educational activities. Access is granted only under INPARQUES supervision. Hiking and posting educational signs maintenance are also allowed.
Managed Natural Environment Zone	The areas that were affected by moderate human use before the park was created. Basic infrastructure building, the posting of informational signs, vehicle use and passive recreational activities are permitted. Areas that do not fall under another category are included in this zone.
Natural Recovery Zone	The areas used for conservation and restoration of natural resources. The agricultural lands in some areas are included in this zone.
Recreation Zone	The areas favorable for development of low-impact recreation. Infrastructure building is permitted, and the area is open to the public for recreation. After the disastrous mudslides of 1999 many of the areas on the northern slope no longer exist as recreation areas.
Service Zone	The zone includes INPARQUES infrastructure: 22 ranger posts in the southern slope.
Historical, Cultural and Paleontological Interest Zone	The areas of Camino de los Españoles, the Casona de Los Venados and 21 historical structures described in the management plan.
Special Use Zone	Activities incompatible with conservation efforts for the National Park but which predate its creation. These areas are still maintained because they include infrastructure that provides services of social interest, for example: the road, television and telecommunication structures, electric wiring, the cable-car, the Hotel, the firefighting camp, the pipeline, 14 small dams on the creeks that flow into Caracas, and three small hydroelectric plants.
Native Villages	The villages that existed before the creation of the park.
Buffer Zone	The areas form the perimeter of the park adjacent to the city of Caracas and require regulated use.
Environmental Protection and Recuperation Zone	The western and northern areas of the park that are outside Caracas, but have been affected by uncontrolled human encroachment.



## CHAPTER 5. SCREENING OF MASTER PLAN PROJECTS

Screening of the proposed projects in the Master Plan was performed by using the screening checklist of JICA's guidelines. The screening was constrained by lack of information mainly due to variations in maturity of project preparation at the time of examination, which thereby rendered depth and extent of analysis different among projects. The table S26-5.1.1 presents the summary of the analysis.

**Table S26-5.1.1 Environmental Analysis of the Master Plan**

Type	Disaster type	Project rename	Issues	Category
Structural	Earthquake	Reinforcement of buildings	Potential impacts of the works may include noise and air pollution during the construction phase. However, they are judged insignificant as the project sites may locate in heavy traffic areas where pollution is already taking place and they have localized and temporal nature. Temporal interruption of traffic is, on the other hand, may need to be minimized through preparation of appropriate protocol, which need to be developed when detailed construction plan become available most probably at the detailed design phase of the project.	B
		Reinforcement of bridges		
	Sediment	Sediment control structures	Involuntary resettlement is an anticipated impact in the densely populated residential area. The extent of the impact resulted from involuntary resettlement is uncertain, as the information on project location is not available. In addition, construction of sediment control structures in the national park may have a certain degree of impact involving changes of water quality and hydrology and resultant adverse effects on aquatic ecosystem.	B
Common	Common	Emergency Command Center	The environmental impact of the project is judged insignificant because major project activity includes interagency coordination, information management and other non-structural measures to address problems in information management in emergency situation.	C
Non-structural	Common	Resettlement of people in risky area	The principal spirit of the project is to resettle the people living in risky area on a voluntary basis to safer areas. The degree of project impact is uncertain due to limited project design information including project sites, methodology of resettlement, needs of site rehabilitation of out-going areas and consensus in incoming sites. Coherent adherence to the spirit needs to be ensured through close monitoring of project design.	B
		Land development for resettlement of disaster refugees	Although the projects are categorized in non-structural measure, the proposed project may involve potential conflict among landowners and tenants due to unclear land ownership in informal areas. Further examination is judged necessary when new information become available.	B
		Redevelopment of informal area after disasters		

## **CHAPTER 6. SCOPING OF SEDIMENT CONTROL STRUCTURE MEASURES**

### **6.1 Overall Assessment of the Project**

Overall, the proposed master plan project will induce relatively insignificant adverse impacts in terms of natural resources. However, the sediment disaster control projects significantly alter sedimentation patterns in the downstream area of the river. The closed type sabo dam may give natural as well as social impacts. Precarious living environment is considerably improved by increasing channel capacity. Improvement of living environment is further expected through improved landscape of the river surroundings. Several possible adverse impacts were, nevertheless, identified in the construction and operation phase of the project, which include those on water quality induced by wastewater contamination and siltation, noise and vibration caused in the period of construction phase and significant linear tree cutting for access road construction.

The following part of the report was prepared for the future implementation of sediment control structure of the master plan.

### **6.2 Project Activities Examined**

The major assessment above is a cross impact matrix, with the major environmental resources as columns, and the project activities as the rows. The Project activities are listed in Table S26-6.1.1 for each project phase.

### **6.3 Project Impact Area**

The impacts examined in Table S26-6.3.1 include on-site and off-site impacts.

### **6.4 Examination on the Sediment Control Structures and Access Road**

#### **6.4.1. Water Pollution**

Construction of the structures involves significant earthworks, quarrying, stockpiling and disposal of unsuitable material, which will have a potential impact on water quality of the river. The impacts on water quality induced by the activities are deemed direct, but short-term and of moderate level of magnitude. Due to proximity to water body, the impact is highly probable unless an appropriate protocol as part of the project's Environmental Management Plan is developed.

Changes in water quality likely occur as alteration of pH when cement material is inappropriately managed. Since the river water is not voluminous in the mountainous part as compared with expected volume of alkaline water produced, dilution of river water is not anticipated. pH rising of surface water as a result of construction work will possibly impair fauna and flora of the national park.

Tree removal and clearing brushwood and associated topsoil stripping brings risks of erosion of exposed ground or stored topsoil, which is expected to result in increased runoff and associated siltation of watercourses.

Equipment servicing and fueling is likely to induce contamination of surface water by leakage of waste oil as the construction activity takes place in and over the water body.

#### **6. 4. 2. Potential Impact on Fauna and Flora, Soil Erosion**

The vegetative cover/trees within the National Park will have to be cleared to make space during the construction site preparation and clearing period for both the sediment control structures and the road construction. Since the construction site of the structure and road alignment has not been fully determined, the extent of the impact is not assessed in this stage of preparation. Within the protected area, the trees do not have commercial value, although they may have significant ecological value providing a serene landscape for recreational purposes. In addition, trees may serve as a nesting place for the tree-dwelling avian fauna.

Therefore, clearing of trees will have a visible and also temporal impact upon the tree-dwelling fauna. Accidental loss caused by collisions with vehicles may result in the weakening or disappearance of an entire generation of the population, if migratory intervention is delayed. Poaching by construction crew may be another potential outcome of the project, which needs to be avoided and minimized through education of the crews.

Changes in water quality may have potential impacts on the aquatic ecosystem in the water bodies. It is, as discussed above, a temporal and direct impact of the construction work, but, they may have significant impact if the area is distributed with rare species.

Disruption of water flow is anticipated in the operation phase of the project, which would take place when the area is stricken by sediment disaster. The storage of sediment and subsequent discharge of sediment will have a rhythm depending upon the precipitation pattern. Therefore, upon the completion of the structure, the catchment area may be subject to drastic alteration of environment.

#### **6. 4. 3 Potential Air Pollution/Public Health**

Quarries and borrow sites, which are the sources for structure building materials, can have impacts through generation of dust from procured construction materials if it is located close to a residential area. It would result in substantial off-site impacts, unless the sites are rehabilitated.

#### **6. 4. 4. Other Potential Impacts**

Detailed analysis of the construction impact is unavailable since the planning of construction is not yet defined in the master plan, although the impact resulting from construction camp establishment may need to be further examined in detail when new information on construction planning becomes available, which may include management of waste from the camp site, increasing pressure on existing resources and infrastructure or on existing institutions.

#### **6. 4. 5. Other Adverse Impacts Examined but Judged Insignificant**

Installation of dam structure on a watercourse is generally deemed to modify the existing stream condition. However the concern is already addressed by adopting open type structure of dam structure design, by which potential changes in hydrology and geomorphologic alteration in sedimentation pattern is minimized.

#### **6. 4. 6. Beneficial Impacts**

Construction of the Sediment Control Structures will have significant beneficial impacts by protecting human life and assets in the downstream area. They include drastic reduction of cost for rehabilitation of the Cota Mil that could be significantly damaged by sediment disaster. Protection of human life and private assets is one of the major project objectives.

### **6. 5 Examination on the Modification of Highway Structures**

#### **6. 5. 1. Temporal Traffic Disruption**

The project may involve temporal traffic suspension of COTAMIL highway that connects the east and west sides of the city during the period of removal of soil foundation and installation of culvert or bridge below the highway. Considering the current traffic volume on the highway, the impact is judged as significant. Guiding vehicle to a bypass route may bring about heavy traffic congestion in the city, and construction of a bypass road may require additional investment cost. In the succeeding period, a least cost option needs to be developed.

#### **6. 5. 2. Water Pollution**

Earthworks for the modification of the highway structure will have a potential impact on water quality of the river. The impacts on water quality induced by the activities are deemed direct, but short-term and of moderate level of magnitude. Due to the proximity to a water body, the impact is highly probable unless an appropriate protocol as part of the project's Environmental Management Plan is developed. Changes in water quality are likely to occur as alteration of pH when cement material is inappropriately managed. Since the river water is not voluminous in the mountainous part as

compared with expected volume of alkaline water produced, buffering reaction of river water is not anticipated. Equipment servicing and fueling is likely to induce contamination of surface water by leakage of waste oil as the construction activity that takes place in and over the water body.

### **6. 5. 3. Noise and Vibration**

Construction works require use of heavy machinery, and although these activities may be intermittent and local, they nevertheless contribute tremendous amounts of sustained noise during equipment operation if the construction site is located close to a residential area. Impacts on noise level during the construction stage are transitory and can be largely mitigated by exercising control measures.

### **6. 5. 4. Potential Air Pollution/Public Health**

Quarries and borrow sites, which are the sources for structure building materials, can have impacts through generation of dust from procured construction materials if it is located close to a residential area. It would result in substantial off-site impacts, unless these sites are rehabilitated.

## **6. 6 Examination on the Channel Work**

### **6. 6. 1. Involuntary Resettlement/Split of Communities**

Consolidation and revetment works involve linear pattern of land acquisition and resultant involuntary resettlement in densely populated urban settings. The impact will have long-term direct effects on the livelihood of the population, resulting in hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. If unmitigated, it may give rise to severe economic, social, and environmental risks: production systems may be dismantled; people may face impoverishment when their productive assets or income sources are lost; people may be relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks may be weakened; kin groups may be dispersed; and cultural identity, traditional authority, and the potential for mutual help may be diminished or lost.

### **6. 6. 2. Traffic Impacts**

The proposed channel works will be executed in a densely populated residential area of the city, which will therefore require Environmental Management Plan specifically developed for this environmental setting. Identified problems include traffic disruption and associated impacts on economic activities during the construction phase. They are direct project impacts having short and reversible nature. Since the traffic system of the project site was not originally designed to accommodate heavy-duty vehicles, there is limited availability of access roads that can serve for

heavy vehicle operation. Therefore, in addition to environmental management plan generally required for construction work, the project will require detailed logistic scheduling, traffic safety measures, detailed planning of waste management.

### **6. 6. 3. Surface Water Hydrology and Coastal Hydrology**

The proposed project option increases the flow velocity of the channel by deepening the depth and widening the width. This may result in changes in hydrology and alteration of sedimentation pattern in the downstream area of the Guaire River. Comparing the volume of the river flow with that of Guaire River, the impact is deemed insignificant at the initial screening level. However, it may need further examination since the economic activity downstream of the river is not identified yet.

### **6. 6. 4. Noise and Vibration**

Construction works require the use of heavy machinery, and although these activities may be intermittent and local, they nevertheless contribute tremendous amounts of sustained noise during equipment operation since the construction sites are position in residential areas. Impacts on noise level during the construction stage are transitory, and can be largely be mitigated by exercising control measures.

### **6. 6. 5. Potential Air Pollution/Public Health**

The impacts on air quality associated with construction activities are moderate localized impacts, short-term and reversible. However, since they are located in a densely populated area, the impact may include: 1) generation of dust due from procured construction materials, and 2) generation of pollutants and dust due to the operation of heavy vehicles and movement of machinery/equipment for material handling, earthmoving, laying of sand, brickbats, metal and stone dust.

Quarries and borrow sites, which are the sources for structure building materials, can have impacts through generation of dust from procured construction materials if it is located close to a residential area. It would result in substantial off-site impacts, unless these sites are rehabilitated.

Other project impact may take place in the construction and operation phase, which are generally judged direct but can be mitigated by incorporating an appropriate protocol as part of the project's Environmental Management Plan.

### **6. 6. 6. Water Pollution**

Earthworks for the modification of the highway structure will have a potential impact on water quality of the river. However, the water bodies where channel work will take place are already heavily polluted as a result of contamination by untreated domestic wastewater. The changes in pH,

nevertheless, may need to be carefully considered in the succeeding study period since it influences the concrete structure.

### 6.6.7. Fauna and Flora

The project impact of construction activities on fauna and flora in the watercourse is judged insignificant as the river is already heavily polluted. However, the construction activity such as site preparation may involve limited range of vegetation loss such as clearing of brushwood and tree removal. To increase positive benefits of the project, incorporation of appropriate mitigation measures and enhancement actions such as compensatory tree planting need to be proposed.

