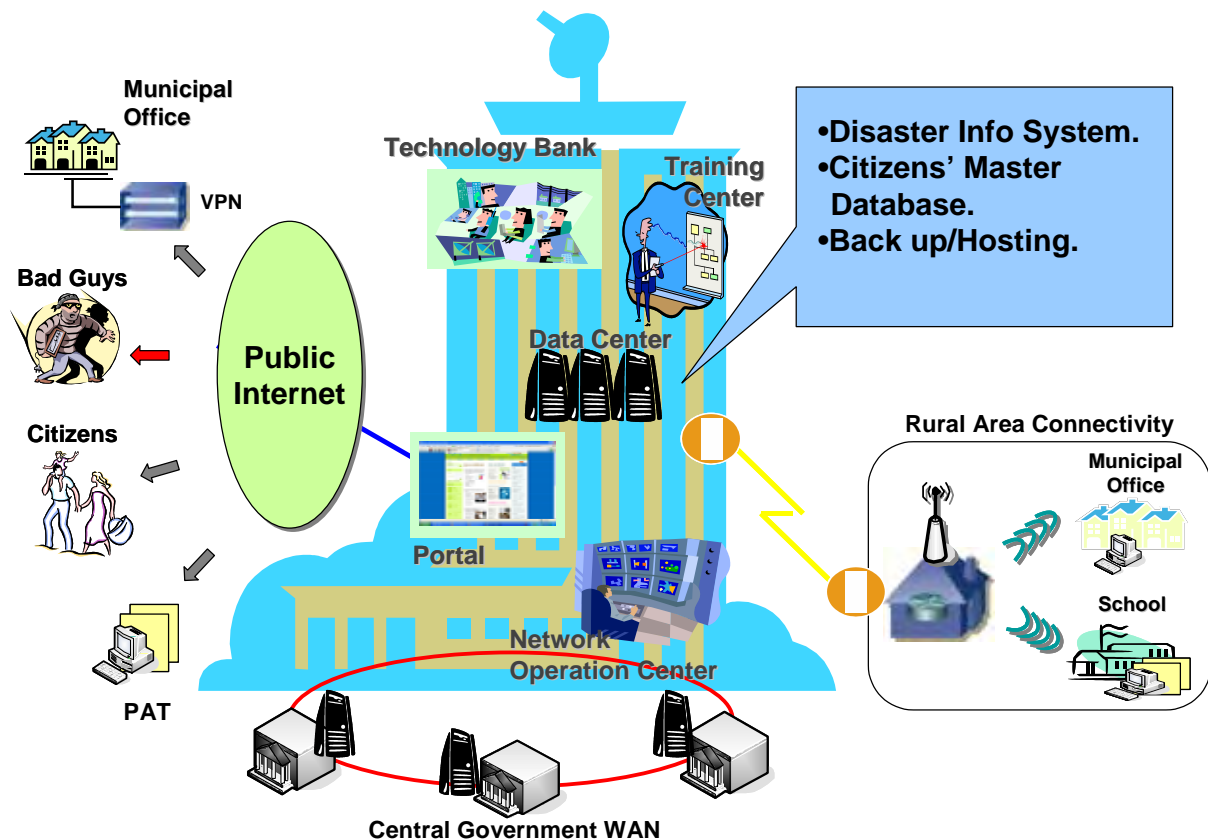


**THE FEASIBILITY STUDY ON ESTABLISHMENT OF THE
e-GOVERNMENT PLATFORM
IN THE REPUBLIC OF EL SALVADOR**

**FINAL REPORT
SUMMARY**

DECEMBER 2006





REPUBLIC OF EL SALVADOR
PRESIDENTIAL HOUSE
TECHNICAL SECRETARIAT



JAPAN INTERNATIONAL
COOPERATION AGENCY
(JICA)

**THE FEASIBILITY STUDY ON ESTABLISHMENT OF
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PREFACE

In response to the request from the Government of the Republic of El Salvador, the Government of Japan decided to conduct the Feasibility Study on Establishment of *e*-Government Platform for El Salvador and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a Study Team, which consisted of experts of PADECO Co., Ltd. to the Republic of El Salvador between January 2006 and November 2006. The Study Team was headed by Mr. Yuichiro Motomura of PADECO.

The Study Team held discussions with the officials concerned of the Government of the Republic of El Salvador and conducted field surveys. Upon returning to Japan, the Study Team conducted further studies and prepared this final report.

It is my hope that this report will contribute to the development in the Republic of El Salvador, and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to all the officials concerned of the Government of the Republic of El Salvador for their generous cooperation given to the Study Team.

December 2006

Kazuhiisa Matsuoka
Vice-President
Japan International Cooperation Agency

December 2006

Mr. Kazuhisa MATSUOKA
Vice-President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to submit herewith the final report of “ The Feasibility Study on Establishment of e-Government Platform for El Salvador”.

This report presents the results of the Study, which was undertaken in the Republic of El Salvador from January 2006 to November 2006 by the Study Team, organized by PADECO Co., Ltd. under the contract with JICA.

The Study Team, in cooperation with diverse sectors of the people in El Salvador, has formulated a comprehensive plan of establishing an e-Government platform and its implementation. The Study Team also technically supported some of the preparatory processes for the Government to acquire funds for the implementation including loans and grants from foreign sources.

We owe a great deal to many people for the completion of this report. We would like to express our deep appreciation and sincere gratitude to all those who extended their kind assistance and cooperation to the Study Team, in particular, the concerned officials of the counterpart agency for this Study, the Technical Secretariat, the Presidential House, of the Republic of El Salvador, and members and related officials of the National Commission for the Information Society.

We also are very much thankful to the officials of your agency and the Ministry of Foreign Affairs of Japan.

We hope that the report will contribute to facilitating further socio-economic development in the Republic of El Salvador.

Very truly yours,



Yuichiro MOTOMURA

Team Leader

The Feasibility Study on Establishment of e-Government Platform for El Salvador

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Summary

1. Study Background, Objectives, and Schedule

El Salvador is the coordinator for ICT sector development in Plan Puebla Panama, a regional development program of the Central American countries. The Government of El Salvador requested the Government of Japan to carry out a feasibility study for establishing an *e*-Government platform for the purpose of making the ICT sector development as the core of national development. This study has been being carried out by PADECO Co., Ltd., which was commissioned by the Japan International Cooperation Agency. The study is assumed to take into account foreign financial assistance such as a yen loan from Japan Bank for International Cooperation. The study commenced in January 2006; its progress report was issued in March 2006, an Interim Report in August 2006, and a Draft Final Report in October 2006.

2. Policy Analysis

2.1. Existing Plans

- JBIC Mater Plan: Submitted in March 2003. Thirteen projects were proposed, which basically include proposals contained in this report.
- *e*-Pais Strategy: Effort of National Committee for Information Society for its preparation is nearing completion. Six components of *e*-Government are identified: central organization, standards and norms, intra-government communication, government to citizen communication, *e*-Government portal, education and training, and research and development center.
- Hinds Paper: Analysis of procedures and benefits of *e*-Government realization by an ex-ministry of finance official.
- Daboub Paper: Explanations of twelve important projects for *e*-Government identified under the previous president.
- Ministry of education and ministry of industry prepared plans including IT policies.

2.2. Objectives of Establishing *e*-Government

- Enhance level of services provided by the government for citizens
- Promotion of the domestic IT industry

2.3. Promotion of Private Sector by the *e*-Government Project

Private IT industries in El Salvador are very much underdeveloped. The *e*-Government project would promote private sector in the following manner.

- Out-sourcing of functions such as maintenance, operation, and training
- Expansion of market by broadening areas for Internet connection
- Outsourcing of some of government services
- Outsourcing of training of government officials

2.4. Reduction of the Digital Divide

No data are available that indicate the digital divide in El Salvador. It is considered that the divide is significant judging from regional difference in literacy. The following are deemed effective to eradicate such divide:

- To increase opportunities of Internet connection (connectivity) in rural and poverty areas;
- To enhance accessibility to PC and Internet; and
- To enhance connectivity at schools.

The above measures are mentioned in the National Education Plan 2021, and within the program Conectate for the purpose there are subprograms of Grado Digital, Edunet, Mi Portal, Aulas Informaticas, and Computadoras para Mi Escuela.

2.5. Relationship to Plan Puebla Panama and Regional Development of Central America

The Plan Puebla Panama advocates eight pillars with respective coordinators:

- Sustainable Development (Nicaragua);
- Human Development (Mexico);
- Prevention and Mitigation of Natural Disasters (Panama);
- Promotion of Tourism (Belize);
- Commercial Exchange Facilitation (Honduras);
- Road Integration (Costa Rica);
- Power Interconnection (Guatemala); and
- Integration of Telecommunication Services (El Salvador).

El Salvador is responsible for the program of integrating telecommunication services with an important objective of promoting IT. Officials of El Salvador are well aware of this aspect. There also exists a high degree of interest in the effect of this *e-Government* project to the countries participating PPP.

