

**Ministry of Housing, Construction  
and Sanitation (MVCS)  
Republic of Peru**

**The Study  
on  
Housing Reconstruction with  
Seismic-resistant Houses  
in  
the Republic of Peru**

**Final Report**

**Summary**

**May 2009**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ORIENTAL CONSULTANTS CO., LTD.**

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**09-047**

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The exchange rate applied in the Study is:

JPY 1.00 = S/0.0318

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(December, 2008)

## **PREFACE**

In response to a request from the Government of the Republic of Peru, the Government of Japan decided to conduct the Study on Housing Reconstruction with Seismic-resistant Houses for the purpose of assisting in the reconstruction of houses destroyed by the earthquake that occurred on August 15th, 2007 in Peru. The Government of Japan entrusted to the study to Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Ichiro Kobayashi of Oriental Consultants Co., LTD. between March, 2008 and March, 2009.

The team held discussions with the officials concerned of the Government of the Republic of Peru and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Peru for their close cooperation extended to the study.

May 2009

Ariyuki Matsumoto,  
Vice President  
Japan International Cooperation Agency

May 2009

Mr. Ariyuki Matsumoto  
Vice President  
Japan International Cooperation Agency  
Tokyo, Japan

**Letter of Transmittal**

Dear Mr. MATSUMOTO:

We are pleased to formally submit herewith the final report entitled “The Study on Housing Reconstruction with Seismic-resistant Houses in the Republic of Peru”. This report compiles the results of the study which was undertaken in the Republic of Peru from March 2008 to March 2009 by the Study Team organized by Oriental Consultants Co., Ltd. under the contract with JICA.

The Final Report is composed of the Summary, Main Report and Annex Report. Main Report contains of the acceleration plan for housing reconstruction after the damages caused by the August 15, 2007 Pisco Earthquake; and Annex Report compiles the results of the pilot projects and other collected data and materials. It is truly hoped that the outcomes of the Final Report will contribute as guidelines to housing reconstruction in the earthquake-damaged area.

Finally, we would like to express our sincere gratitude and appreciation to all the officials of your agency, the JICA advisory committee, the Embassy of Japan in the Republic of Peru, and the Ministry of Foreign Affairs. We also would like to send our great appreciation to all those who have extended their kind assistance and cooperation to the Study Team, in particular, relevant officials of the Ministry of Housing, Construction and Sanitation (MVCS) as the counterpart organization of the Study, Ica Regional Government, and municipal governments of the earthquake-damaged area.

Very truly yours,

Ichiro Kobayashi  
Team Leader, JICA Study Team  
The Study on Housing Reconstruction with  
Seismic-resistant Houses in the Republic of Peru

# **EXECUTIVE SUMMARY**

## **1. Background of the Study**

An earthquake measuring 7.9 on the Richter scale occurred at 6:41 p.m. (local time) on August 15th, 2007 in the central part of Peru's coast, some 150 km south of Lima. The earthquake resulted in around 600 deaths and more than 2,000 injured, and water and sewage facility, hospitals, schools and other infrastructure were damaged. According to INEI figures, 52,154 housing units totally collapsed, 23,632 were severely damaged and 116,706 were damaged by the earthquake. Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched needs assessment teams to Peru and confirmed the importance of the promotion of seismic-resistant housing reconstruction to reduce the risk of future earthquake damage.

The Government of the Republic of Peru (hereinafter referred to as "the Government of Peru") requested that technical cooperation on the Study on Housing Reconstruction with Seismic-resistant Houses in the Republic of Peru (hereinafter referred to as "the Study") be conducted through JICA.

## **2. Objectives of the Study**

The Study aims at achieving the following three objectives:

- 1) To formulate an acceleration plan for housing reconstruction, which consists of a set of practical measures to facilitate housing reconstruction with safer houses;
- 2) To implement pilot projects to test the effectiveness and practicality of the measures, and improve the plan reflecting the test results; and
- 3) To undertake technical transfer to relevant Peruvian officials and engineers through the Study activities.

## **3. Study Area**

The study area consists of Ica, Pisco and Chincha, which are the most earthquake-affected provinces.

## **4. Counterpart Agency**

The counterpart agency is the Ministry of Housing, Construction and Sanitation (hereinafter referred to as "MVCS").

## 5. Analysis of Existing Conditions

### (1) Earthquake Damage

An earthquake damage survey was done by the INEI just after the earthquake. The results of the survey are shown in tabular format below.

**Table 1 Number of Damaged Houses by the Earthquake**

Province	Total Number of Houses Before the Earthquake	Number of Houses by Degree of Damage				Total No. of Houses Affected	Number of Houses without damage
		Completely Destroyed	Heavily Damaged	Partially Damaged	Slightly Damaged		
ICA	81,138 (100.0%)	20,013 (24.7%)	7,011 (8.6%)	22,948 (28.3%)	8,546 (10.5%)	58,518 (72.1%)	22,620 (27.9%)
CHINCHA	48,804 (100.0%)	17,708 (36.3%)	6,891 (14.1%)	16,573 (34.0%)	3,408 (7.0%)	44,580 (91.3%)	4,224 (8.7%)
PISCO	36,232 (100.0%)	8,734 (24.1%)	4,511 (12.5%)	14,499 (40.0%)	3,267 (9.0%)	31,011 (85.6%)	5,221 (14.4%)
TOTAL	166,174 (100.0%)	46,455 (28.0%)	18,413 (11.1%)	54,020 (32.5%)	15,221 (9.2%)	134,109 (80.7%)	32,065 (19.3%)

Source: INEI

**Table 2 Number of Affected People by the Earthquake**

Province	Total Population	Affected Population by Degree of Damage				Total No. of People Affected	Not Affected
		People whose houses were Completely Destroyed	People whose houses were Heavily Damaged	People whose houses were Partially Damaged	People whose houses were Slightly Damaged		
ICA	320,152 (100.0%)	90,206 (28.2%)	26,218 (8.2%)	90,392 (28.2%)	40,362 (12.6%)	247,142 (77.2%)	73,010 (22.8%)
CHINCHA	194,536 (100.0%)	86,902 (44.7%)	21,506 (11.1%)	59,393 (30.5%)	15,755 (8.1%)	183,556 (94.4%)	10,980 (5.6%)
PISCO	127,565 (100.0%)	41,322 (32.4%)	13,533 (10.6%)	44,361 (34.8%)	15,066 (11.8%)	114,282 (89.6%)	13,283 (10.4%)
TOTAL	642,253 (100.0%)	218,430 (34.0%)	61,257 (9.5%)	194,146 (30.2%)	71,147 (11.1%)	544,980 (84.9%)	97,273 (15.1%)

Source: INEI

**Table 3 Damage Level by Type of Housing Structure**

Unit: houses (%)

Type of housing structure	a) Collapsed or heavily damaged	b) Uninhabitable and needs to be demolished	c) Needs to be repaired	d) Without damage	Total
(1) Reinforced Concrete	302 (9.7%)	145 (4.7%)	446 (14.4%)	2,213 (71.2%)	3,106 (100%)
(2) Confined Masonry	3,330 (4.8%)	5,751 (8.4%)	15,067 (21.9%)	44,714 (64.9%)	68,862 (100%)
(3) Masonry Without Concrete Frame	6,260 (33.7%)	3,107 (16.7%)	6,688 (36.0%)	2,501 (13.6%)	18,556 (100%)
(4) Sun-Dried Brick	54,695 (60.8%)	27,287 (30.3%)	4,355 (4.8%)	3,616 (4.1%)	83,953 (100%)
(5) Cane and Mud	1,518 (22.5%)	1,356 (20.2%)	2,244 (33.4%)	1,611 (23.9%)	6,729 (100%)

Note: The number of surveyed districts is 9 for (1) Reinforced Concrete, 26 for (2) Confined masonry, 25 for (3) Masonry Without Concrete Frame, 31 for (4) Sun-Dried Brick and 17 for (5) Cane and Mud.

Source: Field survey for 33 district municipalities, JICA Development Study, April of 2008

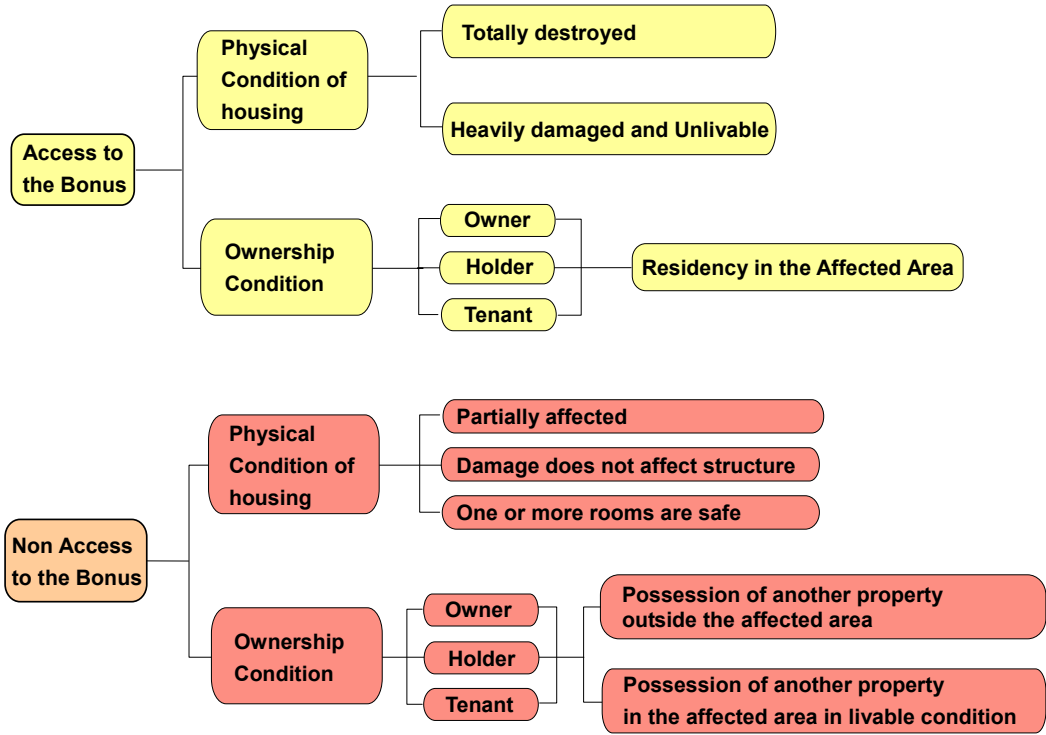
Facts and figures to highlight based on the results of the survey are as follows:

- The number of building damage classified as completely destroyed and heavily damaged is about 65,000 (see Table 1).
- The most damaged structure is the adobe house, which accounts for most of the building damage, while the confined masonry and concrete structure house incurred less damage (see Table 3).
- The affected population is more than 500,000 people (see Table 2). Among them, more than 280,000 people had no place to live.