**Table S26-6.1.1 Project Activities Examined**

Activities	Works examined in the analysis	
Planning and Design Phase	Land Acquisition and Relocation	
Construction Phase	Land alteration and Spatial Occupation	Construction camp establishment Site preparation and clearing Earthworks Quarries and borrow sites
	Machine/Vehicle Operation	Equipment servicing Fuelling
Operation	Spatial Occupation	
	Facility Operation	

**Table S26-6.1.2 Impact Matrix (Sediment Control Structure Measures)**

Project: JICA Sediment Control Project

Project Impact Matrix			Overall Assessment	Social Environment							Natural Environment							Pollution Control					Beneficial Impacts											
Project Activity	Phase	Work		Involuntary Settlement	Economic activities	Traffic and Public	Split of Communities	Cultural Asset Issues	Water and common Rights	Public Health Conditions	Waste Disposal	Hazards(Risk)	Other Social Issues	Topography and Geology	Soil Erosion	Groundwater hydrology	Surface water hydrology	Coastal Hydrology	Fauna and Flora	Metereology	Landscape Impact	Other Natural Issues		Air pollution	Water Pollution	Soil Contamination	Noise and Vibration	Land Subsidence	Offensive Odor	Other Impact				
Sediment Control Structures /Access Road	Planning	Land Acqisition/Relocation																																
		Land Alter/Spatial Occup.	○												○																			
	Construction	Equipment servicing / fuelling	○																															
		Quarries and borrow sites	○																															
	Operation	Spatial Occupation	○																															
Facility Operation		○																														◎		
Minor modification of highway structures	Planning	Land Acqisition/Relocation																																
		Land Alter/Spatial Occup.	○		○																													
	Construction	Equipment servicing / fuelling	○																															
		Quarries and borrow sites	○																															
	Operation	Spatial Occupation	○																															
Facility Operation		○																															◎	
Channel Work Consolidation and Revetment Works	Planning	Land Acqisition/Relocation	◎	◎																														
		Land Alter/Spatial Occup.	○																															
	Construction	Equipment servicing / fuelling	○																															
		Quarries and borrow sites	○																															
	Operation	Spatial Occupation	○																															
Facility Operation		○																															◎	

**Table S26-6.3.1 Examined Impacts**

Component	On site	Off-site	
		Specific	Common
Sediment Control Structures	The Construction site and the river alignment extending from the upper reach of sediment catchment area to the border of the national park	Downstream impact area that may be affected from changes in water quality, hydrology and sedimentation pattern including those on Guaire river, and access roads in the residential area for transportation of the construction material	Constructi on camp site, Quarries and borrow sites
Access Road	Road alignment in the national park	-	
Modification of highway structures	The Construction site beneath the highway	Other parts of highway where traffic congestion anticipated.	
Channel Work -Consolidation - Revetment Works	Construction site in the densely populated residential area with informal settlements, extending from the border of national park to Guaire River	Downstream impact area that may be affected from changes in water quality, hydrology and sedimentation, including Guaire river and its downstream to the mouth of the river.	



## **APPENDIX A**

### **CONTENT OF DOCUMENT OF INTENTION**

The Document of Intention will contain following information:

- 1) Objectives of the project
- 2) Justification of the project
- 3) Description of the options to consider for the development of the proposed program or project
- 4) Actions with potential of generation of impacts for each stage
- 5) Planning and Investments Scheduling
- 6) Inversion of estimate
- 7) The information available on the physical-natural and socio-economic components of the environment to be affected by the different options
- 8) Adequate Scale Planning Maps with coordinate (National Cartography)
- 9) Other relevant information for the evaluation of the program or project.

## **APPENDIX B**

### **CONTENT OF EIA REPORT**

1. Preliminary description of the program or project and the environment: Information about design options, location, and the technological processes to be considered will be included during the formulation process of the proposed program or project (to justify it when there are no options).
2. Definition of the influence area of the program or project: Information about the general characteristics of the physical-natural and socio-economic environment that will be affected and that are relevant to the purpose of identifying impacts.
3. Identification of potential impacts associated with the options considered for the development of the proposed program or project: Information will be included on the activities of the proposed program or project with potential of impacts generation on the different components of the environment. The methodology used for the preliminary identification of impacts will be indicated.
4. Proposal on the scopes of the Study concerning the following aspects:
  - (a) Basic information for the implementation of the study, including the identification and justification of the Base Line Studies needed for the evaluation of impacts and the design of the Monitoring Program.

- (b) Methodology to evaluate impacts, pointing out the activities to carry out, the stages to complete, as well as the goals to accomplish in each one of the stages.
  - (c) Description of the preventive, mitigation and corrective measures of the potential impacts foreseen for the considered options.
  - (d) Analysis of the options concerning the design, location and technology, considered during the project formulation process. If possible an economic value will be assigned to the different options for justification of the selected alternatives.
5. Monitoring Program.
  6. Guidelines of the Environmental Supervision Plan, elaborated according to the criteria established in a paragraph of article 28.
  7. Summary document of the Environmental Impact Study.
  8. Work plan: The program for carrying out workshops and the presentation of progress reports will be included, as well as the estimated execution time of the Study.
  9. Work Team: The work team will be shown, including the Consultant that will elaborate the Environmental Impact Study, the composition of the interdisciplinary team that will intervene in its preparation and the areas where they will make their contributions.

The proposal of terms of reference will be adjusted for each particular case and it will be approved or rejected by the Ministry of Environment and Renewable Natural Resources, in a period that will not exceed forty 45 continuous days starting from its presentation. In any case, the decision taken should be expressed and justified, according to what is established in the Organic Law of Administrative Procedures.

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**PROJECT EVALUATION**

*"Working united, we reduce the disaster "*

*Juan Gilberto Nieto Pérez*

STUDY ON  
DISASTER PREVENTION BASIC PLAN  
IN THE METROPOLITAN DISTRICT OF CARACAS

FINAL REPORT

SUPPORTING REPORT

S27

PROJECT EVALUATION

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## **S-27 PROJECT EVALUATION**

### **CHAPTER 1. GENERAL**

Feasibility study on two priority projects for the study was conducted. The priority projects for the study are “seismic reinforcement of buildings” and “early warning and evacuation for debris flow disaster prevention”.

Based on the concept of the master plan, more detail technical, institutional and community study was conducted on both subjects.

Technical study for seismic reinforcement was done mainly for assessment of the strength of a barrio house and engineering reinforcement methodology by using a field test on seismic reinforcement of barrio houses. Technical study for early warning and evacuation placed emphasis on study of critical rainfall value to trigger debris flow from the Avila to the Caracas urban area.

Institutional study for seismic reinforcement focused on existing institutional framework for the project. The institutional study on early warning and evacuation was carried out by preparing a draft agreement to be signed by the related agencies involved such as the Ministry of Environment and Natural Resources, the Metropolitan District of Caracas, three municipalities in the study area and Central University of Venezuela.

The community aspects for both projects were studied through a social survey. Two communities for each project were selected, one from urban area and the other from barrio area, in order to study the feasibility of the project from the viewpoint of community.

The feasibility of the project was studied from “economic aspect” and “financial aspect” as well.

The overall evaluation result of the two priority projects is that both of them are feasible and are necessary to be implemented as soon as possible.

## **CHAPTER 2. EVALUATION OF REINFORCEMENT OF BUILDINGS**

### **2.1 Feasibility Study of Reinforcement of Buildings**

#### **2.1.1. Field Test of Seismic Reinforcement of Buildings**

A field test on seismic reinforcement of barrio houses were conducted as one of the item of additional survey for feasibility study. The detail of the test is described in the Supporting Report S7.

The purposes of the test are:

- to assess the strength of a real barrio house
- to assess the effect of seismic reinforcement of barrio houses

The model two-story barrio houses were constructed on a slope by using the same design concept, the same materials, the same construction techniques and the same workers as the usual construction of barrio houses.

Four types of models were constructed, one is not reinforced and the other three were reinforced with three different techniques in order to assess the effect of different reinforcement techniques. The four model houses were destroyed by a static horizontal force using two hydraulic jacks.

The result is summarized as:

- the strength of existing barrio houses was assessed ,
- the analysis of barrio house strength of each of the two stories by using the result of the field test revealed the fact that one story and two story barrio houses can stand the earthquake intensity of the 1967 earthquake, which explain the damage record of the 1967 earthquake properly,
- the analysis of barrio houses strength of each story showed that three and more storied barrio houses have high probability of collapse by the earthquake intensity of the 1967 earthquake,
- Damage function of barrio houses used before the test result reveals in the Matte Plan is judged correct from the result of the field test,
- the reinforcement by adding grade beams at the foundation strengthens the structure by 40% against earthquake,
- the reinforcement by adding clay brick walls or concrete block walls does not improve the strength of the structure so much, and

- it is possible to estimate the relationship between the reinforcement cost and the reinforcement effect of barrio houses.

## **2. 1. 2. Technical Study of Seismic Reinforcement of Buildings**

### **(1) Seismic Code of Buildings to be Applied**

The judging base of the seismic evaluation and reinforcement plan for each criteria are applied as following seismic code of Venezuela:

- 1) For the judging base of the seismic reinforcement plan of normal existing buildings is applied the seismic code of Venezuela “NORMA VENEZOLANA COVENIN 1756:2001”.
- 2) For the public building’s and buildings in use for a great number of people such as shopping mall and stadium etc. are applied the seismic code of Venezuela 2001 with use coefficient of 1.15.
- 3) For the most strict judging base of the seismic evaluation of existing key facilities is applied the current seismic code of Venezuela 2001 with use coefficient of 1.30.
- 4) For the judging base of the seismic reinforcement plan of non-engineering existing buildings in Barrio and Rural area is the result of the field test of this Study.

### **(2) Proposed Procedure for Seismic Reinforcement**

The seismic reinforcement plan is proceeded on following procedure;

Firstly, necessity of seismic reinforcement of the subject building is judged according to the result of seismic evaluation with seismic capacity as strength and ductility. Then, the feasibility of reinforcement methods is judged on structural condition and building function, and requirement with building owner and/or building operator. If the building has very low seismic capacity, and/or non-economical feasibility then in such special cases, it is judged to be used restrictively or to be demolished.

In normal cases, the subject building will be reinforced by following procedure:

- Prior investigation. Investigate the building function and special requirements etc. from the building owner and/or operator and original design architect, and survey the condition of structural components.
- Definition of reinforcing target. Reinforce the strength or ductility, and/or combine them.

- Selection of reinforcement methods. Select adequate reinforcement methods for each structure.
- Planning of reinforcement. Plan the reinforcement due to the effect of reinforcement, and building function and use.
- Confirmation of reinforcing effect. Estimate seismic capacity and cost of new reinforced structure.

### **(3) Selection of Seismic Reinforcement Methods for Each Building Type**

Seismic reinforcing methods were studied for each type of structures such as RC Structural Buildings, Steel Structural Buildings, Brick and Adobe Masonry Structural Buildings and Non-Engineering Buildings in Barrio and Rural Area.

After applying the above policy, new damage functions were created and new damage estimation was made with the seismic reinforcement project.

As a conclusion, the project of seismic reinforcement of buildings is technically feasible including barrio houses.

#### **2. 1. 3. Institutional Study of Seismic Reinforcement of Buildings**

Institutional study started from the assessment of existing institutional and legal structure for seismic reinforcement of buildings.

The latest building code is the one issued in 2001. This code has been applied to only buildings newly constructed after the enforcement date, not to the buildings that had already stood or been under construction on the enforcement date. Such buildings had been immune from the 2001 code and are legal but not compliant with the 2001 building code.

There is no law or policy of seismic reinforcement of such buildings at present at central and local government level. Accordingly, a new institutional framework is proposed in the study for the purpose of this project.

##### **(1) National government**

A new ministry named “Ministry of Housing” was created recently merging various housing development authorities before, making CONAVI as the core of the organization. The Ministry of Housing is in charge of policy making of all buildings in the country and the project of seismic building reinforcement should be in the hand of the ministry in terms of basic policy making.

As the existence of buildings being weak against earthquakes is a huge problem, the central government is required to take the initiative in solving this problem although principally the project should be carried out by the building owners.

With respect to the barrio houses, according to the social survey, it is rather difficult for barrio people to pay all the cost of the building reinforcement although the reinforcement cost is averagely 10 % of the new construction cost. Therefore, it is necessary for the Ministry of Housing to take the initiative in barrio house reinforcement by introducing subsidy for the cost.

The following responsibilities are proposed for the Ministry of Housing to assume:

- To legislate policy and procedure for seismic reinforcement of buildings,
- To establish building code,
- To recommend reinforcement methods,
- To implement government building reinforcement, and
- To initiate barrio house reinforcement project.

## **(2) Metropolitan Government of Caracas**

ADMC is in charge of disaster prevention of the Metropolitan District of Caracas and should prepare a basic policy of seismic reinforcement of buildings in the area. The unique feature of the Metropolitan District of Caracas is that more than half of the population lives in barrio houses which are the most vulnerable structurally against earthquake.

Therefore, ADCMC should prepare a policy on how to cope with the seismic reinforcement of barrio buildings.

The following responsibilities are proposed to ADCMC:

- To prepare risk maps of ADCMC,
- To prepare ordinances for the purpose,
- To prepare barrio houses reinforcement policy, and
- To implement government building reinforcement

### **(3) Municipal Government**

The municipal governments have authority to permit building development. Therefore, the municipal government is the one to implement the project directly.

It is proposed that the engineering office of each municipality should perform RVS (rapid visual screening) based on the methodology authorized by FUNVISIS. The municipality office shall have the authority to designate safe buildings after the RVS and issue an official sign (certificate) of seismic safety.