2.6. Current Situation of Government Systems

Details of current IT systems in government organizations were investigated. A variety of system development, operation and maintenance are being executed in each organization. However, *e-Service-type* of systems (which directly provide services to citizens) are hardly to be found. Weaknesses of the current IT situation can be summarized as follows:

- 1) There is no secure and stable system operation. It will very difficult to keep stability in operation when many citizens will access these systems in the near future, as they should;
- 2) Few IT units have back-up system, although El Salvador is one of the most earthquake prone area in the world; and,
- 3) Many similar or duplicated efforts are being made as individual organizations are independently outsourcing system development.

3. Basic Strategy and Design Standards for *e-Government*

3.1. Basic strategy for *e-Government*

General Areas of *e-Government* Application

A survey of desired application in El Salvador found a consensus in the preferred areas for application development:

- 1) Citizen Identification;
- 2) Security;
- 3) Education; and
- 4) Health.

Necessity of *e-Government*

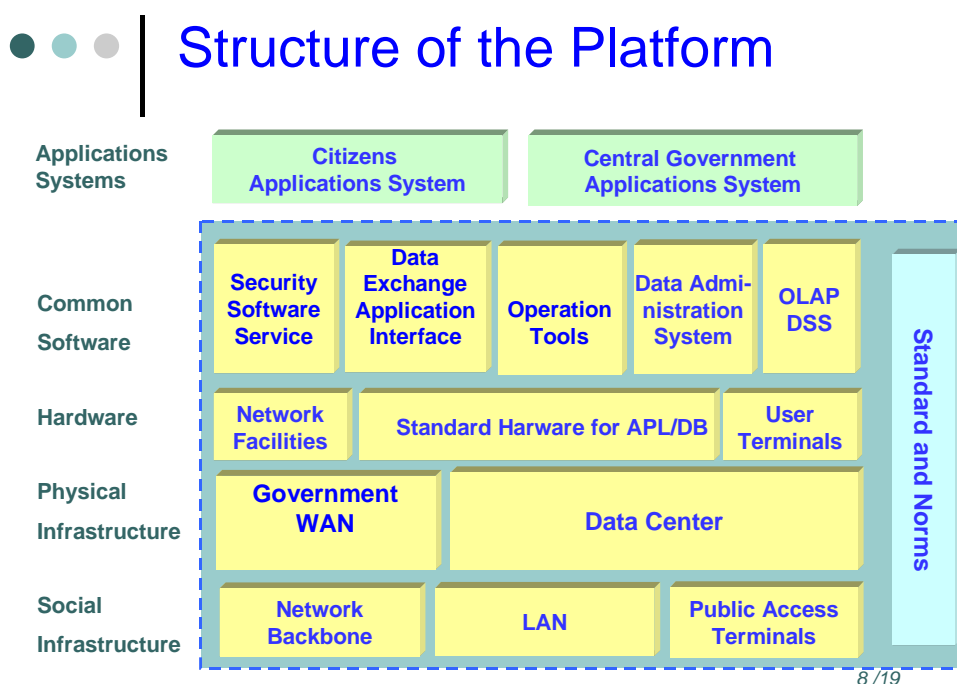
Integrated *e-Government* is highly necessary on the grounds of the following:

- 1) Most of the government organizations are facing shortage of budget and human resources except a few;

- 2) Most of the existing systems cannot handle a near future situation in which many citizens try to access the system;
- 3) Systems are being developed by each organization. This causes inefficiency because the lack of common development methodology results in duplication and incompatibility;
- 4) Because of insufficient data and system back-up, it is difficult to secure system stability;
- 5) Few data are shared by different organizations because each system has been developed separately; and,
- 6) Inefficient development and operation caused by the non-existence of Standards and Norms.

Contents of e-Government Platform

Thus, e-Government platform is to integrate IT infrastructure of government organizations, to secure and promote Internet connection among government agencies and with rural areas and to improve government services to citizens. The e-Government Platform generally consists of four layers as shown below, and application systems run on top of the platform.



Source: JICA Study Team

8/19

Figure 1 Platform and Application

Selection of Application Systems

Application systems in this study are strategically defined as those providing government services to citizens. A survey by this study yielded nine candidate applications. They were evaluated by seven criteria as shown below. Consequently, Citizens’ Master Database and Disaster Information systems were selected.

Table 1 Criteria for Evaluation

Criteria/Appl	Weight	a-1	a-2	b-1	b-2	c-1	c-2	d-1	d-2	d-3
1) Wide Subject	10	10	5	5	7	6	6	8	4	8
2) G2C	10	10	10	10	10	10	8	8	4	8
3) Effect on PPP	5	3	5	3	5	3	3	3	3	3
4) Basis for Exp	5	5	3	3	4	3	3	3	2	3
5) Standardization	5	5	3	3	4	3	3	3	3	3
6) Local Gov.	5	5	3	3	5	3	5	3	3	3
7) Readiness	20	15	10	5	10	5	5	5	5	3
Total	60	53	39	32	45	33	33	33	24	31

Source: JICA Study Team

Selection of Priority Components

The foregoing discussions have led to the conclusion that the following components should be adopted for this *e*-Government project:

- 1) Government WAN;
- 2) *e*-Government Center;
- 3) Trigger Applications; and
- 4) Standards & Norms.

Promotion of IT Industry

This project, once implemented, will promote IT industry in El Salvador in the following ways:

- 1) Increase in income by increasing traffic and reduction of communication cost;
- 2) Increase in contract for the development during the project;
- 3) Outsourcing of operation and maintenance by the government;
- 4) Reduction of development cost and improvement in quality by applying Standards & Norms; and
- 5) Boosting the quantity and quality of manpower of the private sector by re-assigning IT specialists in the government sector to private enterprises.

Effect to PPP countries

This project can be a model to other PPP countries. El Salvador can truly become the leader of *e*-Government in the PPP.

Responsibilities between Public and Private Sectors

It is not desirable for the government alone to operate and maintain the *e*-Government. The table below shows possible distribution of responsibilities.

Table 2 Responsibilities between Public and Private Sector

No	Tasks	Public	Private	Remarks
1	Policy making			
2	Planning			
3	Standards & Norms			
4	Auditing			3 rd party should do.
5	Training			
6	System development			
7	System Implementation			
8	Regular operation			
9	Maintenance			
10	Performance evaluation			
11	Call center			
12	Field services			
13	Procurement			

Source: JICA Study Team

Lots of duplication caused by outsourcing by each organization. Lots of duplication caused by outsourcing by each organization.

3.2. Basic strategy of e-Government WAN

Issues

Internet market of the El Salvador has been fully privatized after the telecommunication infrastructure was sold to a private company in 1998. Generally, the quality of the Internet services has the following problems:

- Internet access speed is slow;
- Bandwidth of backbone network is not sufficient to provide good broadband services to citizens;
- Service price is high relative to GDP per capita level, so that national Internet population is estimated at less than 5 %;
- The Government does not collect any information related to neither the national Internet infrastructure nor statistics on network traffic; and,
- Internet services are not provided to a large part of rural towns and villages, especially in northern area of the country.

Current Internet market situation may not be a comfortable one for El Salvador as a member of PPP, responsible for telecommunication strategy. It should be emphasized that the market mechanism for Internet businesses does not function properly in El Salvador as manifested by the facts that both continuing high Internet service price for years, as commonly found in most of Central/South American countries, and the unsolved problem of expanding Internet services into rural areas.

Another important problem is that the Government continues to pay unnecessarily high charges to ISPs, due to the following reasons:

- No volume discount is available. Most ministries have their own separate Internet contract with ISPs; and
- A contract duration is limited to one year.

It is expected to reduce the government Internet expenditure as much as 50-70%, by implementing various combined solutions, both technical and administrative.

It should also be stated that the government has little experience in managing network operation and maintenance work in the organized way.

Network Design Concept

Government WAN: Gbps class bandwidth expansion capability. Reliable design makes it possible to avoid network service suspension caused by any single equipment failure. Secured network design against Cyber terrorism should be considered.

Local Connectivity: Network facilities to provide Internet services to specific local areas, using such as Wi-Fi wireless LAN, WiMAX wireless LAN, and Power Line Communication (PLC), can be shared among public offices, such as school, police, municipality, hospital, health. Residential use is also considered. Operation and maintenance should be implemented by the private sector.

Network Application Functions

OS: It is recommended to use LINUX as a standard OS.

E-mail: Introducing government standard mail addresses. Security protection service, such as anti-virus, anti-spam software, should be introduced.

Secured network functions: PKI (Public Key Infrastructure) for encryption of transferring files among ministries and municipalities should be introduced.

Web: Web Hosting, Portal Web

Common System: DNS (Domain Name System), File Transfer/Exchange, Search Engine, Access Control

Network Operation Center

Network Operation Center (NOC) is a 24 hours, 7 days/week operation. It monitors and controls entire Government WAN operation status. NOC operation organization should be outsourced to a professional

private company. A quality service level should be defined and verified in a Service Level Agreement contract. Monitoring and repairing arrangement works are done by NOC staffs.