## **(2) The government support program**

Immediately after the August 15 earthquake, the government announced a bonus in the amount of S/ 6,000 for earthquake victims. There are two requirements to be eligible for the bonus: 1) physical condition, which means that the house of earthquake victim is totally destroyed or heavily damaged and uninhabitable; and 2) ownership condition, which means that the earthquake victim has to show proof that he/she is the owner, title holder or tenant of the damaged house.





Source: MIVIVIENDA

**Figure 1 Access to the Bonus for the Victims of the Earthquake**

In the earthquake-affected area, eligible families can apply for the Techo Propio program combined with the S/ 6,000 bonus. This means that they are able to receive a maximum benefit amounting to S/ 19,400.

**(3) Progress of Housing Reconstruction**

The progress of housing reconstruction in the affected area is as follows.

As of October 27, 2008, a total of 23,951 families in the three provinces received the BONO 6000, which corresponds to 37 percent of the total eligible families of 64,868 in the three provinces.

**Table 4 Beneficiaries of BONO 6000 and Techo Propio, as of October 27, 2008**

Province	Damage Investigation of the August 15, 2007 Earthquake 1/			(D)=(B)+(C) No. of Houses Eligible for BONO 6000	Beneficiaries of BONO 6000 2/		
	(A) Total No. of Houses Affected	(B) No. of Houses Destroyed	(C) No. of Houses Heavily Damaged		(E) No. of BANMAT Cards Delivered by Oct. 27, 2008	(F) Techo Propio	
						No. of Families that Acquired New Housing	No. of Families that Constructed Housing on Own Property
ICA	58,518	20,013	7,011	27,024	9,720	30	200
CHINCHA	44,580	17,708	6,891	24,599	6,780	15	67
PISCO	31,011	8,734	4,511	13,245	7,029	29	81
TOTAL	134,109	46,455	18,413	64,868	23,529	74	348

Source: 1/ Conducted by INEI

2/ Banco de Materiales, Fondo Mi Vivienda

Through the effort of COFOPRI, a total of 15,137 land titles were issued during the period from August 15, 2007 to August 15, 2008: 4,283 titles in Ica province; 7,003 titles in Pisco province; and 3,851 titles in Chincha province.

**Table 5 Land Titles Issued through the Assistance of COFOPRI, as of August 15, 2008**

	Ica	Pisco	Chincha	Total
Titles issued before the Earthquake	35,063	6,869	18,579	60,511
Titles issued from August 15, 2007 to August 15, 2008	4,283	7,003	3,851	15,137
Projections of titles to be issued by December 2008	1800	2,500	1,500	5,800

Source: COFOPRI

The number of houses reconstructed is about 20,000 in the study area, while the number of houses reconstructed with building permits is about 7,069, which accounts for 30 percent of the total houses reconstructed.

**Table 6 Construction Permit and the Number of Houses Reconstructed**

Province	Building reconstruction using BONO 6000	BONO 6000 and Techo Propio Program	The number of building permit applications received
Ica	1,987	480	2,542
Chincha	9,210	806	3,838
Pisco	8,262	0	689
Total	19,459	1,286	7,069

Source: JICA Study Team's survey results in November 2008.

The number of housing reconstruction is around 20,000 in the study area and it is equivalent to three times the number in April 2008 of 6,886.

## 6. Analysis of Obstacles of Housing Reconstruction

### (1) Process of housing reconstruction

The housing reconstruction process can be divided into four stages: The first stage is issuing building damage certificate. Second stage is issuing BONO 6000. Third step is determination of financial resources: BONO 6000 or Techo Propio (or both). Final step is submission of building permit application. The building construction will start upon approval of the application.

### (2) Obstacles for housing reconstruction

#### Who were the affected people of the earthquake?

Most of the affected people have a monthly income of less than S/ 900 with temporary job status such as wage workers working as farmers and fishermen. They want to reconstruct their house by confined masonry but they have very little knowledge of housing construction. They are very busy with their daily work and have no time to go and inquire about the government's support for housing reconstruction. Affected people showed interest to construct seismic-resistant houses, but indicated difficulties in paying the cost for it.

#### Difficulty of accessibility to the government supported program

- The affected people have little knowledge and information about the government-supported program for housing reconstruction.
- They claimed that they could not prepare the application form by themselves. They had to ask somebody for help to prepare the necessary documents, which they could hardly afford to do.
- The application forms should be submitted to the municipality office, but owing to their daily work, they had to find time to do this.
- Some of them cannot access to the program because of land title problems.

#### Lack of knowledge of safer housing construction technique

According to the results of the interview survey conducted by the study, most of affected people as well as *albaniles* wish to acquire the knowledge of safer housing technique.

- Affected people have little knowledge about safer housing construction, and no reliable information on safer housing is available. They rely for information from *albanile*, yet some of them have not proper information and technical knowledge about how to construct safer houses.
- The training program of safer house is not available for the affected people and construction workers.

- The cost of training would be high enough that the affected person and construction worker would not be able to attend the construction course.

#### The administrative problems of housing reconstruction

Most of the affected people do not know how to apply for a building permit. In 2007, the law for the procedure of building permit was changed; however, the procedure is different in each district municipality.

The problems of the building permit are summarized as follows.

- There is no standard procedure for issuing building permit and the procedure is complicated.
- The personnel and budget of the district office for housing administration handling building permits are not enough. Building inspection during construction is difficult to implement because of a lack of personnel.
- It sometimes takes three months to get the construction permit, and this is the problem: The BONO should be used within two months after getting approval. So if Applicant would not start construction because the permit has not been issued, Applicant's BONO deadline for use would have expired by the time the building permit is issued.

The government supported program issuing section has its own particular problems to solve, as follows:

- There are local government officials that do not know the exact details of the government supported program for housing reconstruction.
- The information and support from the central government are insufficient. The capacity of the local officials is not enough.
- There are the problems of lack of personnel, insufficient budget, and low capacity of personnel in local governments.

#### Quality management and cost reduction

Before the earthquake, the study area has not developed a housing construction market. In many cases, a house is build a long time ago and extended by owner's own efforts. A person called *albanil* is a skilled laborer who can construct a house. The people in the area usually have a contract with *albaniles*. They construct a housess by their knowledge and experience using unskilled labor. Therefore, the quality of house heavily depends on the knowledge and experience of the contracted *albanil*.

The problem of the self-construction is how to maintain the quality of building. Social survey found that supervision of the housing construction is not common at the site. In many cases, there is neither

supervisor nor foreman who checks the quality of buildings. The owner of the house must inspect the construction work and maintain the quality of house.

### Other problems

Many people in the affected areas claimed that the costs of construction materials and labor have increased. The construction survey results show that the materials cost has increased by 100 percent in the earthquake-affected areas and labor cost increased by 100 percent. Since there is a short supply of construction workers in these areas, the labor cost may pose a big problem, especially if the reconstruction work starts at full scale.

## **7. Evaluation and Implementation of Pilot Projects**

Purpose: The pilot projects demonstrate the validity of facilitating housing reconstruction in the study area, reflecting the outcome of implementation of the pilot project in finalizing the Plan for Housing Reconstruction Enhancement.

Pilot Projects: 1) facilitation of safer housing reconstruction; 2) promotion of safer housing construction; 3) dissemination of government programs of support for housing reconstruction.

Area: La Tinguina district Ica province; Independencia district in Pisco province; and Pueblo Nuevo district in Chincha province.

### (1) Facilitation of safer housing reconstruction

Duration: August 2008 to November 2008

Activity: Preparation of prototype drawings, preparation of manuals, OJT for local government, workshop for residents.

### (2) Promotion of safer housing construction

Duration: August 2008 to November 2008

Activity: Construction of cut-model, one-day training, Theater presentation, Video presentation

### (3) Dissemination of government programs of support for housing reconstruction

Duration: August 2008 to October 2008

Activity: Mobile Kiosk

### (4) Evaluation of pilot projects

JICA Study Team carried out two surveys: an interview survey to 33 district officials and an interview survey to residents. Based on the results of the survey, it is confirmed that the pilot projects were

implemented efficiently and effectively. Whole pilot projects achieved the objectives, especially, prototype drawings are registered in each district's Project Bank, and the building permit will be automatically issued when the residents select the type of house they want among the drawings prepared by the JICA Study Team.

## **8. Acceleration Plan for Housing Reconstruction**

The ultimate goal of the acceleration plan for housing reconstruction is to establish effective measures to promote the reconstruction of seismic-resistant housing.

The objectives of the plan are:

1. Encouraging participation of the affected people in the process of housing reconstruction.
2. Strengthening the capacity of government institutions to support housing reconstruction.
3. Dissemination of seismic-resistant construction techniques in housing reconstruction.
4. Technical training for construction engineers.

In order to achieve these goal and objectives, the study worked out 14 strategies and the necessary projects to implement (see Table 7).

Table 7 Strategies and Projects

Strategies	Name of the Project
<b>Encouraging participation of the affected people in the process of housing reconstruction</b>	
(1) Standardization of the housing reconstruction system	a. Prototype drawings of seismic-resistant house
	b. Manual of construction method of seismic-resistant houses
	c. Illustration of minimum requirements of safer houses
(2) Dissemination of the construction process	d. Illustration of construction process
(3) Extension of construction and supervision manuals for residents	e. One-day training
<b>Strengthening the capacity of government institutions to support housing reconstruction</b>	
(4) Preparation of manuals on the issuing of building permits	f. Manual of building permit for safer houses
(5) Promotion of land registration to permit access to the financial resources of housing reconstruction, such as family housing bonus	g. Practical training of the officials of the land title section
(6) Strengthening the capacity of public institutions	h. Practical Training of officials of the land use planning and building permit section
	i. Dissemination of financial mechanisms of government funded programs
(7) Utilization of the project bank system	j. Building permit approval system by utilization of project bank system
(8) Control of illegal housing construction	k. Strengthening of district government control capacity
<b>Dissemination of safer house construction techniques in housing reconstruction</b>	
(9) Diffusion of construction measures for safer houses through media, pamphlets, handbooks, workshops and community-based training	l. Exchange of information and knowledge on safer house construction
	m. Video demonstration of seismic behavior with shaking table
	n. Brief drama to promote safer houses
	o. Utilization of mass media
(10) Establishment of support mechanisms for affected people	p. One stop kiosk for housing reconstruction
	q. District government's support house for affected persons
(11) Dissemination of information on safer house construction techniques to workers and professionals to promote housing construction	r. Technical training targets for affected people
	s. Technical training targets for skilled labor
	t. Dissemination of reinforced adobe model house
	u. Extension of techniques for constructing houses that are safer against earthquakes
(12) Establishing disaster management education in schools, including theoretical and practical learning of disaster prevention	v. Preparation of textbooks and materials about earthquakes and the concept of safer houses
(13) Developing model houses to disseminate seismic-resistant construction techniques and knowledge	w. Model house construction
	x. Small scale safer house explanation kit
(14) Financial support program	y. Utilization of Techo Propio program

Source: JICA Study Team

The action plan has three phases.