The municipal government also shall promote the policy of seismic reinforcement of buildings by employing various incentives such as subsidy or low interest loan for reinforcement cost or tax exemption for reinforced buildings.

#### **2. 1. 4. Community Study of Seismic Reinforcement of Buildings**

Two communities were selected for survey of building reinforcement policy. The two communities are La Margarita in La Vega and San Bernardino, both in Libertador municipality.

The social survey was conducted in order to assess the acceptability and willingness to invest in the building reinforcement.

As a part of the survey, experts of Seismic Disaster Prevention and People's Organization of the JICA Study Team went into the two communities with local consultants and had meetings with the community people, explaining the result of the field test survey and the proposal of the JICA Study Team on seismic reinforcement of buildings and listened to their opinion about the proposal.

The result of the survey is summarized as;

- (1) People in barrio have wrong perception about the strength of their houses because of little damage in 1967 earthquake, when most of the barrio houses were one or two storied.
- (2) It is possible to let the people in barrio to realize the present risk of their houses by utilizing the photos, videos and charts showing the field test result of this Study.
- (3) Once the people in barrio area realize their risk, they are concerned about the strength of their houses but affordability of seismic reinforcement is low and they are expecting subsidy by the government.
- (4) People in urban area have knowledge in vulnerability of their houses and they can afford the cost but there is a strong distrust toward the policy of the government. It is necessary to forge credibility toward the government before mobilizing them for reinforcement projects.

## **2.2 Project Summary**

### **2.2.1. Project Outline**

To reinforce buildings in the Study area, the project will take the following four components.

- 1) Rapid Visual Screening (RVS)
- 2) Seismic Evaluation
- 3) Seismic Reinforcement
- 4) Reinforcement work

Beginning with RVS, a total number of 182,760 out of 314,657 existing buildings, or 58%, in the Study Area are planned to be reinforced. The detailed distribution of buildings for each step is summarized in Table S27-2.1.

### **2.2.2. Reinforcement Level**

The following seismic codes of Venezuela are applied to evaluation of the seismic resistance of buildings and reinforcement level.

#### 1) Buildings in urban area

- Normal existing buildings: applied the seismic code of Venezuela “NORMA VENEZOLANA COVENIN 1756:2001”.
- Public building’s and buildings in use for a large number of people such as shopping mall and stadium etc.: applied the seismic code of Venezuela 2001 with use coefficient of 1.15.
- Existing key (important) facilities: applied the current seismic code of Venezuela 2001 with use coefficient of 1.30.

#### 2) Buildings in Barrio and rural area

- For reinforcement level of buildings in barrio areas, the level that can be achieved at cost of about 10% of new construction of barrio houses is targeted.

### **2.2.3. Project Implementation Schedule**

The project implementation schedule is as shown in Figure S27-2.1. The project will be starting with conducting VRS for 3 years, following that subsequent Seismic Evaluation will last for 13 years, Seismic Reinforcement Design, 13.5 years and reinforcement work for 14 years until 2020.

#### **2. 2. 4. Effect of the Implementation of the Project**

With the project of reinforcement of buildings, damages are estimated to reduce as shown in Table S27-2.2. The implementation of the project is estimated to reduce the number of heavily damaged buildings from 10,020 to 1,306, and human casualty (death and injury) from 4,908 to 440.

#### **2. 2. 5. Cost Estimate of Seismic Reinforcement of Buildings**

##### **(1) Unit Cost of New Building Construction Work (Building Replacement Cost)**

JICA Study Team investigated each cost of new building construction work otherwise building replacement cost as shown Table S27-2.3.

The typical rough unit cost of building replacement work in Caracas as shown in Table S27-2.4.

##### **(2) Total Cost of Replacement and Seismic Reinforcement of Existing Buildings**

According to the building inventory data, JICA Study Team assumed and investigated the building numbers and total floor area for each uses, the cost of building replacement and seismic reinforcing work of existing buildings in study area. Through our seismic evaluation and reinforcement planning, we assumed and investigated required ratio for seismic evaluation and reinforcement work, and cost of seismic reinforcement per building replacement cost.

The total floor area, total cost of replacement and seismic reinforcement work of existing buildings in study area are shown in Table S27-2.5.

Number of Buildings in each area and uses are shown in Table S27-2.6.

Ratio of required seismic evaluation and reinforcement, and cost of seismic strengthening per replacement cost for each category of existing buildings are shown in Table S27-2.7.

#### **2. 3 Framework of Evaluation**

In the case of 1967 earthquake simulation, around 10,000 buildings in the study area will be heavily damaged and the same order of number of people will be injured or killed.

As the first goal of the plan is to protect human lives from the disaster, a project contributing to it will be the priority project. As there is no way to alert and evacuate people in the case of an earthquake and most casualties by building collapse occur almost instantly in an earthquake case, only mitigation measures can save the lives of the people.



Among mitigation measures studied here, resettlement of people from risky structures is very difficult and it will take quite a long time to implement. Therefore, building reinforcement will be the only probable way in near future in order to attain the first goal of the plan, to protect human lives.

Project of reinforcement of buildings involves a variety of stakeholders including building owners, most of whom are private individuals. A variety of institutional arrangements are needed in order to implement the project effectively. The nucleus of the project is willingness of the building owners to reinforce their buildings when they know the fact that their property is vulnerable to a major earthquake motion. The project requires a huge amount of investment because of its coverage.

Under this situation, for the project of building reinforcement, the evaluation criteria are selected as follows:

- Economic aspect is evaluated with cost-benefit analysis;
- Financial aspect is studied to investment plan of this huge project comparing with the various budgets of governments;
- Technical aspect is studied to confirm the local technological level for reinforcement especially for non-engineering buildings, is evaluated;
- Institutional framework is evaluated in terms of legal framework, and other arrangement to promote reinforcement of buildings from rapid visual screening to reinforcement work; and
- Community aspect is studied on how community will contribute to promotion of reinforcement of buildings

## **2.4 Economic Aspect**

### **2.4.1. Frame of Economic Evaluation**

Benefit of the reinforcement of buildings is conceived as reduction of cost caused by earthquake disaster. Cost of natural disasters can be categorized into three; economic cost, human cost including loss of life and personal injuries, and ecological cost among other damage to ecosystem. Economic cost can be expressed in monetary terms, yet the other effects are difficult to quantify.

Economic loss caused by natural disaster can be categorized into three items: direct loss, indirect loss and secondary effect of the disaster. Figure S27-2.2 shows the links of those damage items. Direct cost relates to physical damage to capital assets, including buildings, infrastructure, industrial plants, and inventories of finished, intermediate and raw materials destroyed or damaged by the disaster.<sup>1</sup>

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<sup>1</sup> Paul K. Freedman et al., "Catastrophes and Development Integrating Natural Catastrophes into Development Planning,"

Indirect cost includes outputs that come from damaged or destroyed assets and infrastructure and loss of earnings due to damage to infrastructure such as roads and airports. Secondary and macroeconomic effects take into account the short and long-term impacts of a disaster on aggregate economic variables.

Among them, reducing human loss is the prime goal of the basic plan, and reducing assets damage is the second, and maintenance of urban function is the third.

The economic analysis would tell which policy decision makes sense in terms of economic costs. However, there is difficulty to evaluate disaster damage in cost-benefit analysis in monetary terms. The reasons are that: 1) placing a monetary value on human life has not reached acceptance; 2) placing a monetary value on speculation of damage and disruption of economy is still an inexact process; 3) prediction when and how disaster will impact any particular buildings or place cannot be done accurately, so the earthquake damage on building is unclear, and 4) real-life testing before and after the project implementation is not possible.

Accordingly, in this analysis, quantitative limitation and data limitation, not all losses can be evaluated in monetary terms.

#### **2.4.2. Benefits**

In this disaster prevention study, *benefit* is conceived as reduction of damage by the project. Accordingly, based on the damage link, reduction of direct damage, indirect damage and secondary damage are calculated or estimated as much as possible, under the limited available data.

The damages caused by the 1967 earthquake scenario are used as the damage for economic analysis. Thus, reduction of the damage is difference between the damage caused by the 1967 earthquake scenario in case without project implementation and in case with project implementation.

##### **(1) Reduction of Direct damage**

###### Heavily damaged buildings

Based on the 1967 earthquake scenario, the damage happens only on buildings and human. No damage on infrastructure and lifelines, and structures.

As reduction of building damage, damage to heavily damaged buildings and moderately damaged buildings are calculated. Heavily damaged buildings should be replaced to use, while moderately damaged buildings can be used by only repair.

Damage to heavily damaged building is calculated as replacement cost of the building. Damage to moderately damaged buildings is calculated as repair cost of the buildings.

In case of the 1967 earthquake scenario, 10,020 buildings are heavily damaged and reinforcement of the buildings will reduce this number to 1,306.

The buildings and human damages in cases with and without project are summarized in Table S27-2.8. Damage to the heavily damaged buildings are 363 MUS\$ in case without the project, and 68 MUS\$ in case with the project, with the difference of 295 MUS\$.

#### Human Damage

In the 1967 scenario earthquake, 602 people are estimated to be killed. And the reinforcement of buildings is expected to reduce this number down to 51 people, by 551 people. For the economic analysis in this study, the Study Team provisionally calculated the reduction of human damage in monetary term as follows:

The value of human life is assumed as the amount of lifetime earning in this provisional calculation.

Lifetime earning of a person is calculated as accumulation of the yearly income for the working years of the person. The average earning of the people of the study team is not available to the Study Team; thus in order to simplify the calculation, the GDP per capita is used as the yearly income. The GDP per capita for the whole nation is 4,080 US\$ (2002), according to the World Bank's country profile. It is assumed that that of Caracas is 50 percent larger than the national average, then 6,000 US\$ per year.

The average age of the population of the Study area is 30.02 years old based on the 2001 Census data by age distribution. People are supposed to work until 65 years old. Accordingly, 35 years, 65 years minus 30 years, is used as the average working years. It is calculated that a person is expected to  $6,000 \text{ US\$/year} * 35 \text{ years} = 210,000 \text{ US\$/person}$ .

Without the project case, 602 people are estimated to be killed and with the project 51 killed. The reduction of the value of human loss is calculated as 115 MUS\$, from 126 MUS\$ down to 11 MUS\$, as shown in Table S27-2.9.

#### (2) Reduction of Indirect and secondary damage

Indirect and secondary damage caused by earthquake is difficult to estimate in the Study area due to limited statistical data and research on economic damage assessment about the past earthquake that happened in the country.

1) Estimation of Caracas economy

The statistical data about Caracas economy is not available but only national account data is available. Venezuela's gross domestic product (GDP) is 85,748 MUS\$ in 2003. It is assumed that Caracas holds about double of the population proportion to this GDP because of its economic concentration. Caracas economy is estimated as follows:

$$\text{Caracas economy} = (\text{National economy}) \times (\text{Population proportion to the national total}) \times 2$$

Based on the 2001 census, the population of Venezuela is 24,915,902 and the Study Area has 2,740,381. Accordingly, Caracas economy is estimated as 18,862 MUS\$.

2) Damage to Economy in the Study Area

Because there is no data about economic damage caused by earthquake, economic damage is estimated on the following assumptions.

- It is assumed that damage to the economy of the Study area is proportion to the damaged floor areas to the total floor area of the office buildings. It is assumed that 15% of the buildings in urban area, of which 30% is 1 to 3 stories, 40% is 4 to 8 stories, and 30 % is 9 stories or more, and 15% of masonry buildings. As shown in Table S27-2.2, based on the number of existing buildings, office buildings are estimated 3,578 for 1 -3 stories, 5,010 buildings for 4 - 8 stories, 3,758 buildings for 9 stories and more, and 1,536 buildings. And total floor area of office buildings is estimated as 17,676,500 m<sup>2</sup> in the study area. Damage to these buildings is expected to affect adversely the economy of the Study Area.
- It is assumed that office buildings heavily damaged will be not a large companies who are influential to the economy of the study area because large industries are housed in rather modern buildings which are relatively resistant to earthquake and likely to survive and have less affect. Consequently, ratio of half the floor area is influential to the economy.
- Economic activities of heavily damaged buildings will take half a year to return to the normal operation
- The damage is estimated as:  
Economic damage = Economy of the Study Area x (ratio of floor area of heavily damaged office buildings to the total floor area of office buildings in urban area) x 0.5 x (half year)

3) Reduction of Damage to Economy in the Study Area

Following the assumption above, the damaged floor area of office buildings for both cases without the project and with the project are summarized in Table S27-2.10.

The Case without project shows the damage in a floor area is 705,500m<sup>2</sup>, or 4.0% of the total office building floor areas in the urban area. Accordingly, the economic damage caused by the damage to office buildings is estimated as 188 MUS\$.

In case with the project, damage is estimated as 1.3% of the total office floor in the urban area, and the economic damage is estimated as 63 MUS\$.

Therefore, the reduction of damage is 125 MUS\$.

#### 4) Reduction of Damage to National Economy

Estimation of effect on the national economy by earthquake is not available in Caracas. Accordingly for damage to national economy as secondary effect of the damage, it is assumed that economic damage to the study area will effect the economic damage to the economy of the rest of the country by about 10% of the economic damage of the study area.

Damage in case without the project is estimated as  $376 \times 10\% = 18.8$  MUS\$, and that in case of with the project is estimated as 6.3 MUS\$.

Damage in case with the project is estimated as 12.5 MUS\$.