The NOC should be equipped with a sophisticated and integrated monitoring and management system, such as Tivoli Monitoring or Openview product.

Regulation

Telecommunications regulations in El Salvador need to be updated. The policies must be in constant change and evaluation, because the telecommunication market is one that moves forward fast and changes at the same pace as technology does.

The SIGET is supposed to monitor and supervise the national telecommunication industry. In order to realize providing a good and efficient Internet services to all citizens on an equal chance basis, the regulator and industry have to give best effort implement the following policies: sharing facilities, information exchange, rural facility investment promotion, among others.

Business Model

It is envisaged that the government will invest all network equipment and installation work. The ownership of the equipment and facilities would belong to the government. Operation and maintenance work is outsourced to a private company. Unless the contractor violates the Service Level Agreement Contract, the government pays required outsourcing fee every year.

Technical Options

Backbone network: Optical fiber cable is a long-term solution. When new data transmission technology is developed, replacement of equipment may be enough to adapt new technology without replacing cables.

Cable laying: Underground cable laying is much safe in terms of security consideration.

Local connectivity: Wireless LAN seems best solution, however further study is needed.

3.3. e-Government Center

Requirements for e-Government Center

- 1) Building
 - (1) Earthquake-resistant structures
 - (2) Location with appropriate considerations of site conditions and surroundings
- 2) Required Services (primarily for governmental organizations)
Web hosting, data back up service, data replication service, system stand by service, data exchange service, virus protection, access log management service, PC monitoring, authentication service, access control service, PKI, technical assistance service, network engineering service, remote operation service, intra-government portal, e-Government portal, open document service, payment gateway, video conference, technology bank, training center, help desk, and call center
- 3) Functional Organization
Planning, Administration, Standardization Promotion Committee, System Auditing Committee, Procurement, Data Center Service, Training, Field Service, Network Service, Software Service, and Facility Management Service
- 4) Items Considered in Building Design
Location, internal space, interior design, functional person-movement, building structure, earthquake-resistant structure, facility management system, operation and management, construction cost control, building site, building size, and equipment size

Preliminary drawings of the building are shown in Appendix of the Final Report.

Functions and Necessary Personnel of *e*-Government Center

It is envisaged that the following staff would be needed by each of the required functions:

- 1) Planning: 3-5
- 2) Administration: 3-5
- 3) Standardization promotion committee: committee
- 4) System auditing committee: committee
- 5) Procurement: 3-5
- 6) Data Center Service: 3-5 (Internal only)
- 7) Training: 2-3 (Internal)
- 8) Field Service: 2-3 (Internal only)
- 9) Network Services:
- 10) Software Services: 3-5

Organizational Position of *e*-Government Center

The following can be considered:

- 1) Presidential House, Technical Secretariat, *e*-Government Division: Possible to establish by a presidential decree;
- 2) Presidential House, Technical Secretariat, *e*-Pais Initiative (existing): Currently no power over ministries;
- 3) Ministry of Gubernacion, Technical Deputy Minister: Already too many responsibilities;
- 4) Ministry of Hacienda, Technical Deputy Minister: No power over other ministries; and
- 5) Ministry of Education, Technical Deputy Minister: No power over other ministries.

The 1) above seems to be the best choice. President can create a department within the Secretariat without asking to the congress.

3.4. National Database for Citizens

Issues

RNPN issues an ID card (DUI) to all of Salvadoran nationals over 18 years old utilizing personal data kept in a database managed by RNPN. Actual operation and maintenance is outsourced to a private company. A number of databases of individual citizens' personal data are maintained by various systems in many organizations. Providing a function that enables data linkages between the RNPN system and other systems would result in more efficient government services to users. Issuing of birth certificate, which is often necessary in various occasions in the life of Salvadorians, is one of those services.

Systems Configuration and Functions

Configuration is shown below.

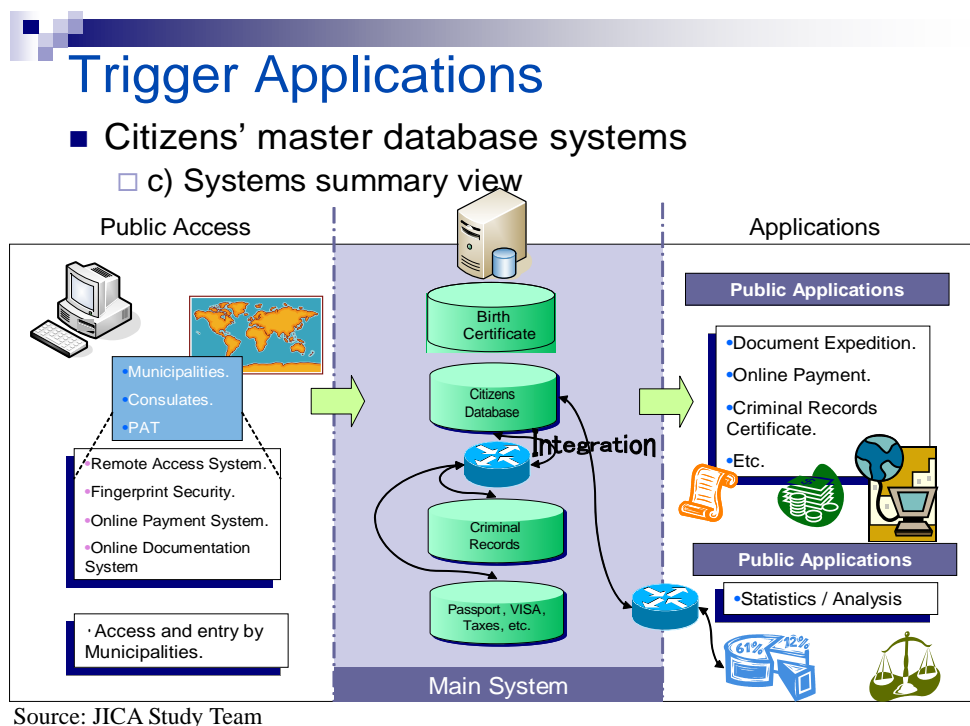


Figure 2 Trigger Application: Citizens' Master Database

- 1) Data retrieval and printing by citizens
- 2) For users' retrieval, a database is created by integrating RNP database and other databases
- 3) Data entry by municipalities. Data will be transmitted to RNP.
- 4) Data transmission to systems of other institutions.
- 5) Data analysis and statistical processing for agencies.

Benefits

Citizens: No need to go to a municipality far from their residence.

Overseas Salvadorians can also enjoy this function.

Municipalities: Reduction of the work of issuing birth certificates.

Transmission of data to RNP through the network.

Central government agencies: Agencies will have access to RNP data

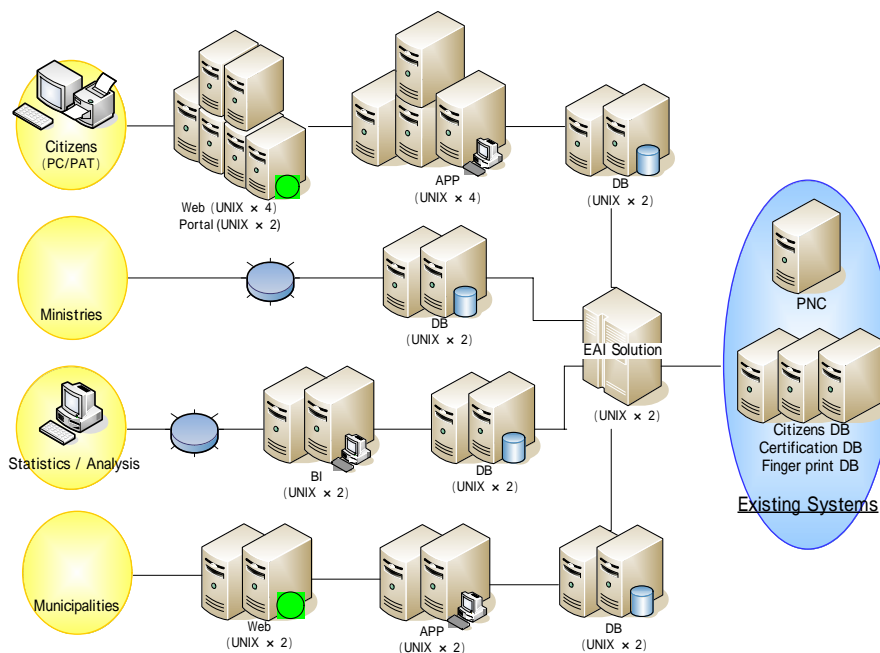
Statistical and analysis systems are available.

Standardization

Some important Standards and Norms described later will be prepared in parallel with the works of design, development and operation/maintenance.

Hardware and Software

Data of 8,000,000 citizens will have to be stored in an integration database. It is estimated to occupy 800GB. Equipment configuration is considered as below.