**Table 8 Action Plan**

1 <sup>st</sup> Phase (2007 to 2010)	2 <sup>nd</sup> Phase (2011 to 2013)	3 <sup>rd</sup> Phase (2014 to 2016)
<ul style="list-style-type: none"> <li>• One day training</li> <li>• Practical training of the officials of the land title section</li> <li>• Practical training of officials of the land use planning and building permit section</li> <li>• Building permit approval system by utilization of project bank system</li> <li>• Exchange of information and knowledge on safer house construction</li> <li>• Utilization of mass media</li> <li>• District government's support house for affected persons</li> <li>• Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforced adobe model house</li> </ul>	<ul style="list-style-type: none"> <li>• One-day training</li> <li>• Practical training of the officials of the land title section</li> <li>• Practical training of officials of the land use planning and building permit section</li> <li>• Building permit approval system by utilization of project bank system</li> <li>• Strengthening of district government control capacity for illegal construction</li> <li>• Exchange of information and knowledge on safer house construction</li> <li>• Utilization of mass media</li> <li>• District government's support house for affected persons</li> <li>Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforced adobe model house</li> </ul>	<ul style="list-style-type: none"> <li>• One-day training</li> <li>• Strengthening of district government control capacity for illegal construction</li> <li>• Exchange of information and knowledge on safer house construction</li> <li>• Utilization of mass media</li> <li>• District government's support house for affected persons</li> <li>• Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforced adobe model house</li> </ul>

## 9. Conclusions and Recommendations

The Study Team's conclusions and recommendations based on analysis of the reconstruction efforts and problems of both government and affected people are as follows:

1. Efficient operation of the Building Permit System to cut down processing time
2. Improvement of capacity of local government officials
3. Dissemination of extension of Building Permit Application System
4. Continuation of the government's housing reconstruction support
5. Provision of long term technical support
6. Conduct safer house research and training
7. Preparation of Post-Earthquake Reconstruction Plan
8. Appropriation of budget for reconstruction
9. Clarification of the roles of government and NGOs in case of disaster
10. Reinforcement of existing houses



In addition to those mentioned above, it is recommended to continue the dissemination of information for safer housing against earthquake not only to affected people but to the wider population by means of the following:

1. Extension and dissemination of Safer House Construction Manual
2. Continuous disaster management education at school level

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## **LIST OF ABBREVIATIONS**

ADRA	The Adventist Development and Relief Agency
APCI	Peruvian International Cooperation Agency
BANMAT	Bank of Materials
BFH	Family Housing Bonus
CARE	The Cooperative for American Remittance to Europe
CAPECO	Peruvian Chamber of Construction
CISMID	Japan-Peru Center for Earthquake Engineering and Disaster Mitigation
CMPAD	Multi-sectoral Commission for Disaster Prevention and Response
COE	Emergency Operation Center
COFOPRI	Commission for the Formalization of Informal Property
FORSUR	Fund for the Reconstruction of the South
FONCODES	National Cooperation Fund for Social Development
GDP	Gross Domestic Product
IGP	Geophysics Institute of Peru
IHD	Human Development Index
INDECI	National Institute of Civil Defense
IMP	Metropolitan Institute of Planning
INEI	National Institute of Statistics and Information
ISC	Superior Institute of the Construction
ITDG	The Intermediate Technology Development Group
JICA	Japan International Cooperation Agency
MMI	Modified Mercalli Intensity
MVCS	Ministry of Housing, Construction and Sanitation
NGO	Non-Governmental Organization
PCM	Presidency of the Ministry Council
PRA	Participatory Rural Appraisal
SEDAPAL	Lima Water and Sewer Company
SENCICO	National Training Service in Construction PERU
SINADECI	National System of Civil Defense
SUNARP	National Superintendency of Public Registration
SNIP	National System of Public Investment
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund

## **DEFINITION OF THE TERM**

Albañile This term is defined as a skilled construction worker engaged in brick works in this report.

# **CHAPTER 1    OUTLINE OF THE STUDY**

## **1.1.    Background of the Study**

### **(1) Damages of the Earthquake**

An earthquake measuring 8.0 on the Richter scale occurred at 18:41 pm on August 15th, 2007 in the central part of Peru's coast, some 150 km south of Lima. The earthquake resulted in around 600 deaths and more than 2,000 injured, and water and sewerage facilities, hospitals, schools and other infrastructure were damaged. According to the INEI, 52,154 dwellings totally collapsed, 23,632 dwellings were severely damaged, and 116,706 were damaged by the earthquake. The Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched needs assessment teams to Peru and confirmed the importance of the promotion of seismic resistance housing reconstruction to reduce the risk of future earthquake damage.

The Government of the Republic of Peru (hereinafter referred to as "the Government of Peru") requested that technical cooperation for the Study on Housing Reconstruction with Seismic-resistant houses in the Republic of Peru (hereinafter referred to as "the Study") be conducted through JICA.

## **1.2.    Objective of the Study**

The Study aims to achieve the following three objectives:

- To formulate an accelerated plan for housing reconstruction consisting of a set of practical measures to facilitate housing reconstruction with safer houses
- To implement pilot projects to test the effectiveness and practicality of the measures, and improve the plan reflecting the test results
- To undertake technical transfer to relevant Peruvian officials and engineers through the Study activities.

## **1.3.    Study Area**

The study area will be the provinces of Ica, Pisco and Chincha.





Figure 1.3.1 Study Area Location Map

## 1.4. Counterpart Agency

The Ministry of Housing, Construction and Sanitation (hereinafter referred to as “MVCS”)

The Study was carried out by JICA Study Team. The team closely collaborates with the Peruvian counterpart members.

The following committees were set up for this study.

- Steering Committee in Peru
- Counterpart (MVCS)

The member of the above mentioned committees are listed in Table 1.4.1 and Table 1.4.2.

**Table 1.4.1 Member of Steering Committee in Peru**

Name	Position
Mr. Jusús Vidalón Orellana (Chairman of Steering Committee)	Vice Minister, Housing and Urban Planning, MVCS
Mr. Luis Hernández Huaranga	General Manager, Fund for Integral Reconstruction of the Affected Zones by the Earthquake of August 15,2007(FORSUR)
Mr. Luis Felipe Palomino Rodríguez	Director, National Institute of Civil Defense (INDECI)
Mr. Arq. Otilio Fernando Chaparro Tejada	President, National Service of Training for the Construction Industry (SENCICO)
Mr. Romulo Triveño Pinto	President, Regional Government of Ica
Mr. Mariano Nacimiento Quispe	Mayor, Provincial Municipality of Ica
Mr. Juan Mendoza Uribe	Mayor, Provincial Municipality of Pisco
Mr. José Alberto Navarro Grau	Mayor, Provincial Municipality of Chincha
Mr. Rubén Ananías Velásquez Serna Mr. Marino Ucharima Tacsí Mr. Lucio Juárez Ochoa	District Municipality to Implement pilot project Mayor, District of La Tinguiña (Ica Province) Mayor, District of Independencia(Pisco Province) Mayor, District of Pueblo Nuevo(Chincha Province)

**Table 1.4.2 Member of Counterpart (MVCS)**

Name	Position
Mr. Enrique Cornejo Ramírez	Minister of MVCS (by October, 2008)
Ms. Nidia Vilchez Yucra	Minister of MVCS (from October, 2008)
Mr. Jesús Vidalon Orellana	Vice Minister of Housing and Urbanism (by August, 2008)
Mr. Juan Sarmiento Soto	Vice Minister of Housing and Urbanism (from August, 2008)
Mr. David Ramos Lopez	National Director of Housing (by September, 2008 and from January, 2009)
Mr. Fernando Neyra	Sectorial Program II Director, Research and Development (from September, 2008 to December, 2008)
Mr. Enrique Carrión	Official, National Direction of Construction (by October 2008)
Mr. Iván Vassallo	Official, National Direction of Housing (continue)
Mr. Humberto Herrera Torres	Official, National Direction of Housing (continue)
Ms. Sonia Huamán Palomino	Secretary, National Director of Housing (continue)
Ms. Florisa Ibarra Zuñiga	Secretary, National Direction of Housing (continue)
Ms. Haydee Yong Lee	Official, National Direction of Housing (continue)
Mr. Jose Luis Benavente F.	Official, National Direction of Housing (continue)
Mr. Armando Aliaga Hinojosa	Official, National Direction of Housing (continue)
Mr. Roberto Prieto	Official, National Direction of Construction (continue)
Mr. Susana Saravia	Official, National Direction of Housing (continue)

## **CHAPTER 2 CONDITIONS OF THE STUDY AREA**

### **2.1. Socio-economic Conditions**

#### **2.1.1. Natural Conditions**

The study area, Ica Region (Región Ica) including Ica, Pisco and Chincha provinces, is located in the southern coastal area of the country. The Ica Region is bordered to the north by the Lima Region, to the south by the Arequipa Region, to the east by the Ayacucho and Huancavelica Regions and to the west by the Pacific Ocean. The geographical area of the Ica Region is 21,305.51 km<sup>2</sup>, which is equivalent to 1.7% of the land area of the country and it had 2.5% of the country's population in 2005.

The study area is 14,838.55 km<sup>2</sup> which accounts for 70 % of Ica region. The Ica Region is divided into two geographic zones, the coastal zone and the mountain zone. Nearly 89% of the region is located in the coastal zone and 11% in the mountain zone. In Chincha province, a large area of 1,149.02 km<sup>2</sup> or 38% of the province is located in the mountain zone.

#### **2.1.2. Administrative Structure**

The Republic of Peru is administratively divided into 24 regions called "regiono". A region is composed of administrative autonomous units of provinces called "provincia." The study area includes the provinces of Ica, Pisco and Chincha in the Ica region. Each province is governed by a mayor and provincial government. The provinces are further divided into administrative units of districts called "distrito". Each district is an administratively and financially autonomous unit and is governed by a mayor and district government. Under the recent decentralization policy, the regional president, provincial mayor and district mayor are elected by the people in their jurisdictions.