### (3) Reduction of Emergency Response Cost

#### 1) Rescue operation cost

In event of earthquake, emergency response will be carried out. Based on the estimation by Civil Protection of AMDC, rescuing victims from collapsed buildings in earthquake situation costs 1,300 US\$ per person, in average.<sup>2</sup>

People affected in the case without the project is estimated 76,000 persons and 11,000 persons in the case with the project, based on the number of heavily damaged buildings and population density. Most of them are rescued by themselves, families and neighbors.

In the case of the 1995 Kobe earthquake, it was estimated that 164 thousand people were trapped under rubbles of the collapsed buildings, instantly after the earthquake happened.<sup>3</sup>

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<sup>2</sup> The cost for mobilization of equipment per operation, about 500,000 US\$, shall be added for setting up of the operation.

<sup>3</sup> Firefighting Agency, Tokyo Metropolitan Government, "Elucidating Factors of Risk to Human Life in the Event of

Among such victims, 35 thousand people were not able to escape by themselves; of which 27 thousand people were rescued by neighbors, and around 7,900 people were rescued by uniformed officers.<sup>4</sup> It summed up that around 8,000 people out of 160,000 people, 5% of the trapped, were rescued by the uniformed officers.

It is assumed in the case without the project that half of 76,000 affected people, 38,000 people are to be trapped under the rubbles and 5% of them, 1,900 are to be rescued by uniformed officers. The rescue operation would cost around 3.00 MUS\$ including mobilization cost of 0.5 MUS\$.

In the case with the project, likewise half of the 11,000 affected people, 5,500 people, are to be trapped and 5 % of them or 280 people will be rescued by the uniformed officer. The cost to rescue those people is 0.89 MUS\$ including mobilization.

The difference of the cases without and with the project is 2.1 MUS\$.

## 2) Medical related cost

In the event of earthquake, many people are expected to be injured and some of them are to be hospitalized. Medical cost varies considerably one patient to another dependent on the degree of injury. In this analysis, as referential average cost for a patient has been employed to estimate the medical related cost in case of earthquake disaster.

According to the referential estimated average cost for a victim per day<sup>5</sup> in Emergency medical treatment cost for a victim per three days at hospital is estimated 600 US\$, according to interview with an official of Civil Protection Metropolitan. It is assumed that victims in emergency will be hospitalized 15 days in average. In case without the project, 430 people will be hospitalized, and 40 persons are estimated to be hospitalized in the case with the project. The hospitalization cost is 3.0 MUS\$. It is estimated that 40 people would be hospitalized in the case without the project, and cost 0.9 MUS\$.

Table S27-2.11 summarizes the results. The project would reduce the cost by 2.1 MUS\$.

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Earthquake and Countermeasures. The figure was estimated by 57 thousand houses multiplied by 2.87 persons/house, that the number of the houses was almost half the total heavily damaged building, 112,000 heavily damaged and burnt-down houses.,

<sup>4</sup> Kawata, "Estimation of human damage caused by large earthquake," *Natural Disaster Science*, vol. 16, No.1, 1997, p.8

<sup>5</sup> Hospital de Clinica Caracas

**(4) Reduction of Debris clearance Cost**

In case of earthquake, much debris will be created from the damaged buildings. The debris has to be moved to somewhere away from downtown area. In this study, 5 km is applied as average length of carriage of debris. Table S27-2.12 summarizes the results. The cost is estimated to be 32 MUS\$ without the project and 4.2 MUS\$ in the case with the project.

**(5) Reduction of Temporary housing Cost**

In the process of emergency response, temporary houses to accommodate the evacuees are needed before they reconstruct their houses in the reconstruction period.

People living in the heavily damaged buildings have to be accommodated in temporary houses prepared by the government before their permanent houses are prepared. It is assumed that half of the evacuees would go stay at their relatives' or return to their home country, and the remaining half requires temporary houses until they acquire their own place to live.

In the case without the project, a total of 76,400 people are estimated affected. 4.5 persons per house is used to estimate the necessary number of houses. 17,000 families are affected, and half of the families, about 8,500 families are estimated to require temporary houses. Likewise, in the case with the project, some 1,240 temporary houses are estimated to be necessary.

In this study, a unit of temporary house cost is assumed to be 1,000 US\$. Table S27-2.14 illustrates the cost estimation both in the case without the project and with the project. They are 8.5 MUS\$ in the case without the project and 1.2 MUS\$ in the case with the project, respectively.

**(6) Total Reduction of costs**

Total reduction of costs that are quantified in this study are shown in Table S27-2.14, summarized as follows:

- Direct damage: Reduced 375.4 million US \$ from 439.6 million US\$ to 64.2 million US\$
- Indirect and secondary damage: Reduced 165.3 million US \$ from 281.6 million US\$ to 116.3 million US\$
- Rescue and Recovery Cost: Reduced 42.2 million US \$ from 49.0 million US\$ to 6.8 million US\$
- Total: Reduced 582.9 million US \$ from 770.2 million US\$ to 187.4 million US\$

### 2.4.3. Costs

The project of reinforcement of buildings starts with diagnosis of the necessity of reinforcement of buildings. In the seismic reinforcement project, a total of 182,760 buildings are planned to be reinforced; however, as cost analyzed in the economic analysis, the cost that accrues the benefit, namely, the cost for reinforcement of a total of 10,020 buildings (1,018 in urban area and 2,002 in barrio & rural area) is employed, even though it is not possible to pinpoint which buildings are the ones. And this cost is different from the financial cost for the entire reinforcement project including the reinforcement of all the 182,760 buildings. As shown in Table S27-2.15 the total project cost is as follows:

- RVS fee: 0.38 million US\$ (exclusive of IVA)
- Seismic Evaluation fee: 11.4 million US\$ (exclusive of IVA)
- Seismic Design fee: 12.7 million US\$ (exclusive of IVA)
- Construction Cost: 53.5 million US\$ (exclusive of IVA)
- Total: 77.9 million US\$ (exclusive of IVA)

### 2.4.4. Economic Evaluation

#### (1) Annual Benefit

For economic evaluation, annual benefit accrued by the project is to be estimated. In this study, the annual benefit is estimated as follows:

Annual benefit = Total reduction of damage x annual probability of earthquake occurrence (1/return period).

It is said that the return period of earthquakes size of the 1967 is around 50 year to 100 years. However, the only concrete figure available about the return period of such earthquake is that by Fiedler G. He stated in “Resultados de Estudios Sismicos en Venezuela, precauciones prerenctivas, I. Simposio Nacional sobre Calamidadas Públicos, Instituto Sismológico, Caracas, 1962., that the return period of the earthquake in Caracas was 60 plus/minus 9.5 years. This means that an earthquake size of the 1967 earthquake happens at return period of 50.9 year to 69.5 years. And although earthquakes smaller than this size may happen at shorter return period, they are not expected to cause damage to Caracas.

Accordingly in this study, the JICA Study Team employs the longest return period of 69.5 years for the 1967 earthquake scenario for the economic analysis.



Therefore, in the study, annual expected benefit is estimated as the total benefit divided by 69.5.

## **(2) Results**

The result of economic analysis is shown in Table S27-2.16. It shows that  $B/C = 0.989$ , and  $NPV = - 0.33$  MUS\$. Simply based on results calculated with the benefits that are estimated quantitatively, the project is slightly unfeasible from economic point of view.

## **(3) Conclusions**

- Based on the provisional economic analysis, the project shows that benefit and cost are almost even..
- The project contributes much to reduction of human casualty that is the primary goal of the Master Plan.
- In barrio areas, if the project will be implemented as self-help type work or with community people used as workers with governmental financial support, the reinforcement of buildings might contribute to local economy.

The Study team would recommend pursuing this project even though the preliminary economic analysis does not show favorable result, because of the reduction of human casualty

## **2.5 Financial Aspect**

### **2.5.1. Public Sector**

The total cost of reinforcement project, inclusive of IVA, is 2,581 MUS\$. The cost, or investment on reinforcement, is allotted based on the implementation schedule. The annual cost of the project is shown in Table S27-2.17.

This project will not make any profit, but will reduce damage to people and property.

In this term, from the financial aspect, the total cost of the project has been compared with the various budgets of national and AMDC governments to examine the size of the project cost in financial term.

Table S27-2.18 compares the project cost with GDP (2003), national budget (2003), Ministry of Infra (2003), AMDC budge (2003), and budget of newly established Ministry of Housing (2004). Total cost of the reinforcement of buildings (2,581 MUS\$) accounts for 3 % of GDP in 2003, and 9.9% of the national budget of 2003. When the annual cost is compared with them, the cost is about 0.2 % of GDP and 0.7% of the national budget at most

### **2.5.2. Individuals**

Considering that most of the buildings are privately owned and their reinforcement is subject to decision of the owners. The study team conducted the community pilot study with La Vega in barrio area and San Bernardino in urban area both in Libertador to study the community's role in reinforcement of buildings. Based on the social survey, when they understand the vulnerability against earthquake, they still have limited willingness to spend on reinforcement even though they would like to reinforce the buildings.

Urban community can spend some on reinforcement.<sup>6</sup> On the contrary, barrio people have different tendency to invest on reinforcement. Barrio people with relatively much assets have intention to invest on reinforcement to protect their property while the people of the lowest strata cannot afford because their central concern is how to secure daily necessities rather than protecting their scarce property from earthquake. In either case, they need public support for reinforcement.

### **2.5.3. Conclusions**

- Comparing the project cost with national budget or other sources, the project has a large impact on public budget.
- This shows the case where all the cost covered by the public sector. However, in reality, individual owners have to pay. The amount the government shoulders have to be discussed further.
- The project's target and schedule should be further discussed, taking into account the both government and building owners financial limitation.
- For barrio houses, the governmental financial support shall be need more than urban areas.

## **2.6 Technical Aspect**

### **2.6.1. Technology Level**

Technically, the project is feasible with local technical level. Even non-engineering buildings located in barrio areas can be reinforced with local technology. As for non-engineering buildings, the Study Team conducted to field test of barrio houses to check how much the existing barrio houses can be reinforced with simple reinforcement ways. Through the simple reinforcement with grade

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<sup>6</sup> In the community workshop, as an example, the following calculation was done: The price of one apartment building of four apartments per floor about 70 to 80 square meters each, with twelve floors, ranges between 90 to 140 million of bolívares. Divided by floors and apartments, the single apartment cost of reinforcement (using 10% of cost of building as reinforcement cost, according to broad estimates from JICA Study Team Experts) is about 9.8 million Bs. People's willingness to pay for this is negative at first, however a simple calculation of monthly installment breakdown, say some 20 thousand Bs per month per each family member, is acceptable by the community people.

beam can reinforce barrio building considerably with the ordinary construction method and materials that are used usually by barrio contractors.

Thus, reinforcement of buildings is technically feasible to secure the reinforcement quality.

### **2. 6. 2. Construction Capacity**

In terms of quality, the project is technically feasible, however, in terms of quality, base on the implementation schedule, a great number of buildings are to be diagnosed, evaluated, designed and reinforced.

During the first three years of RVS period, 100 engineers are needed for RVS every year. After the RVS, detailed seismic evaluation requires 800 engineers every year for 13 years, and seismic reinforcement design are estimated to need 640 engineers every year for 13.5 years. Table S27-2.19 summarizes the numbers of buildings to be screened, evaluated, and designed and reinforce until 2020. Number of buildings to reinforce is about 13 thousand annually for 14 years. Of them, barrio and rural areas occupy around 10 thousand buildings.

Such a large number of engineers and construction workers are to be employed not only from Caracas but also from the entire country or abroad. However, labor force might be available in barrio areas for unskilled labor work from under- or un-employed labor-force, which is expected to give a positive effect on local economy.

## **2. 7 Institutional Aspect**

### **2. 7. 1. Current Situation**

Reinforcement of buildings includes various actors and thereby requires institutional arrangement. However, reinforcement of buildings has not been a major agenda in disaster management in Caracas. The project contains from RVS to reinforcement work, involving public agencies to individual people. Accordingly, a variety of institutional arrangements should be made. .

Under this situation, institutional aspect in the project of reinforcement of buildings is evaluated. As discussed in Supporting Report 6, the present situation about the institutional settings about seismic reinforcement of buildings is summarized as follow:

- Less focus on reinforcement: There has never been an institutional experience of seismic reinforcement building program neither in Caracas city nor in Venezuela.
- Current treatment of reinforcement of existing buildings: The legal and institutional framework that is necessary to support the seismic reinforcement of buildings requirements for the 1967

Earthquake Scenario does not exist. The actual legal tools<sup>7</sup> are neither specific nor strong enough to guaranty that the technical recommendation of the actual seismic code became applied.