Source: JICA Study Team

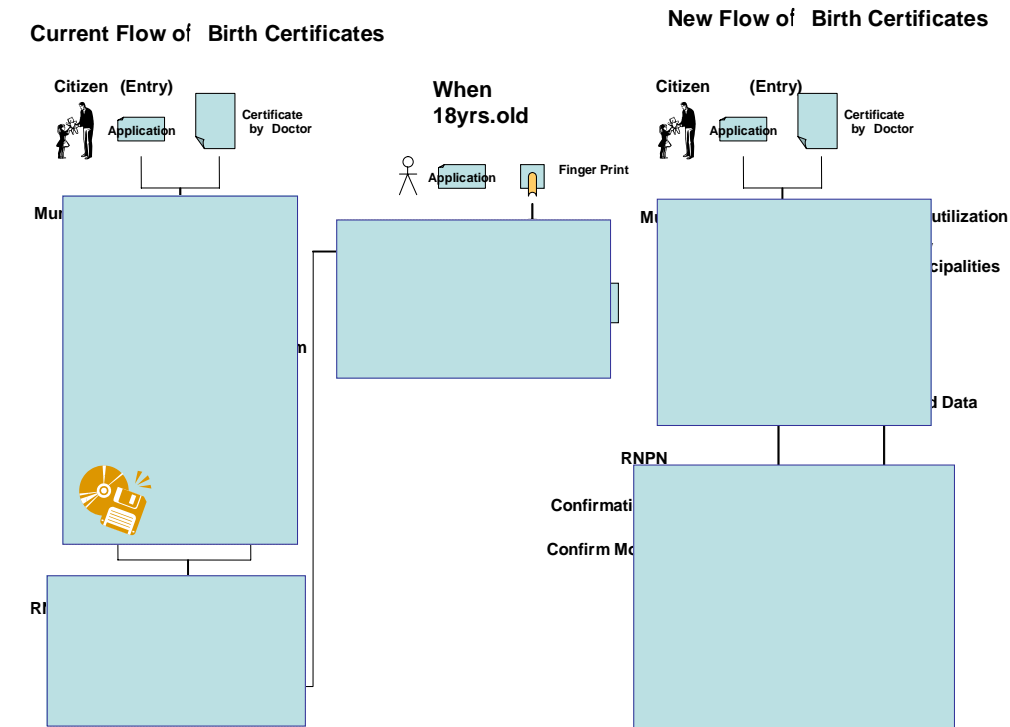
Figure 3 Hardware and Software for Common

Place of Installation and System Accommodation

Servers of this system should be accommodated in the server room of e-Government center.

Change in Business Operation

Data entry process will have to be changed as shown below.



Source: JICA Study Team

Figure 4 Flow for Citizen's Master Database

O&M

The e-Government Center is responsible for securely operating the system. Data themselves should be managed by RNPN.

3.5. Disaster Information System

Issues

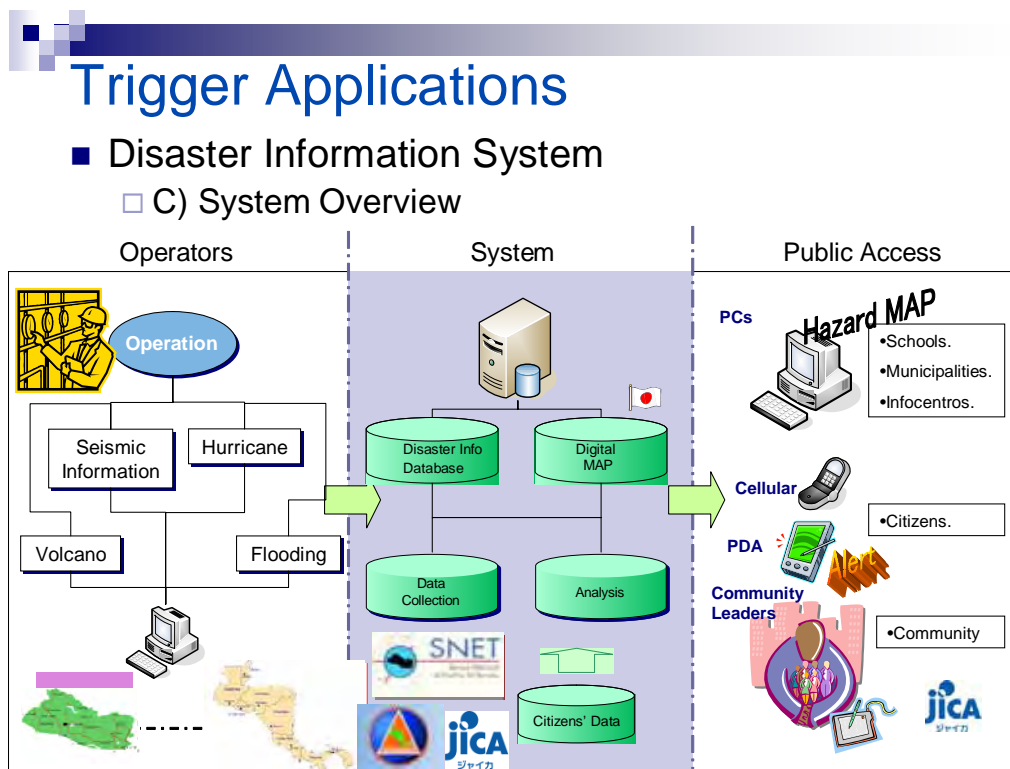
SNET gathers and stores information concerning natural disasters in order to provide them to public and to community leaders. Once a disaster occurs, an emergency headquarters is established and the responsible parties from related ministries gather at Civil Protection under its leadership. Currently, information provision depends on manual operation, so that information flow is often disrupted.

System Overview

Function1: Allow anyone with PC nationwide to get hazard map.

Function2: Distribute disaster information, shelter information, etc. mainly to mobile terminals (such as cellular phones). (One in three persons in El Salvador owns cellular phone)

The chart below shows an overview of this system.



Source: JICA Study Team

Figure 5 Trigger Applications: Disaster Information System

Benefits

- Citizens: Identify areas of high risk
 - Immediate access to information on disasters
 - Initiate timely evacuation or other preventive procedures
- Municipalities: Prepare adequate emergency response plans
 - Make sound decisions for land use planning to reduce the vulnerability to disaster
- Government users: Coordinate risk prevention and emergency response activities
 - Make sound decisions for new infrastructure and social benefit project

Place of Installation and System Accommodation

The system should be accommodated in the server room of e-Government Center.

Participating Organization

SNET

Operation & Maintenance

SNET

Options for expansion

(1) Monitoring camera facilitation, (2) Decision support system, (3) Feedback information from citizens

3.6. Standards & Norms

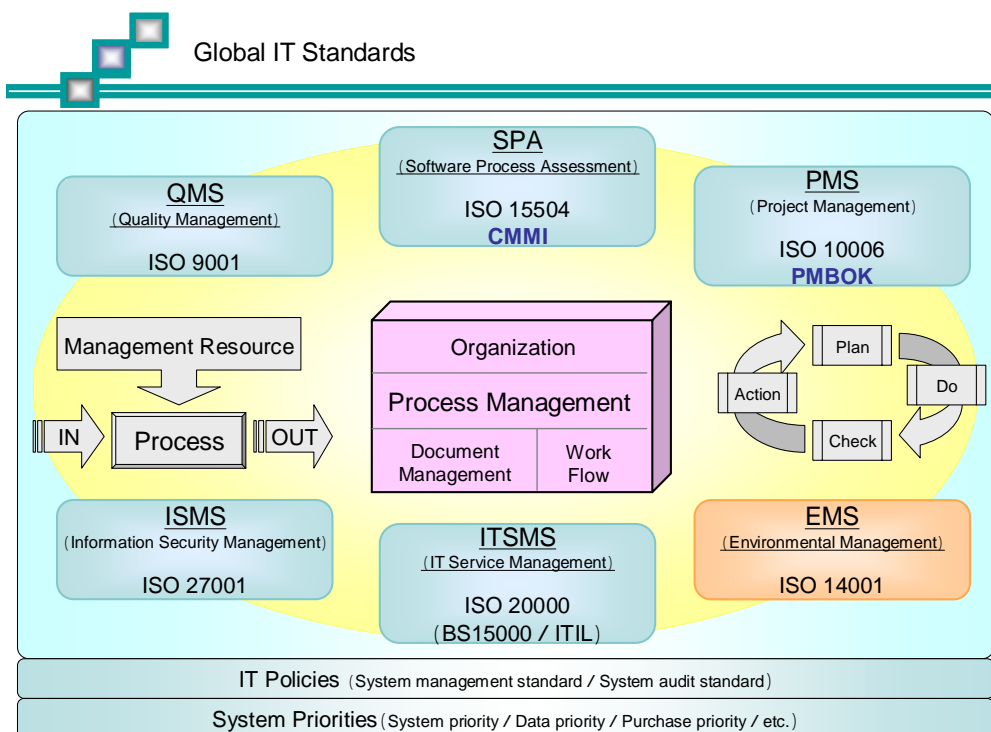
Issues

CONACYT (National Council of Science and Technology) is in charge of the standardization work within the Government of El Salvador. However, standardization document rarely exists in the IT field. Consequently, system inter-connection among ministries has been very limited. The chance of cost reduction in procurement is large but has been missed.