#### **2.1.3. Population and Housing**

The Ica Region had a total population of 665,592 inhabitants in 2005, according to the National Census of Population and Housing conducted by INEI (National Institute of Statistics and Information). The province of Ica had the largest population with 297,771 inhabitants, which corresponds to 45% of the total population of the region, followed by the province of Chincha with 181,777 inhabitants (27%) and the province of Pisco with 116,865 inhabitants (18%) in 2005. The study area of Ica, Chincha and Pisco provinces contains 596,413 inhabitants or 90% of the total population of the Ica Region.

National Census of Population and Housing recorded the number of houses by type of building material. There were 121,323 houses in total in the three provinces: 60,884 houses in Ica province, 23,352 houses in Pisco province and 37,087 houses in Chincha province. It should be noted that the houses constructed with adobe amounted to 60,462 houses, which occupied nearly half of the total houses in the three provinces.

**Table 2.1.1 Number of Houses by Type of Material  
in Ica, Chincha and Pisco Provinces**

Type of Material	Province						Total	
	Ica		Pisco		Chincha		No. of Houses	% Share
	No. of Houses	% Share	No. of Houses	% Share	No. of Houses	% Share		
Bricks or Cement Block	30,913	(50.8)	11,717	(50.2)	9,810	(26.5)	52,440	(43.2)
Stone or ashlar with lime or cement	33	(0.1)	32	(0.1)	80	(0.2)	145	(0.1)
Adobe	26,114	(42.9)	9,244	(39.6)	25,104	(67.7)	60,462	(49.8)
Quincha <sup>1</sup>	2,390	(3.9)	497	(2.1)	729	(2.0)	3,616	(3.0)
Stone with Mud	17	(0.1)	11	(0.1)	97	(0.3)	125	(0.1)
Wood	104	(0.2)	170	(0.7)	59	(0.2)	333	(0.3)
Rush Mat	1,209	(2.0)	1,641	(7.0)	1,187	(3.2)	4,037	(3.3)
Other	104	(0.2)	40	(0.2)	21	(0.1)	165	(0.1)
Total	60,884	(100)	23,352	(100)	37,087	(100)	121,323	(100.0)

Source: INEI

## 2.1.4. Economic Conditions

According to gross regional domestic product (GRDP) data prepared by National Institute of Statistics and Information (INEI), the Ica Region generated 3,963 million soles in 2006 at 1994 constant prices and occupied about 2.5% of the national product. The average annual growth rate of the Ica Region's GRDP from 2001 to 2006 was 7.9%, while the national average was 5.7% per annum and 5.4% per annum in Lima region during the same period. Accordingly, it can be said that the Ica region, in economic terms, is one of the fastest growing regions in the country.

When we look at the 2006 regional GRDP by economic sector, the manufacturing sector produced 896 million soles or 22.6% of the total regional product, followed by other services with 570 million soles (14.4%), commerce with 522 million soles (13.2%) and agriculture with 758 million soles (19.1%), at 1994 constant prices.

## 2.2. Earthquake Damage

### 2.2.1. Earthquake on August 15th in 2007

On August 15th in 2007 an earthquake occurred at 18:41 pm (Peruvian standard time). The epicenter was in the Pacific Ocean, about 60 km west of Pisco municipality. According to the Geophysics Institute of Peru (IGP), the earthquake had the following characteristics:

- Epicenter: 60 km. West of Pisco municipality (in the ocean)
- Depth: 40 km.
- Momentum Magnitude: 7.9
- MMI (Modified Mercalli Intensity): VII Pisco, Chincha and Ica; VI Lima, V Huancavelica

<sup>1</sup> Quincha is a local construction method which consists of wooden frames, weaving wall of cane (caña) and mud on the weaved wall.

The earthquake was caused by the friction of the Nasca and South American plates. The maximum intensity of the earthquake as measured on the Modified Mercalli Intensity (MMI) was VII, affecting a radius of 250 km around the epicenter.

The earthquake tragically resulted in huge damage in the regions of Ica, Lima and Huancavelica. According to records<sup>2</sup> provided by the INEI, the earthquake caused 595 deaths and 318 missing people, more than one thousand injured people, and more than 700,000 affected people in the Ica, Lima and Huancavelica regions<sup>3</sup>. Immediately after the earthquake, the INEI carried out a damage investigation of 250,000 houses in the earthquake affected areas. The damage investigation was conducted during the period from August 29 to September 14, 2007.

Table 2.2.1 summarizes the results of the damage investigation conducted by the INEI. Among the total number of 166,174 houses in Ica, Pisco and Chincha provinces, 134,109 houses or 80.7% were more or less affected by the earthquake. Totally destroyed houses were 46,455 houses or 28.0% and another 18,413 houses or 11.1% were heavily damaged with unlivable condition. The total number of houses in these two categories combined reached 64,868 houses, 39.1% of the total houses existing before the earthquake.

**Table 2.2.1 Number of Houses Damaged by the Earthquake  
in Ica, Chincha and Pisco Provinces**

Province	Total Number of Houses Existed	Number of Houses by Degree of Damage				Total No. of Houses Affected	Number of Houses without Affected
		Completely Destroyed	Heavily Damaged	Partially Damaged	Slightly Damaged		
ICA	81,138 (100.0%)	20,013 (24.7%)	7,011 (8.6%)	22,948 (28.3%)	8,546 (10.5%)	58,518 (72.1%)	22,620 (27.9%)
CHINCHA	48,804 (100.0%)	17,708 (36.3%)	6,891 (14.1%)	16,573 (34.0%)	3,408 (7.0%)	44,580 (91.3%)	4,224 (8.7%)
PISCO	36,232 (100.0%)	8,734 (24.1%)	4,511 (12.5%)	14,499 (40.0%)	3,267 (9.0%)	31,011 (85.6%)	5,221 (14.4%)
TOTAL	166,174 (100.0%)	46,455 (28.0%)	18,413 (11.1%)	54,020 (32.5%)	15,221 (9.2%)	134,109 (80.7%)	32,065 (19.3%)

Source: INEI

### 2.2.2. Damage Investigation Conducted by INDECI

Table 2.2.2 shows the results of damage investigation conducted by the INDECI as of August 15, 2008, one year after the earthquake. According to this record, the degree of damage to housing was classified into three categories: (i) collapse, (ii) unlivable condition and (iii) affected. The INDECI recorded a total of 110,873 houses affected by the August 15, 2007 Earthquake in the three provinces. There were 43,388 houses in the category of collapse and another 35,519 damaged and in unlivable condition. The damaged houses in these two categories combined reached 78,905 houses in total in the three provinces.

<sup>2</sup> INEI, Census of the Area affected by the August 15, 2007 Earthquake, 2007.

<sup>3</sup> The August 15, 2007 earthquake affected area includes Ica, Chincha and Pisco provinces in Ica Region, Cañete and Yauyos provinces in Lima Region and Castrovirreyna, Huaytará and Accobambilla provinces in Huancavelica Region.

**Table 2.2.2 Number of Houses Damaged by the Earthquake  
in Ica, Chincha and Pisco Provinces**

Province	No. of Houses by Degree of Damage			Total No. of Houses Affected
	Collapse	Unlivable Condition	Affected	
Chincha**	17,511	14,349	9,343	41,203
Ica*	14,032	21,170	12,787	47,989
Pisco**	11,707	-	9,550	21,257
Total	43,388	35,519	31,966	110,873

Note: \* In process of verification by the Ica regional committee of INDECI






\*\* Approved by the provincial committee of INDECI.

Source: INDECI

### 2.2.3. Damages by Type of Building Structure

The degree of earthquake damage of housing is closely related to the type of building structure. The Study team conducted a field survey<sup>4</sup> visiting all the district offices in the three provinces and collected information of damage by building structure. There are five categories of building structure: (i) reinforced concrete, called *concreto armado*; (ii) confined masonry (*albañilería confinada*); (iii) masonry without concrete frame (*albañilería simple*); (iv) sun-dried brick (*adobe*); and (v) cane and mud (*quincha*). Photos of typical houses in each category are shown in Figure 2.2.1.

<sup>4</sup> Regarding the methodology and results of the field survey conducted by the Study team, see the supporting report volume 1.

(1) Reinforced Concrete (Concreto armado) house	(2) Confined Masonry (Albañilería confinada) house	(3) Masonry without Concrete Frame (Albañilería simple) house
		
(4) Sun-Dried Brick (Adobe) house	(5) Cane and Mud (Quincha) house <sup>5</sup>	
		

Source: JICA Urgent Development Study, April of 2008

**Figure 2.2.1 Photos of Housing by Type of Structure**

Table 2.2.3 summarizes the number of damaged buildings by type of structure in the three provinces based on information collected from each district office. The figures clearly show that the buildings constructed of reinforced concrete and confined masonry were strongest against the earthquake. About 71% of the buildings constructed of reinforced concrete and 65% of the buildings constructed of confined masonry were not damaged by the August 15, 2007 earthquake. On the other hand, more than 60% of the buildings constructed of adobe were collapsed and another 30% were heavily damaged. This means that more than 90% of the buildings constructed of adobe were collapsed or heavily damaged with unlivable condition in the three provinces. Therefore, it can be said that the buildings constructed of adobe were the most vulnerable to earthquake in the study area.

<sup>5</sup> The photo of (5) Quincha shows a wall of weaved canes. The mud as finis materials is used to put on the weaved canes.



**Table 2.2.3 Damage by Type of Structure**

Unit: house (%)

Type of building structure	Degree of Damage			d) Without damage	Total
	a) Collapse or heavily damaged	b) Uninhabitable and Needs to be demolished	c) Needs to be repaired		
(1) Reinforced Concrete	302 (9.7)	145 (4.7)	446 (14.4)	2,213 (71.2)	3,106 (100)
(2) Confined Masonry	3,330 (4.8)	5,751 (8.4)	15,067 (21.9)	44,714 (64.9)	68,862 (100)
(3) Masonry Without Concrete Frame	6,260 (33.7)	3,107 (16.7)	6,688 (36.0)	2,501 (13.6)	18,556 (100)
(4) Sun-Dried Brick	54,695 (60.8)	27,287 (30.3)	4,355 (4.8)	3,616 (4.1)	89,953 (100)
(5) Cane and Mud	1,518 (22.5)	1,356 (20.2)	2,244 (33.4)	1,611 (23.9)	6,729 (100)
TOTAL	66,105 35.3)	37,646 (20.1)	28,800 (15.4)	54,655 (29.2)	187,206 (100)

Note: All the figures are based on information from each district office.