- Many agencies expected to be involved: The unusual size and complexity of the seismic reinforcement project demand important efforts on legal design and inter-institutional coordination. No matter the important role that could be assumed at the metropolitan or municipal level in the first diagnostics steps (RVS: rapid visual screening), the decision level necessary to support the financial aspects of the whole project goes to the highest levels of national government.
- Need to be a national project: A seismic building reinforcement project demands a political and financial effort that only can be decided at the highest political decision level of the country. This project must be considered by the recently created Ministry of Housing and, even more, must be presented by this ministry to the president of the country in order to take a high level political decision on this matter.
- Role of AMDC and municipalities: A part of the national decision making necessary, a program for implementing the first diagnosis steps of the seismic reinforcement building project (the Rapid Visual Screen process) must be implemented and coordinated by the Alcaldia Metropolitana through a Special Technical Commission composed of the Offices of Municipal Engineering from Libertador, Chacao, Sucre, Baruta and El Hatillo as they are charged in the Organic Municipal law with inspection and application of technical methods related to buildings.
- Agencies to be involved for seismic reinforcement program: Additionally, national public institutions and programs related with urban development and housing as the Urban Development Fund (FONDUR), the National Housing Institute (INAVI), the National Housing Council (CONAVI), the Community Development Foundation (FUNDACOMUN), and the unique social fund (FUS) must created mechanisms to include seismic reinforcement programs as part of the general offer that they have to citizen, and specially to those who lives in the uncontrolled urban spaces. All these institutions must also to include in a transversal way the physic vulnerability mitigation of buildings inside the financial and technical programs that they already have.
- Institutes for technical support: To cover the technical support for this project, formal agreements must been established between the mentioned national and metropolitan institutions and high level research groups include as the Institute of Materials and Structural Models (IMME) and the Urban Planning Institute, the Central University of Venezuela (UCV), the Center for Engineering

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<sup>7</sup> Norma Edificaciones Sismorresistentes COVENIN 1756-98 (Rev. 2001) states reinforcement on existing constructions (Chap. C-12). However, it is not clear who controls it and how.

Materials Technology, the Foundation for Research and Development at Simon Bolivar University (USB) and the Center for Urban Design at the Metropolitan University (UM).

- Reinforcement of buildings as agenda: More than creation of legal framework to support inter-institutional coordination for seismic reinforcement activities, it is necessary presently to create an institutional platform where the reinforcement of buildings could be recognized and understood. If there is no such platform, it is very difficult to convince institutions to open programs on seismic reinforcement. An important opportunity to create the platform is open now at the National Assembly, where five important law projects related to seismic reinforcement are under discussion. Those laws projects are:
  - Organic Law Project for Urban and territorial ordering.
  - Law project of the loan housing system.
  - Law project of the housing system and habitation politic.
  - Law project for the housing subsystem Reforming
  - Law project of Land Tenancy in Barrios.

### **2.7.2. Summary**

- First of all, in Caracas, reinforcement of existing buildings is just stated in the COVENIN and how to promote it has not been discussed and there has not been clear policy on that.
- Many steps should be taken for promotion of reinforcement of buildings. However, starting with the seismic COVENIN, the institutional arrangement can be established, including roles of the central and local governments and institutions for promotional activities, financial support, technical support, and implementation.
- The recent establishment of Ministry of Housing is reflecting that the central government emphasizes the housing policies. Taking advantage of this opportunity, AMDC encourage national government to conceive the reinforcement of buildings as national project.

### **2.8 Community Aspect**

To promote the project of reinforcement of buildings, enhancement of the awareness of people about the importance of the reinforcement of buildings is one of the most important factors because most of the buildings are owned by individuals. Besides raising such individual awareness, people's willingness to reinforce their buildings is a key to the success of the project.

In this study, to grasp the perception of people about reinforcement of buildings, the social survey were conducted in an urban community of San Bernardino, Libertador and a barrio communities of La Vega, Libertador, both of which are estimated to a suffer from higher rate of heavily damage buildings

under the 1967 earthquake scenario (for detail, see Supporting Report S24).<sup>8</sup> In both communities, through workshops with the JICA Study Team's expert, the communities understand the importance of reinforcement of buildings. Barrio community is more actively to reinforce their buildings. This positively means that with proper financial assistance, people are willing to reinforce their houses.

In barrio area, they are consolidated as unit and ready to take a collective action about reinforcement, as long as they can have a financial resource. The social survey also reveals that the higher stratum of the barrio society is likely to invest in reinforcement of their buildings while the lower strata of barrio has less affordability to spend on reinforcement. If governmental financial support will be realized they are willing to reinforce their houses.

In urban community, they understand the importance of the reinforcement of buildings. However, the community has strong distrust about the deed of the government. This distrust would hamper the promotion of the reinforcement of buildings as long as the project is promoted as governmental initiatives. Therefore, rapport building between community and government would be one of the first steps that are mandate to promote reinforcement of buildings in urban area. With respect to financial aspect, the people in urban community have willingness to invest their own in reinforcement as long as the amount is affordable.

Community or community organization plays important role in diffusion and dissemination of importance of building reinforcement. Community as collective entity has a bargaining power with governments in case they request in reinforcement of buildings. Once a community will have reinforced the houses of community members, this is expected to have a demonstration effect to other communities or owners of earthquake vulnerable buildings.

## **2.9 Conclusion**

- The project is judged is most effective to protect life of people from earthquake under the 1967 scenario case. The project of reinforcement of buildings aims primarily at protecting life of people. In this sense, this project is effective although the project cannot prevent 100% of human casualty.
- The provisional economic analysis shows that the benefit and cost of the project is almost even based on the quantified variables.
- This project needs a huge investment in financial terms. Financial aspect is a key to implementation of the project even though this project has a huge contribution to damage

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<sup>8</sup> The Study Team conducted social survey at urban community in San Bernardino and barrio community in La Vega, both in Libertador municipality.

reduction. Based on the social survey, people have willingness to invest in reinforcement at a certain level. To promote this project, the following should be further discussed within the related agencies.

- Incentives for building owners such as subsidy, tax cut, low interest loan, or insurance system, taking into account the financial limitation of both public and private sectors.
- Promotion of people's understanding about the importance of reinforcement.
- Institutional arrangement shall be started with putting the reinforcement of building as agenda. And the other institutional arrangement in financial and technical matters shall follow.
- Communities, once they understand their vulnerability to earthquake, are willing to reinforce buildings, but this again requires financial support from the government. However, the urban community has a relative lack of trust toward the government, therefore it is critical that governments build rapport or win trust from community.

**Table S27-2.1 Number of Buildings of Reinforcement by Area**

	Urban	Barrio +Rural	Total
Total	83,499	231,158	314,657
RVS	62,620	184,900	247,500
Seismic Evaluation	50,080	166,400	235,010
Seismic Design/Reinforcement	40,060	142,700	182,760

Source: JICA Study Team

**Table S27-2.2 Effect of the Project on Damage**

Damage item	Area	Without project	With project
Heavily damaged buildings (number)	Total	10,020	1,306
	Urban	1,018	421
	Barrio & rural	9,002	885
Human casualty (death & injury) (persons)	Total	4,908	440
	Urban	1,568	266
	Barrio & rural	3,387	174

Source: JICA Study Team

**Table S27-2.3 Reference Price in Caracas as of February 2004**  
**(1920Bs = 1US\$)**

<b>A. Basic Materials: (+IVA)</b>	
1. Ready mixed Concrete: Fc250	240,000 Bs/ m <sup>3</sup> + Labor cost
2. Concrete in site mixing	200,000 Bs/ m <sup>3</sup> + Labor cost
3. Reinforcing Bar: fy 4,200 (12m length)	1,400 Bs/ Kg : 1 package: 2 tons
4. Steel fabric mesh	1,500 Bs/ m <sup>2</sup>
5. Brick 15 cm in thickness	380 Bs/ No.                      17 Nos./m <sup>2</sup>
6. Concrete Block 15 cm in thickness	500 Bs/ No.                      17 Nos./m <sup>2</sup>
7. Cement	10,000 Bs/ package              42.5 Kg/ 1 package
8. Gravel/ Sand/ Plastering material	18,500/ 22,500/ 20,000 Bs/ m <sup>3</sup>
9. Wooden form: Plate; 0.3m x 2.4m x 25mm	30,000 Bs/ m <sup>2</sup> : for Beam & Column
Sheet; 1.2m x 0.6m x 25mm	10,000 Bs/ Bs: for Slab & Wall
Square Bar; 50mm x 100mm	3,000 Bs/ ml: for Support
10. Ceramic Tile: 33cm x 33cm	10,000 Bs/ m <sup>2</sup> : 9 units/ 1m <sup>2</sup>
<b>B. Material and Labor: (+IVA)</b>	
1. New Construction (Total Price)	500,000 ~ 600,000 Bs/ m <sup>2</sup>
2. Structure and Masonry Wall (no finish)	280,000 Bs/ m <sup>2</sup>
3. Labor cost of structure only	60,000 Bs/ m <sup>2</sup>
4. Labor cost of wall only	4,000 Bs/ m <sup>2</sup>
Wall + plastering both sides	12,000 Bs/ m <sup>2</sup>
5. Paint finishing	8,000 Bs/ m <sup>2</sup>
6. Asphalt Waterproofing 6mm thick.	12,000 Bs/ m <sup>2</sup>
7. Installation of Ceramic Tiles w/ mortar	10,000 Bs/ m <sup>2</sup>
8. Structural Steel Fabrication work	6,500 Bs/ kg
9. Square Steel Pipe	8,000 Bs/ kg
10. Base Plate	10,500 Bs/ kg
11. Anchor Bolt (A-32S)	16,500 Bs/ kg
<b>C. Others: (+IVA)</b>	
1. Demolition by hand and disposal of Debris	1. Demolition by hand and disposal of Debris
2. Excavation by Machine	2. Excavation by Machine
3. Excavation by Hand	3. Excavation by Hand
4. Electrical work (Cable 12mm)	4. Electrical work (Cable 12mm)
5. Sanitary Plumbing (PVC)	5. Sanitary Plumbing (PVC)

Source: JICA Study Team



**Table S27-2.4 Typical Rough Unit Cost of Building Replacement Work in Caracas  
(As of February 2004, 1920Bs = 1US\$)**

1A. Dwelling Houses in Urban area	
1) Low class of dwelling ( 80-100 m <sup>2</sup> ) (100 m <sup>2</sup> )	400,000 - 600,000 Bs/ m <sup>2</sup> 50,000,000 Bs/ 1 House
2) Middle class of dwelling (100-200 m <sup>2</sup> ) (150 m <sup>2</sup> )	600,000 - 800,000 Bs/ m <sup>2</sup> 105,000,000 Bs/ 1 House
1B. Dwelling Houses in Barrio area (70-100 m <sup>2</sup> ) (100 m <sup>2</sup> )	150,000 - 200,000 Bs/ m <sup>2</sup> 17,500,000 Bs/ 1 House
	Selling cost 300,000 Bs/ m <sup>2</sup>
2A. Apartment Houses in Urban area (150 m <sup>2</sup> )	600,000 Bs/ m <sup>2</sup> 90,000,000 Bs/ 1 Family
2B. Apartment Houses in Barrio area (100 m <sup>2</sup> )	300,000 - 400,000 Bs/ m <sup>2</sup> 35,000,000 Bs/ 1 Family
3. Office Buildings	
1). Reinforced Concrete Buildings	
Architectural work	210,000 Bs/ m <sup>2</sup> (42%)
Structural work	190,000 Bs/ m <sup>2</sup> (38%)
Building Equipment work	100,000 Bs/ m <sup>2</sup> (20%)
Electric work	30,000 Bs/ m <sup>2</sup>
Plumbing work	20,000 Bs/ m <sup>2</sup>
Air Conditioning work	20,000 Bs/ m <sup>2</sup>
Elevator	30,000 Bs/ m <sup>2</sup>
Total	500,000 Bs/ m <sup>2</sup>
2). Structural Steel Buildings	
Architectural work	250,000 Bs/ m <sup>2</sup> (41.7%)
Structural work	250,000 Bs/ m <sup>2</sup> (41.7%)
Building Equipment work	100,000 Bs/ m <sup>2</sup> (16.6%)
Total	600,000 Bs/ m <sup>2</sup>
3). Masonry Buildings (Existing Building)	
Architectural work	330,000 Bs/ m <sup>2</sup> (60%)
Structural work	150,000 Bs/ m <sup>2</sup> (25%)
Building Equipment work	120,000 Bs/ m <sup>2</sup> (20%)
Total	600,000 Bs/ m <sup>2</sup>
4). Commercial Building (Excluding inside finishing)	500,000 Bs/ m <sup>2</sup>
5). Hospital Buildings (Excluding Medical Equipments)	
Small Hospital (without Bed)	600,000 Bs/ m <sup>2</sup>
Large Hospital (with Beds)	900,000 - 1,000,000 Bs/ m <sup>2</sup>
6. School Buildings	400,000 Bs/ m <sup>2</sup>
7. Factory Buildings (Steel structure with light roof)	200,000 Bs/ m <sup>2</sup>

Source: JICA Study Team

**Table S27-2.5 The Total Floor Area, Cost of Replacement and Seismic Reinforcement of Existing Buildings in Caracas (As of Feb. 2004)**