CMMI is the world standard for the software development. Obtaining CMMI certifications will improve competitiveness of private IT enterprises in El Salvador.

Basic Concept

The figure below illustrates the structure of the standards and norms as generally recognized worldwide.



Source: JICA Study Team

Figure 6 Structure of Standards and Norms

Because these international standards are merely guidelines for standardization, it is necessary to work for actual standardization process considering actual situation in El Salvador.

Method of Establishment

It is envisaged that the following standardization work will be implemented in parallel with the implementation of the forthcoming project: standardization in security and network-related areas while the development of the Government WAN, standardization in security and operation-related areas during the implementation period of the *e*-Government Center, and standardization in development-related areas when the trigger applications are being developed.

A committee should be set up for the purposes.

3.7. Common Subsystems

Issues

At present, most of application systems in the government have been developed and implemented separately by each of the individual ministries without much consideration to other organizations, resulting in the waste of effort due to duplication, and in mutual incompatibility. Common subsystems can eliminate such inefficiency.

Targets

There are many that can become common subsystems. However, the following six should be given priority:

- CRM (Customer Relationship Management): Support the call center;
- BI (Business Intelligence): Statistical and other analysis of databases;
- EAI (Enterprise Application Integration): Integrating databases;
- PMS (Project Management System): Project management and capacity building;
- Document Management System; and
- Work Flow.

Method of Establishment

The Standardization Promotion Committee, which should be set up under the *e*-Government Center, will select targets and will oversee the development and implementation.

4. Preliminary Design and Specifications

4.1. *e*-Government WAN

The proposed *e*-Government WAN is consisted of seven components:

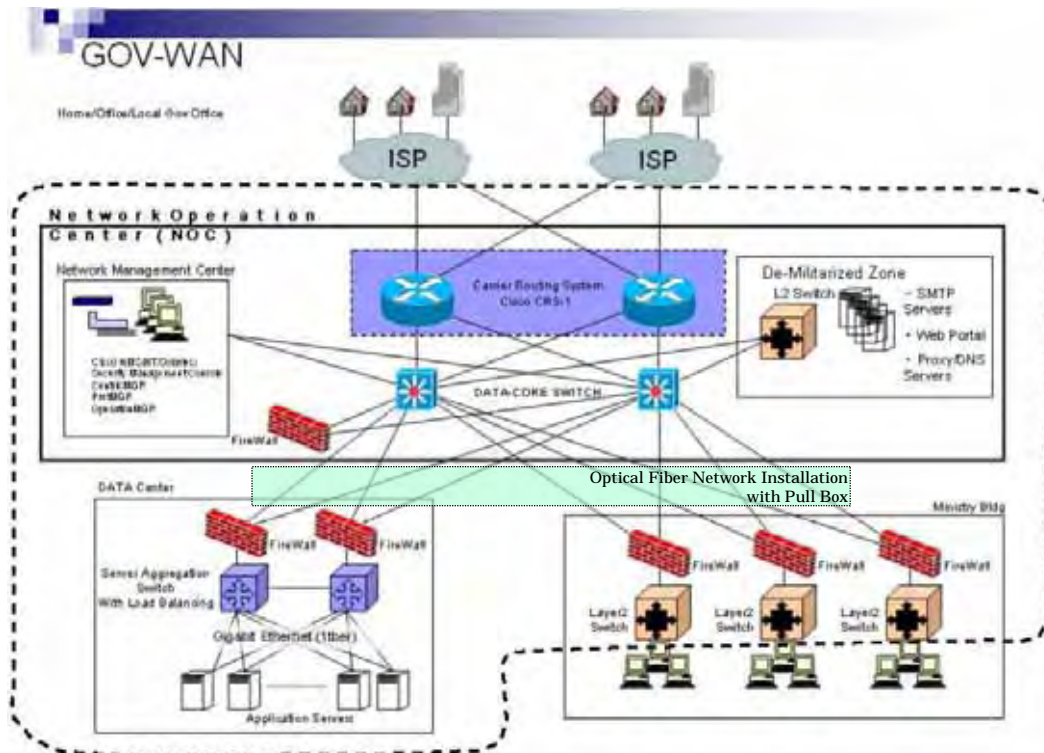
- 1) Optical Fiber Links and Switches;
- 2) Voice IP (VoIP) network;
- 3) Network Operation Center (NOC) system;
- 4) Network Application Servers;
- 5) Municipal Connectivity;
- 6) Rural Wireless WAN; and
- 7) Public Access Terminal (PAT) Network.

Each component is defined with the following specification items:

System Sizing, System Capacity and Scalability, Performance, Configuration, Reliability and Fault Tolerance, Network Topology, Hardware/Software, Network Management, Security, Scope of User Criteria.

Optical Fiber Links and Switches

The figure below shows the outline of the Optical Fiber Links and Switches.

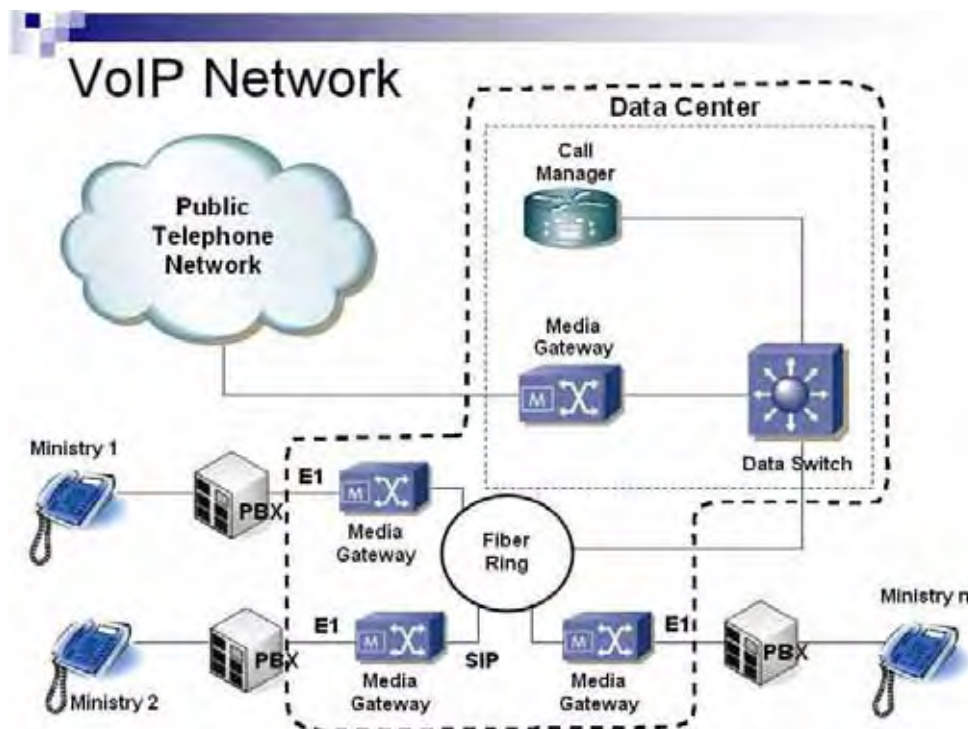


Note: Components circled by the dotted line are those included in the Project.
Source: JICA Study Team

Figure 7 Optical Fiber Links and Switches

Voice IP (VoIP) Network

The figure below shows the outline of Voice IP (VoIP) Network.

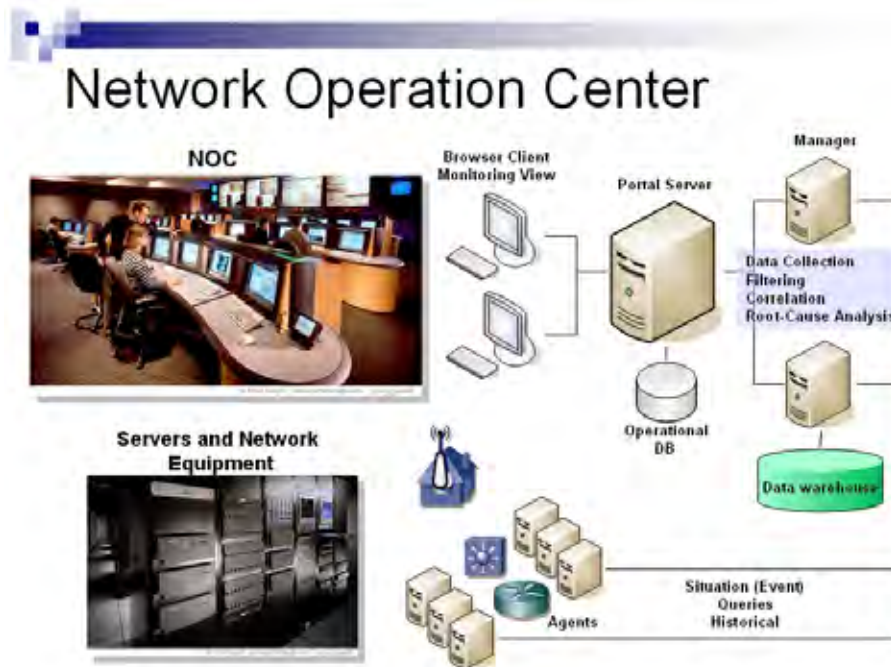


Note: Components circled by the dotted line are those included in the Project.
Source: JICA Study Team

Figure 8 Voice IP (VoIP) Network

Network Operation Center (NOC) System

The figure below shows the outline of Network Operation Center (NOC) System.