Source: Field survey for 33 district municipalities, JICA Urgent Development Study, April of 2008

## **CHAPTER 3 EARTHQUAKE RECOVERY AND RECONSTRUCTION EFFORTS**

### **3.1. Roles and Functions of Organizations in Earthquake Recovery and Reconstruction**

#### **3.1.1. INDECI**

The national security and defense system in Peru is called the “National System of Civil Defense” (SINADECI) and it exists to protect the population from damage, provide appropriate and timely aid, and assure rehabilitation from disasters, calamities or conflicts. It is regulated by Decree-Law 19338. In other words, the State promotes and guarantees civil defense through the SINADECI. There are three groups in disaster management: INDECI, sectors’ ministry and Civil Defense Committees at local level.

The INDECI is the central, governing and directing body for disaster prevention, preparedness and response<sup>6</sup>. Major roles of the INDECI are to avoid or mitigate the loss of lives, material goods, and environmental degradation caused by natural and/or technological hazards in the national territory; however, it does not have responsibility for reconstruction. The Regional Civil Defense Bureaus are decentralized bodies of the INDECI that support, advise and coordinate the civil defense committees and offices in the jurisdictions of the civil defense committees.

#### **3.1.2. FORSUR**

##### **(1) Roles and Functions of FORSUR**

Immediately after the August 15, 2007 Earthquake, the Peruvian government established Fund for the Integrated Reconstruction of the South (FORSUR<sup>7</sup>) to be responsible for rehabilitation and reconstruction in the earthquake affected area. FORSUR was placed under the Presidency of the Ministry Council (PCM). The Law No. 29078 was enacted on August 28, 2007 defining the functions and roles of FORSUR. FORSUR identifies projects that are considered to be high priority for rehabilitation and reconstruction purposes. Each sector submits its project proposals to FORSUR. Once the projects are approved by FORSUR, there is no need to submit the projects to National System of Public Investment (SNIP<sup>8</sup>) to request approval. Thus, the execution of the projects approved by FORSUR is much faster than that of ordinary projects.

##### **(2) Organization Structure and Decision Making Process**

The decision-making of FORSUR rests with its Board of Directors, which consists of representatives of the President of the Republic, Regional Presidents of Ica, Lima and Huancavelica; Ministries of Transportation and Communication, Economy and Finance, Education, Health, and Housing, Construction and Sanitation. Additionally, private entrepreneurs proposed by the President of FORSUR are involved in the Board of Directors. The General Manager is the legal and administrative representative of FORSUR and executes the decisions made by the Board of Directors. The General Manager is also in

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6 Article 5, Decree-Law 19338.

7 The idea of FORSUR is based on the disaster management in Columbia.

8 SNIP is the organization which approves the projects implemented by district, regional and central government.

charge of coordination with the public and private entities as well as the provincial and sector committees.

### **(3) Reconstruction Plan of the South**

FORSUR prepared a comprehensive reconstruction plan for the earthquake affected area on April 2008, named “*Balance y Plan de Reconstrucción del Sur*” (hereinafter refer to as “the Balance and Reconstruction Plan of the South”). FORSUR divided reconstruction activity into the three stages<sup>9</sup>: (i) emergency stage, (ii) transition stage, and (iii) reconstruction stage.

FORSUR estimated that a total investment of 1.29 billion soles would be necessary for rehabilitation and reconstruction of the south.

Regarding housing reconstruction, it was proposed a linked program for the housing reconstruction bonus called BONO 6000 with Family Housing Bonus (BFH), especially in urban areas.

#### **3.1.3. MVCS**

The roles and functions of MVCS are to approve and execute nationwide policies in respect of housing, territorial management, urban development, construction and sanitation. The MVCS is a relatively new ministry and was created in July 2002. There are two vice ministries: (i) housing and urbanism; and (ii) construction and sanitation. Under the operation of vice ministries, there are several technical and financial institutions to execute the national policies, which include Bank of Materials (BANMAT), COFOPRI, and SENCICO.

SENCICO is an institution to provide training, investigation and regulation in relation to building construction techniques. SENCICO has also provided regulations for building design and construction in the country.

COFOPRI is a decentralized institution in the housing sector of the MVCS. The role of COFOPRI is to formalize informal human settlements (asentamientos humanos) in the territory of Peru. Thus, FORSUR requested COFOPRI to provide legal clearance of the lands in the affected area..

Bank of Material is a financial institution to support housing construction. It has distributed BANMAT Card to eligible families of the earthquake victims.

MIVIVIENDA (the meaning is “My Home”) is a financial institution to support new housing acquisition and construction through ordinary financial credit.

#### **3.1.4. Regional and Local Governments**

##### **(1) Earthquake Rehabilitation and Reconstruction**

The Ica regional government has been responsible for overall development policy and welfare of people living within the area of its jurisdiction. Overall housing reconstruction policies in the earthquake affected areas are formulated by the central government. In addition, the financial and institutional supports for housing reconstruction have been conducted by regional institutions in the MVCS, such as MIVIVIENDA, SENCICO, BANMAT, COFOPRI and others. Thus, the role of the Regional Directorate of Housing,

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<sup>9</sup> FORSUR (2008), “Balance and Plan of Reconstruction of the South,” PP.30-39.

Construction and Sanitation is limited to organizing and supervising housing reconstruction and urban development<sup>10</sup>.

In November 2007, some three months after the earthquake, the Ica regional government prepared the Action Plan for Emergency and Post-emergency in the Earthquake Affected Area (hereinafter refer to as “Action Plan”), named “Plan de Acciones de Emergencia y Post Emergencia en las Zonas Afectadas por el Sismo del 15 de Agosto,”.

## **(2) Overview of Building Administration in Peru**

As for a building administration in Peru, Congress enacts laws and MVCS of the national government conducts a policy making and enacts regulations. According to Organic Law of Municipalities (Law N°27972), it is through local governments that the population can be directly addressed, having powers that allow them to regulate over complementary regulations in the benefit of their respective localities. The local governments implement the building administration practice, however, they are unlikely to function normally due to the administration capabilities are still low<sup>11</sup> since the decentralization of power is not matured and also the national policy is not disseminated to nationwide.

Local government needs to issue lots of building permits to facilitate housing construction after the earthquake. Before the amendments, the issuing of permits was a length process. Most of the houses were constructed without building permits. Dissemination of building permits in local population can be affected by construction administration service of local governments. There is a project bank system as such a good plan and it is very effective.

The project bank system is shown in the abovementioned Law of Urban Developments and Building Regulation (Law N°29090) and Law of Regularization of Buildings, of the Procedures for Finalization of Construction and of the Regime of Exclusive and Common Property (Law N°27157). The role of project bank is stipulated in Law N°27157. In case of the building permit of the house with less than 90 m<sup>2</sup> which a house owner cannot prepare the house drawings, a district municipality should provide the owner with the drawings of project bank. It shows also in Law N°29090, which modified Law No.27157, that the drawings of project bank can adopt to the house for uni-family with a floor area of less than 120 m<sup>2</sup> to construct in one lot of land.

After a complete set of house drawings with signature of engineers consisted of architectural, structural, electrical and sanitary drawings and project description is registered as a project bank in the district municipality, building permit of the registered drawings can be issued without technical evaluation. The project bank becomes effective in a municipal bylaw. Therefore, a use of the project bank is very effective and eligible for poor people who cannot prepare the house drawings and it contributes to the diffusion of building permits.

## **3.2. Housing Reconstruction Support Programs**

### **3.2.1. Preparation of Temporary Shelters**

According to the Peruvian Government, one of the priority actions after the earthquake disasters was to provide temporary shelters for the victims. As of April 2008, a total of 18,032 temporary shelters were provided in the Ica region by government, donors and NGOs: 4,970 units in Chincha province, 6,260 units in Ica province and 6,802 units in Pisco

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10 There are five (5) professional staff in the Ica Regional Directorate of Housing, Construction and Sanitation.

11 The office of public work in each district government is varies by district; but majority of district governments in the study area have only one or two official(s).

province. The number of temporary shelters provided was, however, much smaller than the number of damaged houses. In the three provinces, the number of temporary shelters provided was only about 27.8% of the number of damaged houses.

### **3.2.2. Housing Reconstruction Bonus (BONO 6000)**

The Peruvian government announced the provision of a housing reconstruction bonus called “BONO 6000” with an amount of 6,000 soles per family for earthquake victims. There are two eligibility requirements for the BONO 6000: One is a certificate of physical damage that the house was totally destroyed or heavily damaged and in uninhabitable condition verified by the district committee of civil defense. Another is a certificate of house ownership that the earthquake victim lived in the damaged house as an owner, title holder or tenant certified by the local government.

BANMAT provides the BANMAT card to earthquake victims who can receive BONO 6000. Earthquake victims with BANMAT card are able to buy the materials for housing construction, using BANMAT card with 5,400 soles (90% of total amount of BANMAT card) at the eligible shops for the use of BANMAT card. The rest of 600 soles (10%) can be used for employment of construction staff with cash.

### **3.2.3. Other Housing Reconstruction Support Programs**

MIVIVIENDA has provided financial support for housing acquisition and construction through ordinary financial credit. Techo Propio is the most important program to solve the problem of financing housing for low income families who earn less than 1,450 soles per month. With the Techo Propio program, low income families can get access to BFH as well as to credit.

## **3.3. Training of Housing Construction Technique**

### **3.3.1. Training Programs Provided by SENCICO**

Since the earthquake, SENCICO established some temporary training centers in affected area, and has provided free training courses in construction techniques for ordinary people to promote housing reconstruction in the earthquake affected area. From October 2007 to February 2008, a total of nearly 600 people took training courses provided by SENCICO. Capacity Building of Local Government Officials

### **3.3.2. Capacity Building of Local Government Officials**

After the earthquake, many organizations concerned realized an importance of capacity build of local governments to promote disaster management and housing reconstruction in more proper manner. Several training programs have been conducted by the central and regional governments, NGOs and donors. The trainings include a wide variety of topics, including construction technique with adobe and quincha, government financial support program for housing acquisition and construction such as Techo Propio,

### **3.3.3. Dissemination of Reinforced Adobe Houses**

In order to disseminate the way of reconstruction with reinforced adobe, Forty (40) people were trained in one month program and the training was conducted in 9 locations where were available mud for adobe materials. By April 2008, a total of 360 people were trained. Another training of reinforced adobe construction method has been carried out by a support

of JICA. Through the training program, one community building and two model houses were constructed with reinforced adobe.

### **3.3.4. JICA Funded Project**

The Project “Training and Dissemination of Improved Adobe New Technologies” was formulated by JICA, with the objective of disseminating information on and training the population in the construction of low cost, safe and healthy houses. The first stage was implemented with the training directed towards the general population, particularly the masons.