Area	Category		Total Floor Area (m <sup>2</sup> )	Building Replacement Cost (M. Bs)	Seismic Reinforcement Cost (M. Bs)	
	Type of Building	Item				
Urban Area	Dwelling House	High Class	526,000	526,000	36,200	
		Middle Class	3,244,000	2,271,000	156,500	
		Low Class	3,507,000	1,754,000	120,900	
		Sub Total	7,277,000	4,551,000	313,600	
	Apartment	Low Rise: 1 ~ 3	2,404,000	1,442,000	99,400	
		Middle Rise: 4 ~ 8	11,683,000	7,594,000	629,500	
		High Rise: 9 ~	9,345,000	6,074,000	434,900	
		Sub Total	23,432,000	15,110,000	1,163,800	
	Office Building	Low Rise: 1 ~ 3	1,878,000	939,000	64,700	
		Middle Rise: 4 ~ 8	7,511,000	4,131,000	342,500	
		High Rise: 9 ~	7,510,000	4,506,000	322,600	
		Sub Total	16,899,000	9,576,000	729,800	
	Hospital and Governmental Office	with Beds	504,000	479,000	39,700	
		without Bed	734,000	440,000	30,300	
		Governmental Office	4,672,000	2,570,000	213,000	
		Sub Total	5,910,000	3,489,000	283,000	
	Other Important Building	Low Rise: 1 ~ 3	1,002,000	501,000	34,500	
		Middle Rise: 4 ~ 8	2,004,000	1,102,000	91,400	
		High Rise: 9 ~	1,500,000	900,000	64,400	
		Sub Total	4,506,000	2,503,000	190,300	
	Urban Area Total			58,024,000	35,229,000	2,680,500
	Rural Area	Dwelling House	Slope > 20degree	1,527,000	611,000	58,700
			Slope ≤ 20degree	9,639,000	816,000	173,000
	Barrio Area	Dwelling House	Slope > 20degree	13,424,000	2,349,000	300,700
Slope ≤ 20degree			17,474,000	3,058,000	275,200	
Rural & Barrio Total			42,064,000	11,234,000	807,600	
Ground Total			100,088,000	46,463,000	3,488,100	
US\$ (1920 Bs= 1US\$)				24,200 M.US\$	1,817 M.US\$	
Cost less IVA (16%)					1,566 M.US\$	

Source: JICA Study Team

**Table S27-2.6 Number of Buildings in Each Area and Uses**

Area	Nos. of Bldg.	%	Category	Nos. of Bldg.	%	Class, Story	Nos. of Bldg.	%
Urban Area	83,449	100	Dwelling House	58,449	70	High C.	1,753	3
						Mid. C.	21,626	37
						Low C.	35,070	60
			Apartment House	6,680	8	1 ~ 3	2,004	30
						4 ~ 8	3,340	50
						9 -	1,336	20
			Office Building	12,526	15	1 ~ 3	3,758	30
						4 ~ 8	5,010	40
						9 -	3,758	30
			Hospital and Governmental O.	3,340	4	w/ Beds	84	2.5
						No Bed	918	27.5
						Govn. O.	2,338	70
			Other Important Building	2,504	3	1 ~ 3	1,002	40
						4 ~ 8	1,002	40
9 -	500	20						
			Urban Area Total	83,449	100		83,449	
Rural Area	25,175	10.9	Slope > 20degree	10,182	40.4	---	---	
			Slope ≤ 20degree	14,993	59.6	---	---	
			Sub Total	25,175	100			
Barrio Area	205,983	89.1	Slope > 20degree	89,491	43.4	---	---	
			Slope ≤ 20degree	116,492	56.6	---	---	
			Sub Total	205,983	100			
	231,158	100	Rural & Barrio Total	231,158	100			
	314,657		Grand Total	314,657	100			

Source: JICA Study Team

**Table S27-2.7 Ratio of Required Seismic Evaluation and Reinforcement, and  
Cost of Seismic Reinforcement per Building Replacement Cost**

Area	Category			Ratio of Building Number	Ratio of Required Seismic Evaluation (Ratio of Seismic Reinforcement)	Cost of Seismic Reinforcement / Building Replacement Cost		
	Type	Item	Year Built					
Urban Area	Type of Structure	R. C. Structure		82.1%				
		Steel Structure		3.7%				
		Masonry		14.2%				
	Year Built	Before 1967 *1			51.7%		15%	
		1968 ~ 1982 *2			37.4%		10%	
		After 1983			10.9%		5%	
	Number of Story			*1	44.1%	80%, (80%)	15%	
			Low Rise: 1 ~ 3	*2	30.4%	75%, (70%)	10%	
				*3		70%, (60%)	5%	
			Middle Rise: 4~8		*1	6.4%	90%, (90%)	15%
					*2	4.6%	80%, (80%)	10%
					*3		70%, (70%)	5%
			High Rise: 9 ~		*1	1.1%	95%, (70%)	15%
					*2	2.5%	90%, (60%)	10%
				*3		85%, (50%)	5%	
Rural Area	Dwelling House	Slope > 20degree	---	40.4%	80%, (80%)	15%		
		Slope ≤ 20degree	---	54.6%	80%, (75%)	10%		
Barrio Area	Dwelling House	Slope > 20degree	---	43.4%	80%, (80%)	20%		
		Slope ≤ 20degree	---	56.6°°°	80%, (75%)	15%		

Source: JICA Study Team

**Table S27-2.8 Monetary Loss of Building due to Heavily Damaged and Collapsed by 1967 Earthquake (As of Feb. 2004)**

Area	Category		Building	Monetary Loss of Buildings (M. Bs)		
	Type of Building	Item	Replacement Cost (M. Bs)	(B) Before Reinforcement	(A) After Reinforcement	Difference (B) - (A)
Urban Area	Dwelling House	High Class	526,000	3,000	1,500	1,500
		Mid. C.	2,271,000	27,600	12,200	15,400
		Low C.	1,754,000	22,000	9,900	12,100
		Sub Total	4,551,000	52,600	23,600	29,000
	Apartment	1 ~ 3F	1,442,000	19,400	10,800	8,600
		4 ~ 8F	7,594,000	95,600	6,800	88,800
		9F ~	6,074,000	59,200	9,100	50,100
		Sub Total	15,110,000	174,200	26,700	147,500
	Office Building	1 ~ 3F	939,000	14,300	10,000	4,300
		4 ~ 8F	4,131,000	52,800	3,300	49,500
		9 F~	4,506,000	43,200	7,200	36,000
		Sub Total	9,576,000	110,300	20,500	89,800
	Hospital and Govern. Office	/w Beds	479,000	17,100	5,700	11,400
		No Bed	440,000	3,400	1,000	2,400
		G. Office	2,570,000	30,800	5,500	25,300
		Sub Total	3,489,000	51,300	12,200	39,100
	Other Important Building	1 ~ 3F	501,000	11,000	5,500	5,500
		4 ~ 8F	1,102,000	5,500	1,100	4,400
		9F ~	900,000	3,600	1,800	1,800
		Sub Total	2,503,000	20,100	8,400	11,700
Urban Area Total			35,229,000	408,500	91,400	317,100
Rural Area	Dwelling House	Slope > 20°	611,000	18,700	1,400	17,300
		Slope ≤ 20°	5,216,000	19,400	900	18,500
Barrio Area	Dwelling House	Slope > 20°	2,349,000	112,600	16,400	96,200
		Slope ≤ 20°	3,058,000	138,400	8,900	129,500
Rural & Barrio Area Total Total			11,234,000	289,100	27,600	261,500
Grand Total (M. Bs)			46,463,000	697,600	130,700	566,900
M. US\$ (1920 Bs= 1US\$)			24,200	363	68	295
M. US\$ (1920 Bs= 1US\$) less tax			20,860	313	59	254

Source: JICA Study Team

**Table S27-2.9 Estimation of Human Damage**

Item	unit	amount	
Average age	years	30	
Retirement age(assumption)	years	65	
Working years	years	35	
GDP per Capita for Venezuela (2002)	US\$	4,000	According to World Bank country profile
GDP per Capita for Caracas (2002)	US\$	6,000	(assumed double to the national average)
Death without case	persons	602	
Death with case	persons	51	
Loss of Value of human without case	MUS\$	126	(=GDP per capita *working years)
Loss of Value of human with case	MUS\$	11	(=GDP per capita *working years)
Reductin of human loss	MUS\$	116	

**Table S27-2.10 Economic Damage in Cases without and with the Project**

Item	Total	Non-masonry buildings			Masonry
		1-3 stories	4-8 stories	9 stories -	
No. of existing buildings in urban area	83,499	54,715	11,203	5,913	11,668
Office buildings					
15 % of the urban total (bldg)	12,525	3,757	5,010	3,757	1,536
Average floor (m <sup>2</sup> /bldg)		500	1,500	2,000	500
Total floor area (m <sup>2</sup> )	17,676,500	1,878,700	7,514,900	7,514,900	768,000
<b>Case without project</b>					
Damaged buildings	1,020	549	122	49	300
Damaged floor without project (m <sup>2</sup> )	705,500	274,500	183,000	98,000	150,000
Ratio to existing urban total	<b>4.0%</b>	1.6%	1.0%	0.6%	0.8%
<b>Economic damage (MUS\$)</b>	<b>376</b>	<b>146</b>	<b>98</b>	<b>52</b>	<b>80</b>
<b>Case with project</b>					
Damaged buildings	413	156	12	11	234
Damaged floor with project (m <sup>2</sup> )	235,000	78,000	18,000	22,000	117,000
Ratio to existing urban total	<b>1.3%</b>	0.4%	0.1%	0.1%	0.7%
<b>Economic damage (MUS\$)</b>	<b>125</b>	<b>42</b>	<b>10</b>	<b>12</b>	<b>62</b>

Source: JICA Study Team

Note: Of non-masonry buildings, office buildings ratios are assumed at 30%,40%, and 30% for 1-3 floors, 4-8 floors, and 9 floors and more, respectively.

**Table S27-2.11 Cost for Rescue Operation and Hospitalization Cost**

	unit	Amount in Case With the Project	Amount in Case With the Project
<b>Rescue &amp; operation cost</b>			
Total people rescued	(person)	1,900	280
Sub-Total cost	(MUS\$)	<b>3.00</b>	<b>0.89</b>
<b>Medical cost for hospitalization</b>			
Total victims hospitalized	(person)	430	40
Sub-Total cost	(MUS\$)	<b>3.92</b>	<b>0.36</b>
<b>Total emergency + medical cost</b>	(MUS\$)	<b>6.92</b>	<b>1.35</b>

Source: JICA Study Team

Note: Figure are on the conditions that the average rescue operation cost per person is 1,300 us\$, and that medical treatment cost per person/day is 600 US\$ with average hospitalization of 15 days per person.

**Table S27-2.12 Debris Amount and Debris Clearance Cost**

Area	Case WITHOUT Reinforcement			Case WITH Reinforcement		
	Number of heavily damaged buildings	Amount of Debris (m <sup>3</sup> /m <sup>2</sup> )	Debris Clearance Cost (MUS\$)	Number of heavily damaged buildings	Amount of Debris (m <sup>3</sup> /m <sup>2</sup> )	Debris Clearance Cost (MUS\$)
Urban	1,018	469,595	<b>3.76</b>	413	107,170	<b>0.86</b>
Rural	634	57,060	<b>0.46</b>	39	4,095	<b>0.03</b>
Barrio	8,368	753,120	<b>27.87</b>	846	88,830	<b>3.29</b>
Total	10,020	1,279,775	<b>32.08</b>	1,298	200,095	<b>4.18</b>

Source: JICA Study Team

Note: unit price to excavate and move 1 m<sup>3</sup> of debris: 8 us\$ in urban and rural area, 37 us\$ for barrio, because barrio area, trucks cannot be enter to move the debris which requires carrying debris to major roads manually from the inside the barrio.

**Table S27-2.13 Temporary Housing Cost**

Case	Number of Affected people			Number of Affected families	Number of Required Houses to accommodate 50% of the affected families	Required Houses (cost) (MUS\$)
	Total	Urban+ rural	Barrio			
Without the project	76,396	19,389	57,007	16,977	8,489	8.5
With the project	11,161	5,397	5,764	2,481	1,241	1.2

Source: JICA Study Team

Note: Number of each affected people are estimated by population density /building for area of urban + rural and the area of barrio.



**Table S27-2.14 Comparison of Damage Without and with Project**

(unit: MUS\$)

Item	Damage Without Project (A)	Damage With Project (B)	Benefit (A-B)
Direct cost	439.6	64.2	375.4
Heavily damaged building value	313.2	53.5	259.7
Human damage	126.4	10.7	115.7
Indirect & Secondary Economic loss	281.6	116.3	165.3
Loss to Caracas (study area) economy	230.8	95.4	135.5
Loss to National economy	50.8	21.0	29.8
Rescue & Recovery cost	49.0	6.8	42.2
Emergency + medical cost	6.9	1.2	5.6
Debris clearance	33.6	4.3	29.3
Temporary house cost	8.5	1.2	7.2
Total	770.2	187.4	582.9

Source: JICA Study Team

**Table S27-2.15 Estimation of Engineering Fee for Seismic Evaluation and Seismic Reinforcement Design**

	A total of 182,760 Buildings					A total of 10,020 buildings		
	No. of buildings	unit cost (Bs/bldg)	Cost (M Bs)	Cost (MUS\$)	Cost less IVA (MUS\$)	No. of buildings	Cost (MUS\$)	Cost less IVA (MUS\$)
<b>RVS</b>								
Urban	62,600	300,000	18,800	9.8	8.4	1,018	0.16	0.14
Barrio + Rural	184,900	60,000	11,100	5.8	5.0	9,002	0.28	0.24
Total	247,500		29,900	15.6	13.4		0.44	0.38
<b>Seismic Evaluation</b>								
Urban	50,080	9,000,000	450,700	234.7	202.4	1,018	4.8	4.1
Barrio + Rural	166,400	1,800,000	299,500	156.0	134.5	9,002	8.4	7.3
Total	216,480		750,200	390.7	336.8		13.2	11.4
<b>Seismic Design</b>								
Urban	40,060	10,000,000	400,600	208.6	179.9	1,018	5.3	4.6
Barrio + Rural	142,700	2,000,000	285,400	148.6	128.1	9,002	9.4	8.1
Total	182,760		686,000	357.3	308.0		14.7	12.7
<b>Total</b>								
Urban			870,100	453.2	390.7	1,018	10.2	8.8
Barrio + Rural			596,000	310.4	267.6	9,002	26.5	22.9
Total			1,466,100	763.6	658.3		62.0	53.5

Source: JICA Study Team

Note: The heavily damaged 10,020 buildings in the 1967 scenario earthquake are composed of 1,018 buildings in urban area and 9,002 buildings in barrio and rural area.