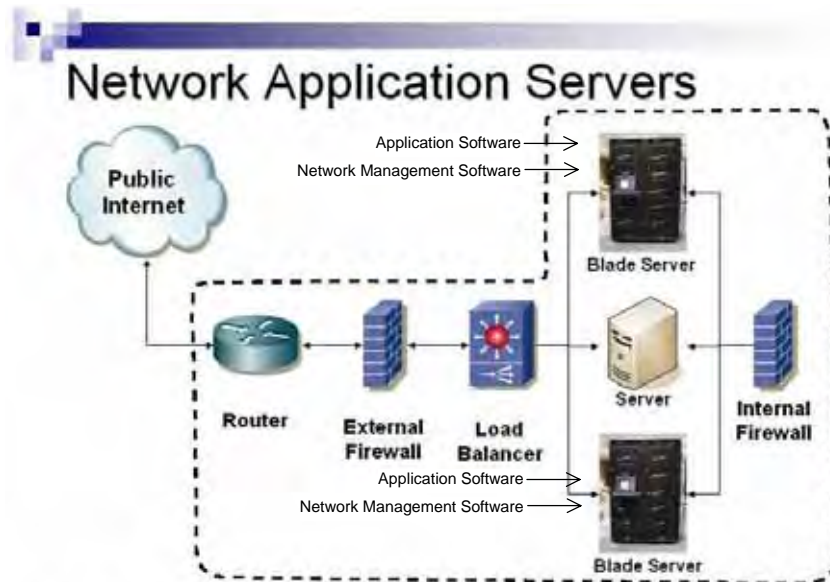


Source: JICA Study Team

Figure 9 Network Operation Center (NOC) system

Network Application Servers

The figure below shows the outline of Network Application Servers.



Blade Servers are self-contained computer servers, designed for high density, so they can host different types of applications.

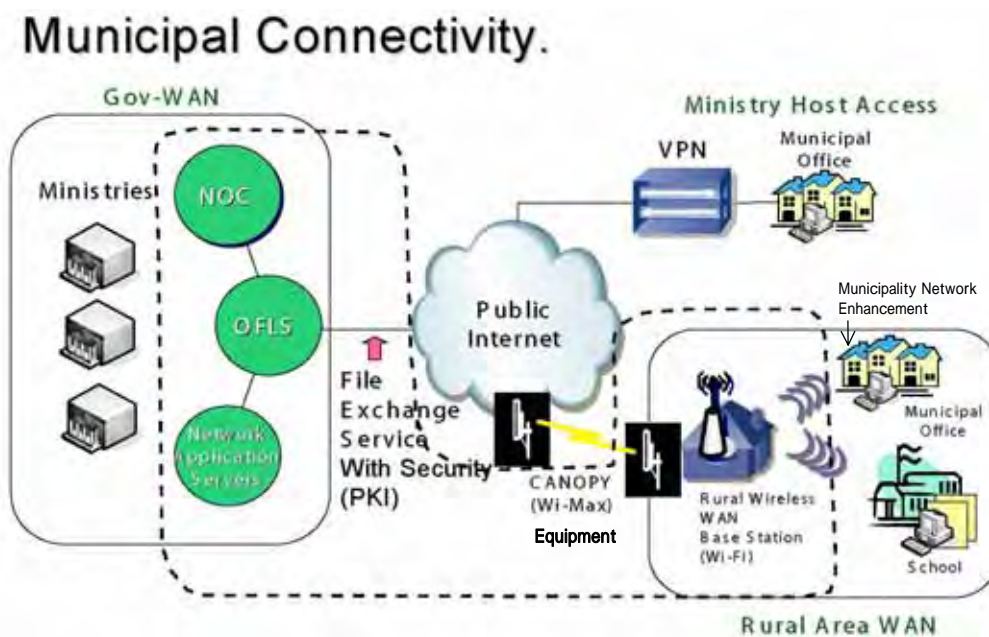
Note: Components circled by the dotted line are those included in the Project.

Source: JICA Study Team

Figure 10 Network Application Servers

Municipal Connectivity

The figure below shows the outline of Municipal Connectivity.

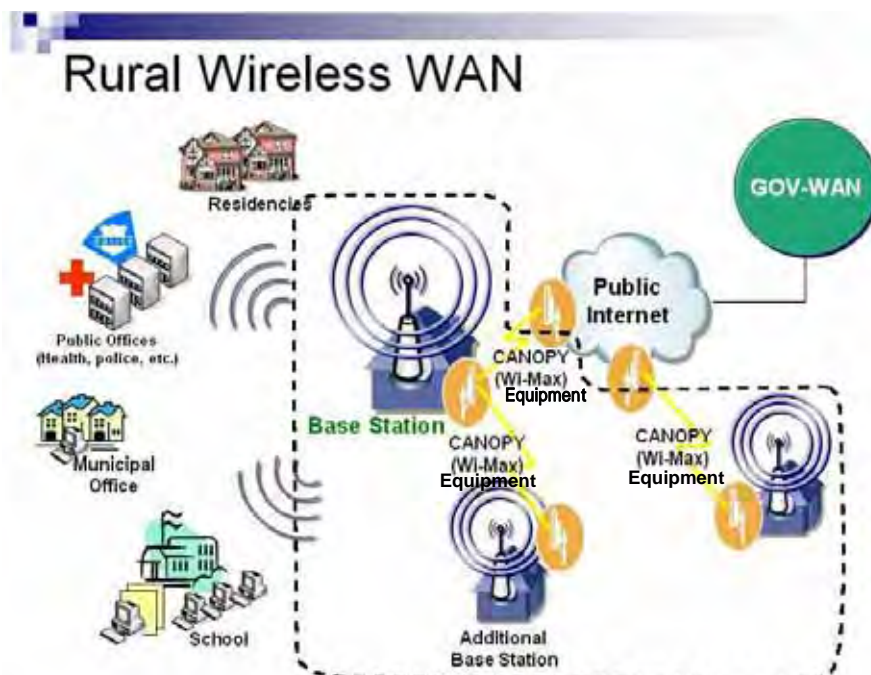


Note: 1) Components circled by the dotted line are those included in the Project.
 2) CANOPY is a wireless data communication equipment.
 Source: JICA Study Team

Figure 11 Municipal Connectivity

Rural Wireless WAN

The figure below shows the outline of Rural Wireless WAN.

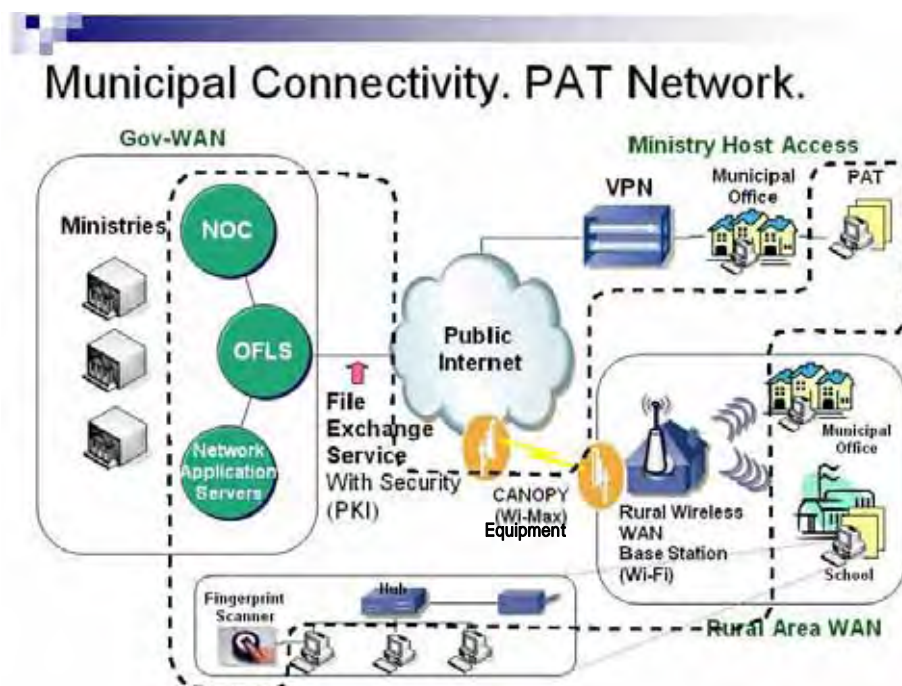


Note: Components circled by the dotted line are those included in the Project.
 Source: JICA Study Team

Figure 12 Rural Wireless WAN

Public Access Terminal (PAT) Network

The figure below shows the outline of Rural Wireless WAN.