The second stage has been implemented with some changes affecting the following: a) the conduct of training for architects and engineers working in district municipalities of rural areas; b) JICA contribution of US\$ 3,000 to purchase industrial materials for each construction module. Instead of the project being executed through SENCICO, the local government and JICA will execute the project directly.

The expected project results are as follows:

1. Model houses and community centers constructed in adobe for areas of extreme poverty
2. Training personnel to support the population in housing construction
3. Production of educational material on low cost, safe and healthy house construction

In August 2007, before the earthquake, four municipalities were selected to implement the project; but in November 2007, three construction works (two in Junin department and one in Cajamarca) had to be suspended due to the rainy season. The termination of construction of one house (in Cajamarca) is pending.

## **CHAPTER 4 MAJOR ISSUES IN THE HOUSING RECONSTRUCTION**

### **4.1. Progress of Housing Reconstruction in the Study Area**

#### **4.1.1. Housing Reconstruction Process**

Housing reconstruction in the earthquake affected areas is a complicated and lengthy process that can be divided into the four steps. The overall processes of housing reconstruction are illustrated in Figure 4.1.1 and each step is described below.

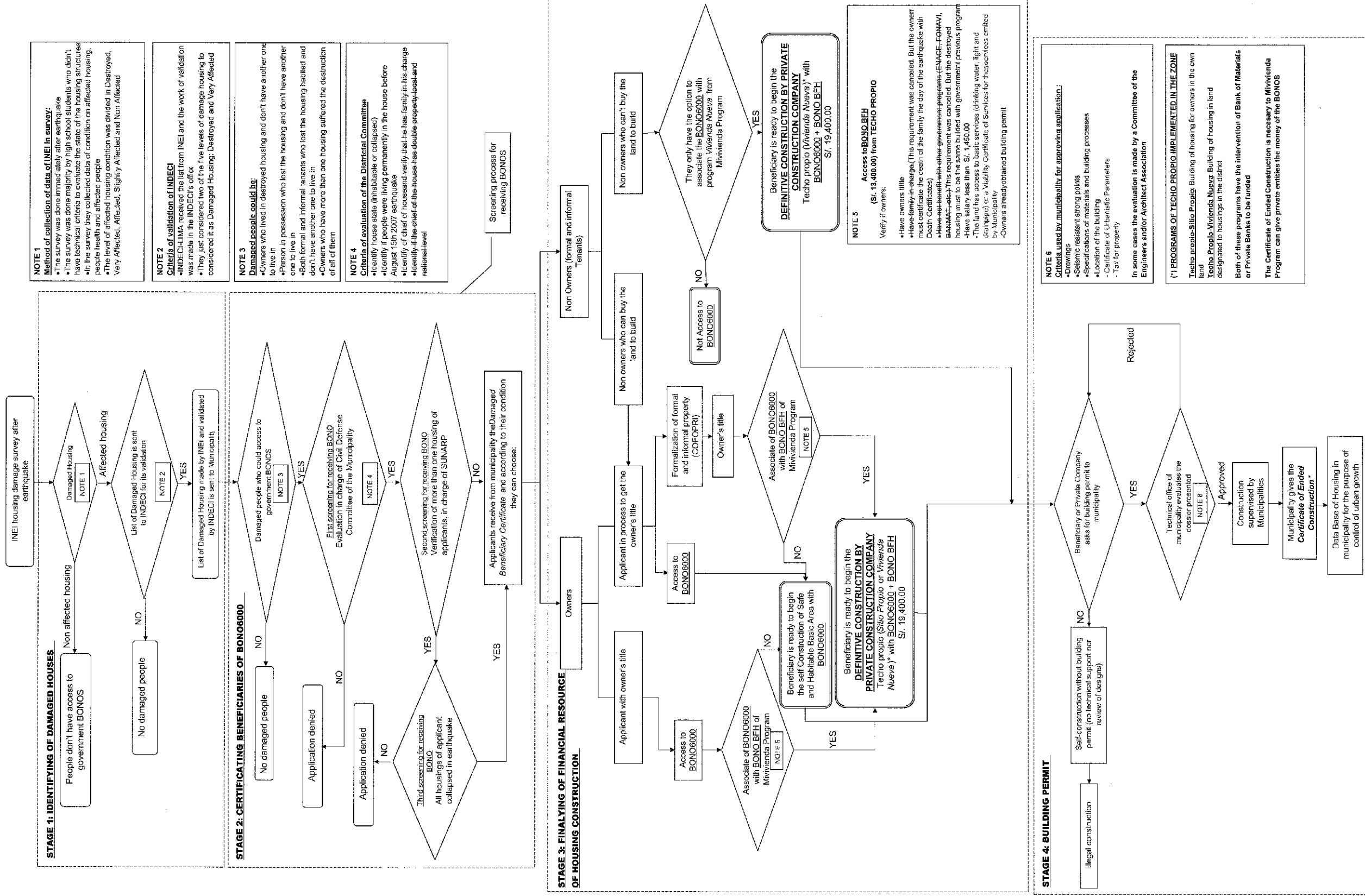
- (1) The INEI conducts an investigation of each house to examine physical damage caused by the earthquake and determine whether the house is in livable or unlivable condition. If a house is evaluated as totally collapsed or heavily damaged and in unlivable condition, the household is eligible for BONO 6000.
- (2) If a house is evaluated as totally collapsed or heavily damaged and in unlivable condition, the household can be eligible for BONO 6000 with the documents of damage certificate issued by the district committee of civil defense and resident identification issued by the municipality. Then, the district committee of civil defense makes a list of potential beneficiaries of the BONO 6000 and submits it to National Superintendency of Public Registration (SUNARP) to check whether the applicants have another house or houses. If the potential beneficiaries have other houses which are in livable condition, regardless of location, they are not qualified as beneficiaries of the BONO 6000.
- (3) There are two types of housing reconstruction processes for the beneficiaries of the BONO 6000: one is for families who have a land certificate for the property; the other is for families who do not have a land certificate for the property.

If a family has a land certificate for the property, the household would either receive a BANMAT card or would submit the beneficiary certificate to Fondo Mivivienda to combine the BONO 6000 with BFH.

If a household does not have a land certificate for the property, the household would receive a BANMAT card, and they can purchase housing construction materials from designated shops.

- (4) People must submit an application for a building permit to the municipality for approval of construction. Under recent new regulations, the municipalities must complete an evaluation of the application and issue a building permit the next day after receiving the application. In the current situation, however, the procedure for issuing a building permit varies from one municipality to another. There is no standardized process for issuing building permits. Normally, the approval of a building permit takes 2-3 weeks and sometimes 2-3 months even some district governments do not accept building permit documents. In the case of the Techo Propio program, a private construction company contracted with the Fondo Mivivienda prepares the application for the building permit and submits it to the municipality for approval of construction

**FLOW CHART OF THE ACCESS OF DAMAGED PEOPLE FOR OBTENTION OF BONO6000 AND BONO BFH**



**NOTE 1**  
Method of collection of data of INEI in survey:  
• The survey was done immediately after earthquake  
• The survey was done majority by high school students who didn't have technical criteria to evaluate the state of the housing structures  
• In the survey they collected data of condition on affected housing, people health and affected people  
• The level of affected housing condition was divided in Destroyed, Very Affected, Affected, Slightly Affected and Non-Affected

**NOTE 2**  
Criteria of validation of INDECI  
• INDECI-LIMA received the list from INEI and the work of validation was made in the INDECI's office  
• They just considered two of the five levels of damage housing to considered it as Damaged Housing: Destroyed and Very Affected

**NOTE 3**  
Damaged people could be:  
• Owners who lived in destroyed housing and don't have another one to live in  
• Person in possession who lost the housing and don't have another one to live in  
• Both formal and informal tenants who lost the housing habitated and don't have another one to live in  
• Owners who have more than one housing suffered the destruction of all of them

**NOTE 4**  
Criteria of evaluation of the Districtal Committee  
• Identify house state (inhabitable or collapsed)  
• Identify if people were living permanently in the house before August 15th 2007 earthquake  
• Identify if chief of household verify that he has family in his charge  
• Identify if the chief of the house has double property-look-and relational-level

Screening process for receiving BONOS

**NOTE 5**  
Access to BONO BFH (S/. 13,400.00) from TECHO PROPIO  
Verify if owners:  
• Have ownrains title  
• Have family-in-charge (This requirement was canceled. But the owner must certificate the death of the family the day of the earthquake with Death Certificates)  
• Have not benefit with other government programs (ENAGE, FONAVI, SANAAMAT, etc.) This requirement was canceled. But the destroyed housing must to be the same builded with government previous program  
• Have salary less than S/. 1,450.00  
• The land has access to basic services (drinking water, light and drainage) or a Validity Certificate of Services for these services emitted by Municipality  
• Owners already obtained building permit

**NOTE 6**  
Criteria used by municipality for approving application:  
• Drawings  
• Seismic resistant strong points  
• Specifications of materials and building processes  
• Location of the building  
• Certificate of Urbanistic Parameters  
• Tax for property  
In some cases the evaluation is made by a Committee of the Engineers and/or Architect Association

**(\*) PROGRAMS OF TECHO PROPIO IMPLEMENTED IN THE ZONE**  
Techo propio-Sitio Propio: Building of housing for owners in the own land  
Techo Propio-Vivienda Nueva: Building of housing in land assigned to housings in the district  
Both of these programs have the intervention of Bank of Materials or Private Banks to be funded  
The Certificate of Ended Construction is necessary to Mivivienda Program can give private entities the money of the BONOS

**Figure 4.1.1 The Processes of Housing Reconstruction**



#### 4.1.2. Progress of Housing Reconstruction in the Study Area

##### (1) Beneficiaries of BONO 6000 and Techo Propio

The BONO 6000 is a housing reconstruction subsidy provided by the government for the earthquake victims who lost their houses or whose houses were heavily damaged and in unlivable condition. As of October 27, 2008, a total of 23,951 families in the three provinces received the BONO 6000, which corresponds to 37% of the total eligible families of 64,868 in the three provinces. This means that more than 40,000 families are still waiting for delivery of the BONO 6000. Among the beneficiaries of the BONO 6000, 74 families acquired new housing and another 348 families constructed their housing on their properties by using the linked program combining the BONO 6000 with the Techo Propio program.