**Table S27-2.16 Flow of Cost and Benefit**

(unit: MUS\$)

	year	Cost					Expected benefit	Net Benefit
		RVS	Detailed Seismic Evaluation	Seismic Reinforcement Design	Reinforcement Work	Total Cost		
1	2005	0.05				0.1		-0.1
2	2006	0.11	0.8	0.4		1.3	0.0	-1.3
3	2007	0.11	0.8	0.8	3	5.0	0.0	-5.0
4	2008	0.05	0.8	0.8	3	4.9	0.6	-4.3
5	2009		0.8	0.8	3	4.9	1.2	-3.7
6	2010		0.8	0.8	3	4.9	1.8	-3.1
7	2011		0.8	0.8	3	4.9	2.4	-2.5
8	2012		0.8	0.8	3	4.9	3.0	-1.9
9	2013		0.8	0.8	3	4.9	3.6	-1.3
10	2014		0.8	0.8	3	4.9	4.2	-0.7
11	2015		0.8	0.8	3	4.9	4.8	-0.1
12	2016		0.8	0.8	3	4.9	5.4	0.5
13	2017		0.8	0.8	3	4.9	6.0	1.1
14	2018		0.8	0.8	3	4.9	6.6	1.7
15	2019			0.8	3	4.1	7.2	3.1
16	2020				3	3.3	7.8	4.5
17-50	2021 - 2054						8.4	8.4
	NPV					29.6	29.3	-0.3
	B/C							0.99

Source: JICA Study Team

Note: Earthquake return period is assumed as 69.5 years. Referring JICA project evaluation guideline, 50 years is employed as project life. 12 % is employed as discount rate as the World Bank uses in a project in Venezuela.

**Table S27-2.17 Annual Cost for Reinforcement of Buildings**

(unit: MUS\$)

Year	RVS	Detailed Seismic Evaluation	Seismic Reinforcement Design	Reinforcement Work	Total
2005	2.6				2.6
2006	5.2	30.1	13.2		48.5
2007	5.2	30.1	26.5	129.8	191.5
2008	2.6	30.1	26.5	129.8	188.9
2009-2018		30.1	26.5	129.8	186.3
2019			26.5	129.8	156.3
2020				129.8	129.8
Total	16	391	357	1,817	2,581

Source: JICA Study Team

Note: inclusive of IVA (16%)

**Table S27-2.18 Percentage of Project cost to GDP and Various Budgets**

Item	Project Cost	GDP (2003 est.)	National Budget (2003)	MINFRA Budget (2003)	MINFRA project budget (2003)	Min. of Housing (2004)	AMDC Budget (2003)
Year	(MUS\$)	85,748 (MUS\$)	25,968 (MUS\$)	1,936 (MUS\$)	884 (MUS\$)	625 (MUS\$)	600 (MUS\$)
2005	2.6	0.0%	0.0%	0.1%	0.3%	0.4%	0.4%
2006	48.5	0.1%	0.2%	2.5%	5.5%	7.8%	8.1%
2007	191.5	0.2%	0.7%	9.9%	21.7%	30.6%	31.9%
2008	188.9	0.2%	0.7%	9.8%	21.4%	30.2%	31.5%
2009-2018	186.3	0.2%	0.7%	9.6%	21.1%	29.8%	31.1%
2019	156.3	0.2%	0.6%	8.1%	17.7%	25.0%	26.0%
2020	129.8	0.2%	0.5%	6.7%	14.7%	20.8%	21.6%
Total	2,580.6	3.0%	9.9%	133.3%	291.9%	412.9%	430.1%

Source: GDP data from Central Bank (<http://www.bcv.org.ve/EnglishVersion/Index.asp>), National and MINFRA budget from “Resumen de la, LEY DE PRESUPUESTO 2003,” Office of National Budget, (Oficina Nacional de Presupuesto) Ministry of Finance, AMDC budget from AMDC. For newly established Ministry of Housing news paper website “

**Table S27-2.19 Annual Number of Buildings for Reinforcement Project**

Year	RVS			Detailed Seismic Evaluation			Seismic Reinforcement Design			Reinforcement Work		
	Total	Urban	B+R	Total	Urban	B+R	Total	Urban	B+R	Total	Urban	B+R
Total Number	247,500	62,600	184,900	216,480	50,080	166,400	182,760	40,060	142,700	182,760	40,060	142,700
2005	41,250	10,433	30,817									
2006-2007	82,500	20,867	61,633	16,652	3,852	12,800						
2008	41,250	10,433	30,817	16,652	3,852	12,800	6,769	1,484	5,285	13,054	2,861	10,193
2009-2018				16,652	3,852	12,800	13,538	2,967	10,570	13,054	2,861	10,193
2019							13,538	2,967	10,570	13,054	2,861	10,193
2020										13,054	2,861	10,193

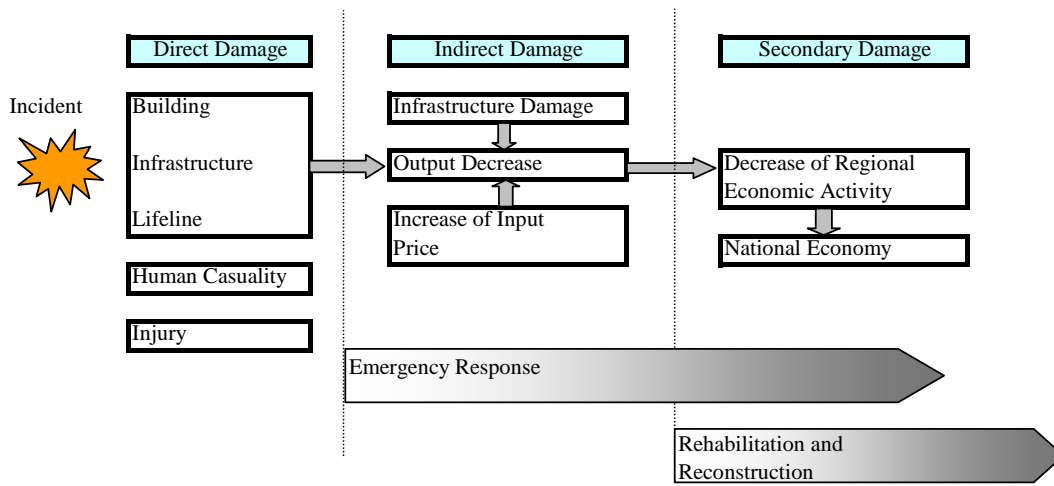
Source: JICA Study Team

Note: B+R denotes “barrio and rural.”

Year	05	06	07	08	09	10	15	16	17	18	19	20
Rapid Visual Screening (RVS)	3 years 100 Engineers			Urban: 62,600 Buildings								
				Rural & Barrio: 184,900 Buildings								
Detailed Seismic Evaluation	13 years			800 Engineers		Urban: 50,080 Buildings						
						Rural & Barrio: 166,400 Buildings						
Seismic Reinforcement Design	13.5 years			640 Engineers		Urban: 40,060 Buildings						
						Rural & Barrio: 142,700 Buildings						
Construction Work				14 years		Urban: 40,060 Buildings						
						Rural & Barrio: 142,700 Buildings						

Source: JICA Study Team

**Figure S27-2.1 Project Implementation Schedule**



Source: JICA Study Team based on Paul K. Freedman, et al., "Catastrophes and Development Integrating natural Catastrophes into Development Planning." Disaster Risk Management Working Paper Series No.4, World Bank, 202

**Figure S27-2.2 Damage Link**

## **CHAPTER 3. EVALUATION OF EARLY WARNING AND EVACUATION FOR DEBRIS FLOW DISASTER PREVENTION**

### **3.1 Feasibility Study of Early Warning and Evacuation**

#### **3.1.1. Technical Study of Early Warning and Evacuation**

In order to assess the technical feasibility of the project of “early warning and evacuation for debris flow disaster prevention”, a study was made on two aspects. The one aspect is the global meteorological phenomenon, which will cause a heavy rainfall triggering debris flow disaster in Caracas. Another aspect is the relationship between the rainfall amount and the occurrence of debris flow.

Regarding the global meteorological phenomenon causing heavy rainfall in Caracas, the historical two prominent events in 1951 and 1999 both occurred in the dry season in Caracas, in February and in December, respectively. In both cases, the cause of the long and heavy rainfall was brought about by the cold weather front developed from a low pressure in the Caribbean Sea. As the samples are only 1951 and 1999 events, it is difficult to conclude that debris flow occurs in Caracas, only when the cold weather front comes from the Caribbean Sea. However, it may be said that it is necessary to watch the phenomenon as an important symptom of debris flow. This kind of global meteorological phenomenon has been observed and publicized by MARN for a long time and it is possible to obtain the information through the WebPages of MARN nowadays. Much more, the activation of INAMEH, global meteorological observation will become more intensive utilizing rainfall observation radar system.

The Study Team collected information on rainfall amount and the occurrence of debris flow in Caracas, Vargas and Maracay. Because of the small number of records of debris flow phenomena and also few records of precise rainfall phenomena; it is not an easy task to draw a conclusion of critical value for early warning and evacuation for Caracas.

The Study Team proposed a pilot value for early warning utilizing available information and proposed to enhance the diagram by accumulating more information on rainfall and occurrence of debris flow.

As a conclusion, early warning and evacuation project for debris flow disaster prevention is technically feasible utilizing the existing technical skills and existing institutional framework.

#### **3.1.2. Institutional Study of Early Warning and Evacuation**

The Study Team proposed an institutional framework for early warning and evacuation based on the existing government institutional framework.

Basically, existing government institution can coordinate to establish a system.

However, a new organization, which is in charge of observation and analysis of local meteorological and hydrological phenomena of Caracas and Vargas, in the Ministry of Environment and Natural Resources, was proposed.

It is also proposed for the Ministry of Environment and Natural resources to establish a protocol for early warning and evacuation system for debris flow disaster prevention or flood disaster prevention nationwide.

The Study Team proposed a draft agreement, which will be signed among the related agencies for the early warning and evacuation system for debris flow disaster prevention. The proposed agreement is shown in Chapter 4 of this Main Report.

### **3. 1. 3. Community Study of Early Warning and Evacuation**

Two communities were selected for survey on this particular subject. They are Los Chorros in an urban area and 12 de Octubre in barrio area.

The survey result shows that:

- People in both urban area and barrio area have correct perception about the sediment disasters as they have experiencing frequent inundation and slope failure problems.
- In both communities, there exist strong community unity and hierarchy system of communication. There is also physical space for the community to have daily meeting among the members.
- In urban community, knowledge level on sediment disaster is high and people can access information from MARN directly through Web site, while in barrio community, Internet access is impossible.
- In both communities, people are willing to collaborate with governmental institution for sediment disaster prevention once such kind of collaboration is proposed by the institution such as the Civil Protection of the Municipal Government.

## **3. 2 Project Summary of Early Warning and Evacuation**

### **3. 2. 1. Project Outline**

The project of early warning and evacuation for debris flow disaster prevention covers 47 mountain streams area with the total 2,700 buildings and 19,000 people.

The project involves the Ministry of Environment and Natural Resources, the Civil Protection of ADMC, the Civil Protection of each municipality, the Central University of Venezuela and the community.

The project is composed of publication of hazard map/risk maps, establishment of agreement among the related organizations, installation of required equipments for observation and communication and capacity building of personnel.

### **3. 2. 2. Implementation Schedule**

The implementation schedule of the project is shown in Figure S27-3.1.

The first step of the project is establishment among the institutions and installation of equipments. As a long-term scheme, capacity building of the regional office of MAR and operation and maintenance of the Operation Control Center and the Emergency Command Center are included.

### **3. 2. 3. Effect of the Project**

By implementing the project, it is possible to safeguard the lives of the people living in the risky area of debris flow.

According to the hazard map and the risk map prepared by the Study Team, the total number of buildings in risky areas of debris flow is 2,700 including urban area and barrio area. The total number of residents estimated in the area is 19,000.

Therefore, 19,000 citizens in the area will be able to evacuate by the system and save their lives from the debris flow disasters.

### **3. 2. 4. Operation and Maintenance**

#### **(1) Operation and Maintenance of Seismic Reinforcement of Buildings**

Reinforcement of buildings is not a single event project but it requires constant observation and maintenance. Because of weathering or fatigue of materials of buildings, the strength of buildings deteriorates with time.

Therefore, it is necessary to carry out periodical observation by using rapid visual screening method for every building. The owner of the building is responsible for the maintenance of the structure.

It is proposed to carry out periodical rapid visual screening for every building every 30 years after construction.



## **(2) Operation and Maintenance of Early Warning and Evacuation**

### 1) Maintenance of equipments

It is necessary to maintain and operate the equipments, such as rainfall gauging system , water level staff gauges and weir sensor system. The maintenance of rainfall gauging system and weir sensor system shall be done by the owner of the system, the Ministry of Environment and Natural Resources. The water level staff gauges shall be maintained by the community.

The maintenance of rainfall gauging system includes payment of telephone bill for data transmission, payment of electricity to operate the receiving computer and change of batteries for rainfall data sending device.