Note: Components circled by the dotted line are those included in the Project.

Source: JICA Study Team

Figure 13 Public Access Terminal (PAT) Network

4.2. e-Government Center Building

Design

- Isolation system in the foundation
- Pressure slab under the foundation
- Main structure: reinforced concrete, column: 60cm × 60cm, girder: 60cm × 45cm, thickness of shear wall: 18cm
- One basement floor and three upper floors, the area of each floor: 1,440 m², total floor area: 5,805 m²
- The first floor height is 5m, the second floor 4m, the third floor 5m, and the total building height 14m
- Generator: N+1 Redundancy

Equipment for e-Government Center

- Data Center floor area: 710m², server rack including UPS: 150 sets
- The server room floor: 18 inches raised, floor strength: 1,200 lbs/square feet
- HVAC for server room
- Operation room for servers and network
- Call center including 40 desks
- System production room

Services

Services with possible charging schemes to users:

Web Hosting Service,	System Operation,
Data back up service,	Data Replication Service,
System Stand by service,	Data Exchange Service,
Virus Protection,	Access Log Management Service,
PC Monitoring,	Authentication Service,
Access Control Service,	PKI,
Technical Service,	Network Engineering Service,
Remote Operation Service,	Intra-Government Portal,
e-Government Portal,	Open Document Service,
Payment Gateway,	Video Conference,
Technology Bank,	Training Center,
Help disk,	Call Center

SNET and Civil Protection

The SNET and the Civil Protection may reside in the e-Government Center building.

4.3. Citizens' Master Database System

A general system configuration chart is shown below.

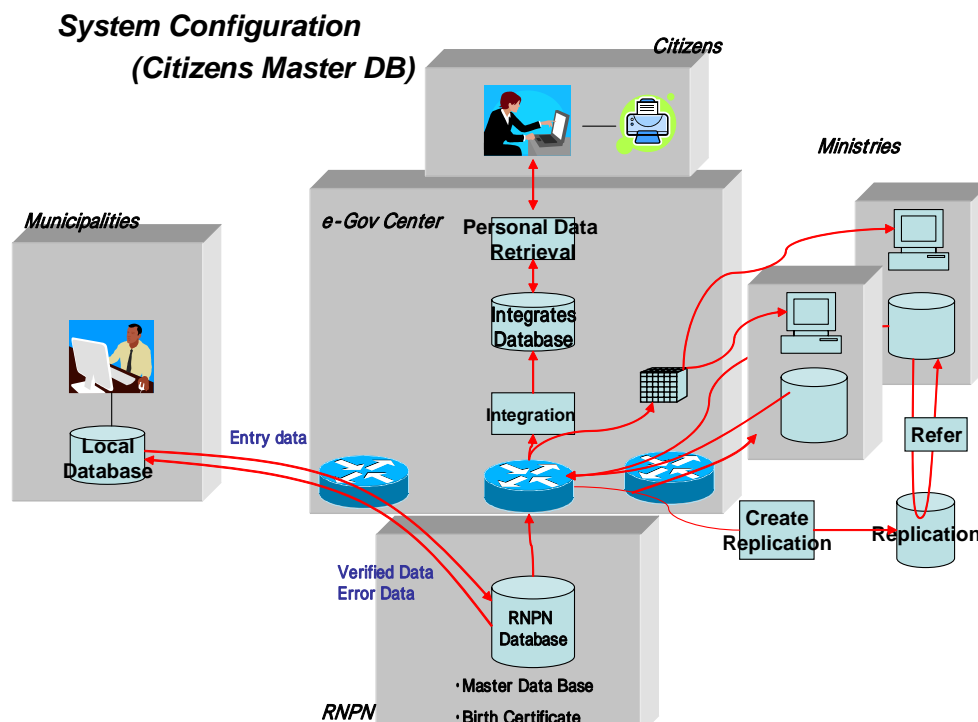


Figure 14 System Configuration (Citizens Master DB)

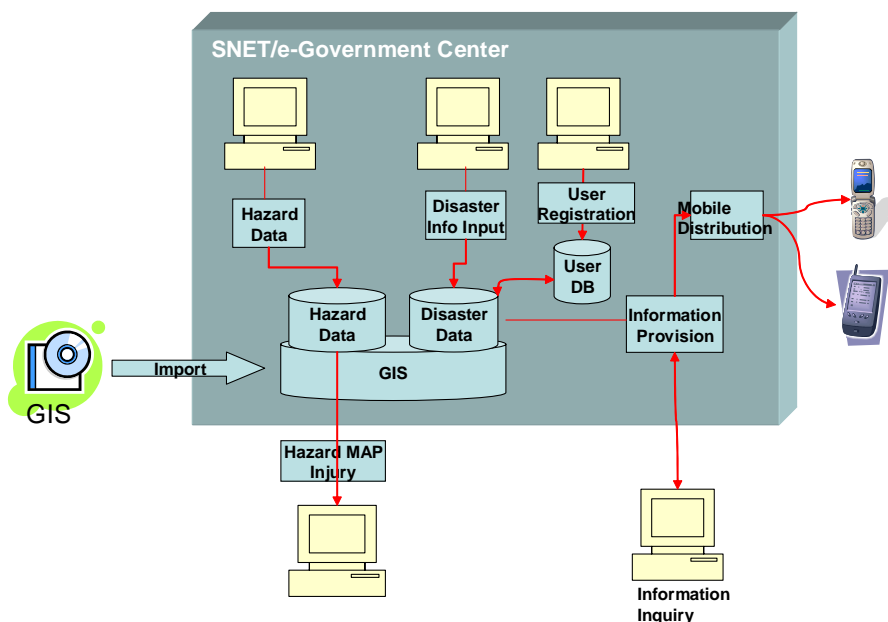
This system has following Functions:

- Citizens' retrieval of birth certificate;
- Data entry by municipalities;
- Data exchange with ministerial systems; and
- Creation of BI cubes.

Existing RNP databases such as those for DUI and birth certificates will be used as the basis of the expanded system as shown above.

4.4. Disaster Information System

A general system configuration chart is shown below.



Source: JICA Study Team

Figure 15 Systems Configuration (Disaster Information System)

This system has following Functions:

- Hazard Map
 - Map Import
 - Hazard data input
 - Hazard map inquiry
- Disaster Information
 - User registration (Linked with Citizens' Master DB)
 - Disaster Information entry
 - Disaster Information inquiry
 - Disaster information distribution (To mobile terminals as well as PCs)

4.5. Standards and Norms

As soon as the e-Government Center is organized, the standardization promotion committee should be set-up. Development of Standard & Norms is not only for government agencies but also for private enterprises. Subjects will include:

- Common issues including ICT policy;
- Standards & Norms for Operation & Maintenance;
- Standards & Norms for Network;
- Standards & Norms for System Development; and
- Standards & Norms for Security & Data.

Output of this activity should be published onto Website for better dissemination.

4.6. Common Subsystems

Systems which are necessary in this project with high priority are listed below. It is recommended that all of them be implemented immediately.

- CRM (Customer Relationship Management)
- BI (Business Intelligence)
- EAI (Enterprise Application Integration)
- PMS (Project Management Systems)
- Document Management System
- Work Flow System

4.7. Cost

Project cost estimates are shown below.