**Table 4.1.1 Beneficiaries of BONO 6000 and Techo Propio, as of October 27, 2008**

Province	Damage Investigation of the August 15, 2007 Earthquake by INEI 1/			(D)=(B)+(C) No. of Housing Eligible for BONO 6000	Beneficiaries of BONO 6000 2/		
	(A) Total No. of Housing Affected	(B) No. of Housing Destroyed	(C) No. of Housing Heavily Damaged		(E) No. of BANMAT Card Delivered by Oct. 27, 2008	(F) Techo Propio	
					No. of Families Acquired New Housing	No. of Families Constructed Housing on Own Property	
ICA	58,518	20,013	7,011	27,024	9,720	30	200
CHINCHA	44,580	17,708	6,891	24,599	6,780	15	67
PISCO	31,011	8,734	4,511	13,245	7,029	29	81
TOTAL	134,109	46,455	18,413	64,868	23,529	74	348

Source: 1/ Damage Investigation of the August 15, 2007 Earthquake conducted by INEI

2/ Banco de Materiales, Fondo Mi Vivienda

##### (2) Land Title issued by COFOPRI

Land registration is essential for application to the Techo Propio program. By the effort of COFOPRI, a total of 15,137 land titles were issued during the period from August 15, 2007 to August 15, 2008: 4,283 titles in Ica province. It is estimated that another 5,800 land titles will be issued by the end of 2008 in the three provinces.

##### (3) Building Permit

According to the survey on November 2008, the number of building reconstruction, including under construction, has increased as the distribution of BONO6000 to the affected family. The data show that the number of the building construction is about 20,000 in the study area, while the number of building permit received building is about 7,069, which accounts for 30 percent of the total building reconstruction.

##### (4) Number of Housing Reconstructed

The number of housing reconstruction is 20,000 in the study area and it is equivalent for 3 times of 6,886 on April 2008. The main reason of the increase in construction number is the government's distribution of BONO 6000. Linked program, BONO 6000 and Techo Propio, is 1,200, which is a little number in April. It can be said that the government housing support program has been increased by the government efforts.

## 4.2. Major Issues in Housing Reconstruction Raised from Stakeholders

### 4.2.1. Major Opinions from Earthquake Affected People

A total of 221 people were interviewed in the selected seven districts in the Ica region: La Tinguina, Salas Guadalupe and Santiago districts in Ica province; San Clemente and San Andres districts in Chincha province; and Tambo de Mora and El Carmen districts in Pisco province.

- The most of workers are temporary, even before the earthquake. They have insufficient funds to start reconstruction of their houses. Many of them are still living in damaged houses or temporary shelters. The housing reconstruction support program, such as BONO 6000 and Techo Propio, would be essential to promote housing reconstruction in the earthquake affected area.
- To make things worse, the prices of construction materials have increased significantly, which inflicts additional pain on the people who reconstruct their housing. They strongly feel that more proper interventions by the government are necessary to control the price of construction materials.
- The housing reconstruction bonus, the BONO 6000, with the monetary value of 6,000 soles is not enough for reconstruction of a house because the cost of construction materials and labor has been increasing significantly in the region since the Earthquake.
- Some people pointed out the issues of land registration. If people do not have a land registration certificate for their property they have difficulties to access to the government supported housing programs such as Techo Propio and other loans and credits.
- Most of the people do not have proper knowledge of housing construction techniques that will be safe against earthquakes. They need technical assistance for housing construction from professionals. In many cases, however, technical advice on housing construction has been given by *albañiles*, but they do not have enough knowledge in appropriate construction techniques to safeguard against earthquakes.

### 4.2.2. Major Opinions from Construction Companies and Workers

Construction companies and *albañiles* pointed out the following issues in housing reconstruction in the study area:

- When people reconstruct their houses, it is necessary to apply for a building permit to local government for approval of construction. In many cases, however, issue of the building permit takes a long time due to the lack of capacity of local government. People often start to construct their houses without a building permit, which can lead to inappropriate construction of houses.
- The construction companies in the study area are relatively small and financially weak. It is, therefore, quite difficult for them to participate in the housing reconstruction market. Further, a shortage of skilled workers is another serious problem that causes delays to housing reconstruction in the area.
- Albañiles have played an important role in the construction of housing in the study area. Although they have basic knowledge and skills in housing construction techniques, they need to learn more advanced techniques, especially in methods to build house safe against earthquake.

### **4.2.3. Major Opinions from Local Government Officials**

A workshop was held in the Ica Regional government on 28 April 2008 to collect opinions from local government officials. Major opinions raised from the officials are summarized as follows:

- There is a gap between people's needs and government assistance. The government has provided housing reconstruction support programs such as BONO 6000 and Techo Propio, but the beneficiaries are still limited in number. The government needs to disseminate information on housing reconstruction support programs more effectively.
- There is a communication gap between the local and central governments. The central government does not understand the local situation. This gap seems to be one of the critical issues in the housing reconstruction of the affected area.
- Local governments are responsible for issuing building permits for construction activities within their jurisdictions. Due to a lack of capacity of local government, the issue of building permit takes for a long time. A simplification of the building permit process is necessary.

## **4.3. Major Issues in Housing Reconstruction**

### **4.3.1. Lack of Information on Government Programs to Support Housing Reconstruction**

Information on the government programs has not been given properly to the people. In fact, the affected people have little knowledge of government programs to support housing reconstruction. They did not know about: where they can get the information; what documents were needed for BONO 6000 and Techo Propio program; and how to use the BANMAT card.

If people want to apply for BFH to construct housing on their property, they need a land registration certificate. Many people in the study area, however, do not have land registration certificates and have difficulties to access BFH. Thus, many people complained that the government programs to support housing reconstruction were insufficient, especially for the poor people.

### **4.3.2. Lack of Capacity of Local Government**

The administration of housing construction is mainly the responsibility of local governments, which includes issuing building permits for approval of construction and inspection to control the quality of construction. Due to a lack of capacity of local government, building permits take a long time to be issued and inspection is often not conducted. Thus, many people tend to construct their houses without a building permit or inspection by the local government. This situation causes poor quality housing that does not follow building regulations and codes. The major issues of local governments in the administration of housing construction are summarized as follows

- There is no standard process for application and issue of building permits. Each district office has a different procedure for evaluation, and quite often the issue of building permit takes as long as 2-3 months.
- The office of public works in local government is responsible for building permits and construction inspection, but there is a lack of human resources and capacity to deal with these works.

#### **4.3.3. Lack of Knowledge of Safe Housing Construction Technique**

There is a lack of opportunity for people to learn basic knowledge of housing construction. According to the interview, the affected people in the study area wanted to have more technical information, especially in construction techniques for earthquake resistance.

#### **4.3.4. Immature Housing Construction Industry**

The study area is mainly agricultural, although there are a few medium-sized cities<sup>12</sup>. Because of the relatively small population size of the area, the housing construction industry is not well developed. Before the earthquake, many houses were built by the family or their ancestors, especially in rural areas. Private construction companies worked only in limited urban areas. According to an interview with the Peruvian Chamber of Construction (CAPECO), housing construction companies are mainly located in Lima and there are only a few companies in the study area. Housing construction companies in the study area are relatively small and have an unstable financial basis. Thus, they cannot participate in the housing reconstruction market because of a lack of funds and labor. In the case of housing reconstruction under the Techo Propio program, there is no system of advanced payment and construction companies receive the payment of the entire sum after the construction is completed. Therefore, small construction companies cannot participate in the housing construction market.

#### **4.3.5. Poor Quality Control in Housing Reconstruction**

The most common practice of housing construction in the study area is “auto-construction”. The client hire *albañil* who constructs housing based on their experience and knowledge. However, the quality of the housing varies depending on the knowledge and experience of the *albañi*. In many cases, *albañiles* do not have proper knowledge of construction techniques for safe house against earthquake. From our investigations, some houses constructed by *albañile* have serious problems, especially structural problems caused by improper connection of reinforcement.

#### **4.3.6. Poor Economic Situation in the Ica Region**

The economy of the Ica region was dependent on the agricultural industry and many people worked on farms or in factories related to the agricultural industry. Unless strong measures and political intervention are applied, many people are unable to start reconstruction of their housing.

Some data show that many earthquake victims in the Ica region are socially and economically vulnerable. Furthermore, the recent price inflation of construction materials and labor present serious impediments to the progress of housing reconstruction.

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<sup>12</sup> They are Ica district with 117,800 inhabitants, Chincha Alta district with 56,000 inhabitants and Pisco district with 52,000 inhabitants.

## CHAPTER 5 PILOT PROJECTS

### 5.1. Preparation of Pilot Projects

#### 5.1.1. Objectives of Pilot Projects

The pilot projects demonstrate the validity of facilitating housing reconstruction in the study area reflect the outcome of implementation of the pilot projects in finalizing the Plan for Housing Reconstruction Enhancement.

#### 5.1.2. Selection of Pilot Projects

The study team proposed three pilot projects. They were: (i) facilitating of housing reconstruction; (ii) promotion of safer housing construction; and (iii) dissemination of government programs of support housing reconstruction.

#### 5.1.3. Districts Selected for the Implementation of the Pilot Projects

The study team selected priority districts for implementation of the pilot projects. Through intensive discussions with MVCS and quantitative evaluation, the study team selected La Tinguina district in Ica province; Independencia district in Pisco province; and Pueblo Nuevo district in Chincha province. After discussion with JICA, the proposed pilot areas were agreed. Figure 5.1.1 shows the location map.



Source: JICA Study Team

Figure 5.1.1 Location Map

## **5.2. Pilot Project 1: Preparation and Dissemination of Prototype Drawings of Safer Housing**

### **5.2.1. Background and Objectives**

Pilot project 1 aimed at facilitating safer housing reconstruction through the preparation and dissemination of prototype drawings.

### **5.2.2. Implemented Activities**

#### **(1) Implementation of the Pilot Project**

The pilot project 1 was carried out by two working groups, one consisting of the members of the JICA Study Team and the other being a Peruvian engineering company, Master Building Inc., subcontracted by the JICA Study Team. .

#### **(2) Dissemination of the Prototype Drawings**

The prototype drawings needed to be registered into a project bank, which is an administrative tool for local government to assist the pre-qualification of drawings and issue of building permits. It means that if a house owner uses the prototype drawings to construct housing, he or she can obtain building permit automatically from the local government.

A series of OJT exercises were conducted for technical officers in three district municipalities in order to make use of prototype drawings in building administration by dispatching local engineers to each district government. In addition to this, five workshops in each district were scheduled to disseminate the prototype drawings to citizens.