Periodical inspection and maintenance is required for every electrical and mechanical part of the system. Periodical replacement of parts is also required to keep the good condition of the machines.

### 2) Operation of Institutional System

In order to activate the early warning and evacuation system as a whole in an emergency when the system is really needed, it is necessary to practice the activity of the system. The Metropolitan Civil Protection is responsible for such kind of practice, namely periodical drill.

It is proposed to do such kind of drill in two levels. One is a desktop exercise and the other one is real field drill.

The desktop exercise will be carried out by the representatives of each organization involved, such as the Ministry of Environment, the Metropolitan Civil Protection, the Operation Control Center, the Municipality Civil Protection, the Central University of Venezuela and Community Organization. This drill on the desk is proposed to be carried out twice a year.

The field drill will be carried out mobilizing all personnel related to this system including residents who are supposed to evacuate. This drill is proposed to be carried out once a year at the end of rainy season, say November 1st.

### **3. 2. 5. Cost Estimate of Early Warning and Evacuation**

The cost is composed of four items as:

- Establishment of agreement among related organizations
- Installation and equipments
- Maintenance cost of equipments
- Capacity building of regional office

Cost of each item was calculated and the total cost for the project was estimated. (Table S27-3.1)

In the cost calculation, the following items are excluded as they are involved in other projects.

- Publication of hazard maps and risk maps
- Development and maintenance of disaster information system
- Construction and maintenance of an emergency command center

### **3.3 Evaluation Framework of Early Warning System**

Early Warning System is a non-structural measure designed to protect people and other movables from debris flow, not aimed to protect unmovable assets such as buildings. The project covers the 47 quebrada areas north of Guaire River with 19,000 people. With the early warning system, people are expected to evacuate more effectively from debris flow.

Early warning system is a series of actions from collection and analysis of the relevant information, the resulting issue of early warning, and evacuation activities of affected people based on the early warning. Various technologies are used, and wide ranges of actors are involved in the system and each actor has their own sub-system, which are linked to make the entire early warning system. Accurate and timely data collection analysis are required for functional system. Each actor should act as designed, through a communication system among the actors.

The project aims to reduce human casualty and economic and financial analyses are judged unfit to evaluate this project. The following aspects are selected as evaluation criteria:

Institutional aspect: Evaluate framework of laws and regulations, agency's capacity and coordination and communication among the relevant agencies and also community

Technical aspect: Evaluate technical aspects to provide necessary warning based on accurate and timely data collection and analysis on hazard and risk

Community aspect: Evaluate capacity to act according to early warning from the institute and evacuate effectively and timely.

### **3.4 Institutional Aspect**

#### **3.4.1. Introduction**

The early warning system is judged feasible from institutional aspect. Early warning system involves various people from national government to community levels, thereby the system is difficult to function effectively. The system is successful when the early warning runs through as designed to reach the system end of community people and evacuate them from the risk.

Close coordination among the related agencies is necessary to form an effective early warning system though they have not worked together on early warning.

The following summarizes the limitation of the present institutional arrangement in Early Warning System.

#### **3.4.2. Review of Existing Conditions**

Existing condition of legal framework, capacity of related agencies, and coordination and communication are summarized as follows:

##### **(1) Legal Framework**

- The legal framework that rules the Ministry of Environment activity, particularly after the project VENEHMET started, is good enough for support an Early Warning System in Caracas, but some institutional arrangement such as agreement among the related agencies must be created in order to conduct this project effectively.
- The legal framework of Civil Protection System is good enough to support the institutional and social coordination and preparation activities that must be done as part of the Early Warning System project. This applies either in the National, metropolitan and Municipal levels.

##### **(2) Capacity of related agencies**

- National institutions, like MARN, have an adequate performance on big scale weather monitoring, even though they have the deficiencies on equipment and personnel. Those deficiencies are bigger for the local hydro-meteorological monitoring that an early warning system project to Caracas city requires.
- MARN has not enough engineers to work on hydrological and hydraulic modeling for hazard maps and meteorological forecast.

- AMDC has received meteorological information from MSRN, however, never taken action of early warning and evacuation. And it is not practical for AMDC to monitor and provide hydro-meteorological information to the public.
- Municipalities are capable of emergency response, but have few experiences of early warning and evacuation.

**(3) Coordination and communication**

- It is important to promote formal agreements and spaces of coordination and communication between the key institutional actors that will be in charge of the Early Warning System project.

**3.4.3. Factors to Functional System**

In order to make the system work by overcoming the limitation mentioned above, the following are necessary to realize at each level.

**(1) National level**

- Promote VENEHMET project
- Establish and strengthen a regional branch of MARN to unite present rainfall monitoring system, update hazard map, and study hydrological features of Caracas.
- Formalize agreement for the early warning system

**(2) AMDC level**

- Construct Emergency Operation Center
- Establish Operation Control Center for disaster management of Caracas
- Develop (train) human resources

**(3) Municipal level**

- Issue the evacuation instruction to vulnerable community based on the information from AMDC and MARN
- Collaborate community in planning and operating the system

#### **3.4.4. Summary**

Because the early warning is has not been operated among the related agencies, the initial institutional arrangement is important. The study team proposed the draft agreement among the related agencies, and they have discussed it for effective system operation. Starting with the existing institutional framework including VENEHMET project, it is judged that the related agencies with progressive improvement will be able to handle the early warning system.

#### **3.5 Technical Aspect**

The Early Warning System requires a variety of data to issue a warning. Among them, establishment of Critical Line (CL) is preferable to issue a timely and proper early warning, though it is one of the technical difficulties of the system. As discussed in Supporting Report S18, it is difficult to issue a timely early warning because of the short lead time of debris flow between the occurrence in the Avila and the arrack to the habitat area in Caracas. At present, lack of accumulated information hampers establishment of the reliable Critical Line; and accordingly further data accumulation is necessary to establish more reliable CL.

In such situation, in described in detail in Supporting Report 18, the Study Team preliminarily formulated a Critical Line with a limited available data to provide a threshold rainfall amount to assess a disaster situation and thereby decide on an issuance of evacuation. The reliability of evaluation figure depends on the accuracy of the timing of debris flow occurrence and accuracy of the hourly rainfall and cumulative rainfall at that time. This analysis is based on many assumptions for these important factors and the differences in the case of different assumptions are also shown. The preliminary CL shall be modified upon the accumulation of available information for model formation.

Even though a CL is granted as one of the information based on which the warning will be issued, with this preliminary CL as reference, the system would be started and will be improved gradually being operated.

#### **3.6 Community Aspect**

##### **3.6.1. Introduction**

The early warning system is successful when the affected people evacuate the disaster because of accurate and timely early warning. As experienced in the Catuche case in the 1999 disaster, a community plays an important role in evacuation activities. The proposed early warning system aims at more accurate and systematic method for evacuation of vulnerable communities.

Necessary information and warning will be provided to the community from the institutions in charge or their own observation, thereby the community, ultimately each member of the community will take a necessary action. Based on such information or warning, communities are expected to take a smooth collective action.

For improvement of community's capacity to take a proper action, communities and other related institutes require the following features from the initial stage of information gathering to evacuation action.

### **3.6.2. Observed Limitations**

The Study Team conducted a social survey to communities in both urban and barrio areas, in order to observe and study the capacity of the community as a part of early warning system. The Study Team selected the communities of Los Chorros in urban area and 12 de Octubre in barrio area. In the study through workshops and other activities, the following are observed in early warning context.

Basically, there is no systematic early warning system in communities. The existing conditions are characterized by:

- Information is gathered by themselves or information that are public through Internet, TV, or radio;
- Some communities have their own evacuation system based on the rule of thumb;
- Their communication is very limited, within families or close neighbors; and
- They are not well prepared in spite of their past experience of disaster

### **3.6.3. Factor Necessary to Functional Community for EWS**

Through the social survey at the communities, some points are recognized as indispensable factors the communities have to have to function effectively in the early warning system.

The following points are necessary factors to functional community for the Early Warning System.

#### **(1) Internal Capacity of Community**

- Existence of Core Community Organization like neighbors association, its functional System Cooperation of Sub Sectors and Citizen
- Disaster management recourses and capacity (risk map, vulnerability, evacuation route map, information flow of community members, response capacity, simple meteorology of measurement observation of natural phenomena)

- Participation of the community members, leadership, solidarity, autonomy, and sustainability of community activities
- More knowledge about risk
- Establishment of Internal technical committee

**(2) Relation between community, institutions and other organizations**

- Rapport with the related institutions, other organizations, and communities
- Easy access to governmental institutions and information (Municipal, PC Municipality, ADMC, EOC, National –information, course
- Supportive organization (NGOs, NPOs) or third party to facilitate to capacitate the community
- Cooperation with Other Communities

**(3) Role of Community in the whole system**

- Community participation in planning process from the beginning

**3.6.4. Improvement for Early Warning System (EWS)**

Based on the analysis above, the followings are perceived necessary for improvement of the situation for the early warning system.

**(1) Internal resources of community**

- PC municipality will provide information to community
- Dissemination of risk information, with vulnerability and evacuation map.
- Both community are not well prepared
- Communication is limited within families, or close neighbors.
- Functional community is endowed with functional community association and community leadership.
- Establishment of Internal technical committee

## **(2) Relation between community, institutions and other organizations**

- PC municipality will provide warning information to community
- Promotion of employment of the Intermediary group
- Easy access to Information for all
- Communication and negotiation

## **(3) Role of Community in the whole system**

- Facilitation of community participation in planning process from the beginning

### **3.6.5. Summary**

The early warning system is judged as feasible from community aspect. In the early warning system, existing community organizations will be used as a core entity to play an important role in both urban and barrio communities. The communities are willing and responsive to the new system through the experience of the pilot study with the communities in urban and barrio areas.

The proposed early warning system shall provide openly to the community more accurate and timely information and instruction which the communities need.

A key is the relation between community and municipal agency like CP who has to have a close relationship with community and build up a rapport. In addition, when the system will be planned and designed, the communities shall participate actively so that they feel they are really a part of the system.

On such occasions and for enlightenment and improvement of the community in early warning system, the third party or intermediary groups will be utilized to act as a facilitator or mediator.

### **3.7 Conclusion**

The Early Warning System will be feasible from institutional, technical, and community aspects. The following are important points in early warning system.

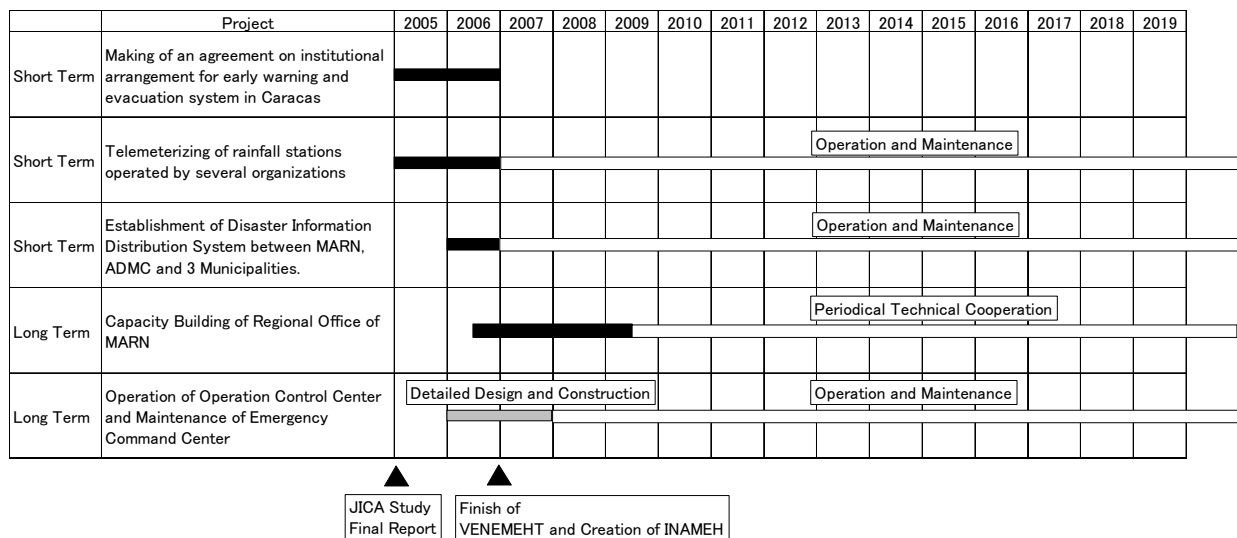
- The institutions have not made early warning, and the early warning system shall be established. However there is a program that can be a base for the system, such as creation of INAMEH. The system is expected to be operated based on the official agreement among the related governmental agencies, and communities in the near future.



- In respect to technical aspect, although more accumulation of necessary information and record of disaster are needed to establish more accurate analytical models, the system can be started with the provisional analytical models such as CL the JICA Study Team studied, even which requires further modification.
- Communities are willing and able to be part of the early warning system. They shall not be treated with passively in the system from the planning stage, but they shall be participating positively from beginning of the system establishment, thereby they shall feel they are part of the system. In order to enlightenment and improvement of community in the early warning system, intermediary groups, or external experts play an important role.

**Table S27-3.1 Cost of Early Warning and Evacuation**

Item	Cost (USD)
Establishment of Agreement	4,000
Installation of Equipments	100,000
Annual Maintenance Cost of Equipments	56,000
Capacity Building of Regional Office	300,000
<b>Total</b>	<b>460,000</b>



**Figure S27-3.1 Project Implementation Schedule for Early Warning and Evacuation**