Table 3 Overall Project Cost (Thousand US\$)

					Grand Total	46,406
COMPONENT 1: Government WAN						
Item	Unit	Vol	Unit Cost	Cost	Total	
Detail Design	set	1	703	703	703	
Project Management	set	1	477	477	477	
Cable	set	1	2,210	2,210	2,210	
Hardware (Network)	set	1	8,740	8,740	8,740	
Hardware (Application)	set	1	720	720	720	
Software	set	1	480	480	480	
Connection with municipalities	set	1	628.8	629	629	
Public Access Terminals	set	1	1,200	1,200	1,200	
Rural Wireless Network	set	1	3,600	3,600	3,600	
Total				18,759	18,759	
COMPONENT 2: e-Government Center						
Item	Unit	Vol	Unit Cost	Cost	Total	
Detail Design	set	1	169	169	169	
Project Management	set	1	282	282	282	
Data Center Infrastructure	set	1	740	740	740	
Hardware	set	1	2,170	2,170	2,170	
Software	set	1	400	400	400	
Total				3,761	3,761	
COMPONENT 3: Citizens' Master Database						
Item	Unit	Vol	Unit Cost	Cost	Total	
Detail Design	set	1	727	727	727	
Project Management	set	1	648	648	648	
Hardware	set	1	1,050	1,050	1,050	
Software	set	1	400	400	400	
Development	set	1	1,276	1,276	1,276	
Total				4,101	4,101	

COMPONENT 4: Disaster Information System

Item	Unit	Vol	Unit Cost	Cost	Total
Detail Design	set	1	727	727	727
Project Management	set	1	648	648	648
Hardware	set	1	820	820	820
Software	set	1	400	400	400
Development	set	1	1,276	1,276	1,276
Total				3,871	3,871

COMPONENT 5: Common Sub Systems

Item	Unit	Vol	Unit Cost	Cost	Total
Detail Design	set	1	355	355	355
Project Management	set	1	252	252	252
Hardware	set	1	1,420	1,420	1,420
Software	set	1	2,050	2,050	2,050
Development	set	1	1,200	1,200	1,200
Total				5,277	5,277

COMPONENT 6: EGC Building

Item	Unit	Vol	Unit Cost	Cost	Total
Detail Design	set	1	924	924	924
Project Management	set	1	660	660	660
Building Construction	set	1	7,391	7,391	7,391
Total				8,975	8,975

COMPONENT 7: Standards and Norms

Item	Unit	Vol	Unit Cost	Cost	Total
Technical Assistance	set	1	1,662	1,662	1,662
Total				1,662	1,662

Source: JICA Study Team

3) Standard Conversion Factor

El Salvador adopts an open trade policy, which has accelerated even further with the implementation of CAFTA (Central American Free-Trade Agreement with the United States) in 2006. There is no subsidy or duties on exports while there is no import duties levied on the main products imported for the present project. Hence, standard conversion factor of 1.0 is applied.

4) Taxes

Economic costs and benefits exclude value added tax of 13%.

5) Contingencies

Economic investment and OM costs include 5% physical contingency. Price contingency is not included.

6) Economic Discount Rate

The project sets the target EDR at 10%.

Economic Project Costs

1) Investment Costs

Financial investment costs are adjusted to economic investment costs by adding 5% physical contingency. There is no investment costs under without project case.

The following table summarizes economic investment costs of the project, which amount to US\$80.9 million including reinvestment costs.

Table 4 Economic Investment Costs

(US\$ Million)

	Initial Investment Costs					Reinvestment Costs				Total
	2007	2008	2009	2010	Sub-total	2012	2013	2014	Sub-total	
Gov-WAN	12.2		2.7	2.7	17.6	9.5			9.5	27.0
e-Gov Center		7.2	3.2	0.3	10.7		1.6	0.2	1.9	12.6
Citizens' Master Database		1.8	0.9		2.7		1.1	0.6	1.7	4.4
Disaster Information System		1.7	0.8		2.5		1.0	0.5	1.5	4.0
Common Subsystems		4.7			4.7		1.4		1.4	6.1
Total Construction Costs	12.2	15.4	7.7	3.0	38.2	9.5	5.1	1.3	15.9	54.1
Consulting Fees	4.2	2.8	0.8		7.8				0.0	7.8
Total Base Costs	16.4	18.1	8.5	3.0	46.0	9.5	5.1	1.3	15.9	61.9
Physical Contingency (5%)	0.8	0.9	0.4	0.2	2.3	0.5	0.3	0.1	0.8	3.1
Total Economic Construction Costs	17.2	19.0	8.9	3.2	48.3	19.4	10.5	2.6	32.6	80.9

Source: JICA Study Team

2) Operation and Maintenance Costs

Financial operation and maintenance costs are used as incremental economic operation and maintenance costs, except for electricity/water and building maintenance costs of e-Government Center. Incremental economic O&M costs are estimated to be US\$7.5 million in 2018.

Quantitative Economic Benefits

The Study considers the items on the below table as quantitative economic benefits. Those items with an asterisk are mainly generated by respective component.

Table 5 Quantitative Economic Benefit Items by Component

Government WAN	* Reduction in Telecommunication Costs of the Central Government
	* Reduction in Telecommunication Costs of Municipalities
	Time Value Saved of Citizens Applying for Birth Certificates
	Cost Reduction of Municipality Employees Attending Citizens Applying for Birth Certificates
	Reduction of Citizens' Data Entry Cost
	Reduction of Damages to Citizens
Citizens' Master Database	* Time Value Saved of Citizens Applying for Birth Certificates
	* Cost Reduction of Municipality Employees Attending Citizens Applying for Birth Certificates
	* Reduction of Citizens' Data Entry Cost
Disaster Information System	* Reduction of Damages to Citizens
e-Government Center	* Reduction in Damages to RNPN, SNET and Civil Protection
	Facilitation for Other 3 Components to Achieve Respective Benefits
Standards & Norms/ Common Subsystems	Facilitation for Other 3 Components to Achieve Respective Benefits

Source: JICA Study Team

- 1) Government WAN
 - Reduction in Telecommunication Service Costs

Central Government

It is estimated that telecom service costs of the central government will be reduced gradually by US\$13 million (-58% in comparison to without project case) in 2018 due to estimated 40% reduction in data communication costs and introduction of free IP phones.

Municipalities

It is estimated that telecom service costs of the municipalities will be reduced gradually to US\$ 267,000 (-73.3% in comparison to without project case) in 2018 due to introduction of free IP phones and rural wireless data communication service.

- 2) Citizen's Master Database
 - Time Value Saved by Citizens

The time saved by citizens in obtaining birth certificates by accessing the database through the Internet is calculated as incremental benefits in comparison to traditional methods, based on the assumptions including the following.

- Average salary per hour: US\$1.9
- Average time required to receive a birth certificate at a municipality: 1.24 hours
- Average traveling time to a municipality: 3 hours
- The frequency to apply for birth certificates: Aged 15-64 (59% of the population); once every three years, aged below 15 and over 64 (41%); once every six years

62% of birth certificate acquisition will be made by Internet in 2018, when reduction in cost of time will reach US\$5.4 million.

➤ **Cost Reduction of Municipality Employees Attending Citizens Applying for Birth Certificates**
Efficiency improvement is calculated as reduction in costs of these municipality employees and is estimated to be US\$1.2 million in 2018.

➤ **Reduction of Citizens' Data Entry Cost**
As municipalities will be able to enter the citizens' data by themselves, outsourcing costs to a private company for data entry of citizens' data of birth and death will be reduced from 2009. The study estimates that cost reduction rate will gradually increase to 60% (US\$1.3 million) in 2018.

3) Disaster Information System

The Fifth Long-term Plan 2002-2009 Report of WMO (World Meteorological Organization) states that 'every dollar invested in national Meteorological and Hydrological Services produces an economic return many times greater, often ten times or more.' Thus, the study assumes ten times return (economic benefits) to the annualized investment costs and annual O&M costs of Disaster Information System.

4) e-Government Center

➤ **Reduction in Damages to RNPN, SNET and Civil Protection**
It is assumed that a natural disaster will occur in the middle year of the project life of the e-Government Center (2012) that will be large enough to damage and suspend the computer & telecommunication network system of RNPN, SNET and Civil Protection for one month under the without-project scenario.

National Register of Citizens (RNPN)

It is expected that the outsourcing company in charge of data entry will be assigned an additional month of work to complete the data entry in case a natural disaster occurred. Thus, the damage made under the without-project scenario is calculated at US\$0.18 million.

SNET

It is assumed that the SNET data (worth US\$ 12.9 million based on the employees' costs) will be destroyed by a natural disaster in 2012. In addition, the replacement costs of SNET's equipment are assumed to be US\$0.6 million

Civil Protection

It is assumed that the operations of Civil Protection will be suspended once a natural disaster strikes San Salvador in 2012, increasing the damage (estimated at US\$14 million p.a. based on the past 55 year data of casualty by earthquakes) by a conservative 10% estimate under the without-project scenario.

In total, the reduction in damages to RNPN, SNET and Civil Protection is calculated at US\$15.0 million.

Conclusion

Reduction in telecom service costs of the Central Government (Gov. WAN) is the largest economic benefit, followed by that of Disaster Information System and time value saved of citizens (Citizens' Master Database). The economic internal rate of return (EIRR) is calculated at **17.3%**, which exceeds the target EIRR of 10%. It is concluded that the proposed project is economically beneficial to the economy of El Salvador.

5.2. Financial Evaluation

The current prevailing thinking within the Government concerning the implementation of the Government WAN project is that the Government invests in the construction of the initial infrastructure by itself and that a private sector company operates the system under a contract with the Government. In accordance with the contract the private company charges the Government periodically for an amount that covers actual operating cost plus profit deemed reasonable. In addition, the Government pays user charges to the ISP company that provides communication lines as is the case now. Under such circumstances, it would be meaningless to calculate the Financial Internal Rate of Return.

6. Recommendations

The Government of El Salvador should implement this project as a priority project of the country. It should secure budgets for various aspects of the project such as operation, maintenance and management, and human resource development, and adopt means for retaining trained personnel for the purpose of sustainable operation and growth.