### **5.2.3. Outputs of the Project**

- The prototype drawings consist of i) prototype drawings, ii) a selection matrix of prototype drawings<sup>13</sup>, and iii) shopping list<sup>14</sup>. The prototype drawings are prepared as four types according to construction cost: from prototype 1, construction cost is equivalent to BONO 6,000, to prototype 4, construction cost is equivalent to Bonus 6,000 plus Techo Propio BHF.
- Manual of Improved Building Permit for Safer Housing<sup>15</sup> (Officials of the District Government)
- Manual of Monitoring the Construction for Safer Housing<sup>16</sup> (Residents and Low-skilled Workers)
- Manual of Simple Inspection for Construction of Safer Housing<sup>17</sup> (Official of the District Government)
- Poster of Minimum Requirements for Safer Housing<sup>18</sup>
- Poster of Prototype Drawings for Safer Housing<sup>19</sup>
- Leaflet of Prototype Drawings for Safer Housing for the Process of Issuing a Building Permit<sup>20</sup>

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13 See Annex 1 Vol.3 Appendix 1

14 See Annex 1 Vol.3 Appendix 5

15 See Annex 1 Vol.3 Appendix 6

16 See Annex 1 Vol.3 Appendix 7

17 See Annex 1 Vol.3 Appendix 8

18 See Annex 1 Vol.3 Appendix 9

19 See Annex 1 Vol.3 Appendix 10

## 5.2.4. Lessons Learned

### (1) Knowledge Transfer to Officers in District Municipality

The OJT sessions were held to help technical officers of the municipality administer their building permit system smoothly once prototype drawings have been registered in the project bank. Five subjects for the OJT program were used to understand the building permit system practically as follows: the prototype drawings for safer housing, the minimum requirements for safer housing, the manual for improved building permit, the manual for watching over construction of safer housing, and the manual for simple inspection of construction of safer housing. An engineer from the JICA Study Team was dispatched as a trainer to each municipality.

After the OJT, the trainees' understandings of the subjects were evaluated by test sheets<sup>21</sup> prepared by the JICA Study Team. The tests were conducted twice on all the subjects. Some subjects were under the pass mark for the first test, but all subjects passed the second test<sup>22</sup>. All participants passed the tests. Accordingly, it was concluded that the OJT achieved its objectives.

### (2) Institutionalization of Prototype Drawings

The prototype drawings for safer housing produced by the OJT activity of the JICA Study Team have facilitated the registering of projects in the project bank of the municipality. As of November 2007, Pueblo Nuevo and Independencia registered prototype drawings into the project bank. As the legal procedure the municipal resolutions were in force<sup>23</sup>. Therefore, the OJT in the three districts produced excellent results.

## 5.3. Pilot Project 2: Promotion of Safer Housing Construction Technique

### 5.3.1. Objectives

The pilot project 2 was aimed at promoting safer housing construction with confined masonry in the affected area. The project consisted of the following two components:

- Component 1: training to learn minimum requirements in construction of safer housing. The training was managed and carried out by SENCICO subcontracted by the JICA Study Team and a cut model house was constructed at Pueblo Nuevo through the training.
- Component 2: a series of dissemination activities to encourage construction of safe housing with confined masonry. The construction knowledge and technique were disseminated through a series of exhibitions, consultation and training activities, including minimum requirements to construct safer housing with confined masonry, video showing earthquake mechanism and its effect on housing. The dissemination activities were carried out by a NGO contracted by the JICA Study Team.

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20 See Annex 1 Vol.3 Appendix 11

21 See Annex 1 Vol.3 Appendix 12

22 The test results are shown in Annex 1 Vol.3 Appendix 13

23 See Annex 1 Vol.3 Appendix 14

### **5.3.2. Component 1: Training of Minimum Requirements of Safer Housing Construction with Confined Masonry**

#### **(1) Implementation of the Training**

The implementation of the project was divided into two stages: preparation stage and implementation stage. In the preparation stage, the JICA Study Team developed a basic concept of “training”, which includes not only formal technical aspects of construction methodology for trainees, but also activities for dissemination of construction knowledge to the public. For these purposes, a cut-model house was constructed by trainees, which is an unfinished model to show the construction process of safer housing with confined masonry. In this stage, SENCICOI-Ica prepared an instruction manual<sup>24</sup> and a participant textbook<sup>25</sup> under the instruction and supervision of the JICA Study Team. The trainees were selected by SENCICO-Ica with consultation of the municipality.

During the implementation stage, training to disseminate knowledge of safer housing was carried out by SENCICO-Ica. The training sessions consisted of 16 units as described in the participant text book. Twenty (20) trainees, selected from Pueblo Nuevo district under the condition of no or little experience of construction, learned minimum requirements to construct safer housing with confined masonry through the training. The SENCICO-Ica provided trainers, text books and some safety wear for construction.

The training and construction of a cut-model house with confined masonry was conducted at a vacant lot near the existing public market in Pueblo Nuevo district in Chincha province. The training was conducted from 15th of September to November 14th 2008.

#### **(2) Construction of Cut-model House with Confined Masonry**

The cut-model house was a full sized building of 3 meters wide and 6 meters long and 2.5 meters high with confined masonry. The cut-model house consists of two parts: one is completed construction and the other is incomplete to expose the minimum requirements for excavation and foundation, columns with steel assembly, brick walls, ring beams, and roofing. Thus, the cut-model house shows all the process of construction with minimum requirements to construct safer housing. The cut-model house was constructed by trainees as a part of training and neighbors or visitors could learn the minimum requirements of safer housing construction from the exposed structure.

#### **(3) Outputs of the Project**

The following outputs were obtained through the described activities:

- Drawings of a cut-model house: The drawings were prepared based on the cut model house with confined masonry showing the minimum requirements for safer housing.
- Instruction manual: The instruction manual of the project was prepared based on a regular instruction manual developed by SENCICO-Ica. It consists of educational technology, training system and curricular program including lesson plans in an instruction manual. The instruction manual mainly describes the functions of the trainer, the basic policy of planning and programming the education action, and developing the course program.
- Participant textbook: The participant textbook has 16 training units that follow the construction process. In the text book, each unit shows an image of the construction

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<sup>24</sup> See Annex 2 Vol.4-1 Appendix 2

<sup>25</sup> See Annex 2 Vol.4-1 Appendix 3



step and work in conformity with the minimum requirements by many illustrations due to readers who have no experience of housing construction.

- Scale model of the cut-model house: A scale model of the cut-model house was made at a scale of 1:16.6 for trainees to understand easily each part of the structure during the training. The model was displayed for people coming to the project site.
- Training materials for the minimum requirements of safer housing through construction of cut-model house: The JICA Study Team prepared training materials with photos and video showing each training session. Those could also be used for dissemination of the minimum requirements to construct safer housing with confined masonry.

#### **(4) Lessons Learned**

- Preservation of the cut-model house: The cut-model house is a temporary product constructed through the training. However, it is useful to demonstrate the minimum requirements of safer housing construction with confined masonry to the public. We hope that the cut-model house is maintained for a certain period of time and used for dissemination of construction technique of safer housing to the public.
- Selection process of participants in the training: Twenty (20) persons were selected as trainees by the SENCICO-Ica and municipality. Although the training was announced through local TV and public board, only twelve (12) persons came to participate in the training on the first day. Because of the efforts of the JICA Study Team, the other persons joined the training after a couple of days. The training was a useful opportunity for the people to obtain the knowledge of safer housing construction. The participants in the training need to have a strong motivation to learn the construction technique of safer housing.

### **5.3.3. Component 2: Dissemination of Safer Housing Construction to Ordinary People**

Dissemination of the knowledge of safer housing construction was conducted through the following activities:

#### **(1) Implementation of the One-day Training**

The training was a two-hour session and was composed of three modules. In module 1, a video was shown to illustrate the general mechanism of earthquakes and how to reduce the risk of human disasters from earthquakes. In module 2, a lecture was provided of essential factors, called “minimum requirements,” needed for the construction of safer housing, including selection of construction materials and construction method by using the prototype drawings prepared by the JICA Study Team. Module 3 was on-site training to learn the minimum requirements at the construction site of the cut-model house. The two-hours training session was organized by ADRA, an NGO, under subcontract with the JICA Study Team. The trainings were conducted in 36 sessions from September 28 to November 12, 2008 and a total of 1,553 people participated in the training.

#### **(2) Drama Presentation: “A Safe Little House”**

In addition to the training, a drama called “A Safe Little House” was performed in Pueblo Nuevo 10 times on weekends. The drama conveyed the concept of the importance of safer housing construction against earthquake by using the “minimum requirements.” The drama was very attractive for the people in Pueblo Nuevo and more than 800 young and old people attended the drama presentations.

### **(3) Other Outputs of the Project**

During the course of the project, the following materials and outputs were produced:

- *Facilitator's manual*: This manual was prepared for the instructors and facilitators in the training. It includes likely questions and answers that might arise during the training.
- *Information kit*: Participants in the training were provided with an information kit to provide a better knowledge on the topics of the training. By using this kit, the participants can review the minimum requirements for safe housing construction.
- *Panels*: These panels contained pictures and graphics which were useful for the facilitators to provide better training for participants.
- *Posters*: To inform the event of training, 300 sets of posters and 2,000 sets of flyers were distributed to communities, markets, restaurants and stores before the event. Thus, the people could learn the dates and venues of the training.
- *Mascot*: It was a symbol of the project. The mascot aimed to have a positive impact on the participants.
- *Video Presentation*: The video titled "My Safe House" was presented at the beginning of the training. Through the video presentation participants understood the general mechanism of earthquakes and learned the importance of safe housing construction.

All the details of these materials and activities are explained in Annex 2 Report: Volume 4.

### **(4) Lessons Learned from the Activities**

Through the implementation of the project, the following issues have been identified:

- *Messages to be delivered*: It is important to deliver simple messages to enable all generations of people to understand. The messages/information should be delivered through not only written materials but also some attractions or events like drama presentation.
- *Information Flow*: It was effective to use various measures to disseminate the information. We used lectures, video, drama and on-site training to deliver the messages. The dissemination activities were conducted for only 2 months, but continuous intervention is required to promote safer housing construction.
- *Methodology*: It is necessary to elaborate the outreach approach for disseminating information to the people. Although most of the training implemented was scheduled in the day time, a more flexible schedule should be considered, especially to encourage more male participants.

## **5.4. Pilot Project 3: Dissemination of Government Programs to Support Housing Reconstruction**

### **5.4.1. Objectives of the Project**

From the results of the stakeholder survey conducted in April 2008, many earthquake victims have raised concerns about lack of access to information on government assistance programs for housing reconstruction. Pilot project 3 aimed to disseminate information on the government programs to support housing reconstruction in the affected area.

## 5.4.2. Implementation

The dissemination activities were conducted through “mobile kiosk” that circulated around all the villages in the selected three districts, Pueblo Nuevo in Chincha, Independencia in Pisco and La Tinguña in Ica. The mobile kiosk was operated by ADRA-Peru, an NGO, under subcontract with the JICA study team. It operated for more than two months from September 19 to November 3, 2008.

## 5.4.3. Outputs of the Projects

During the course of the project, the following materials and outputs were produced:

- *Work Plan*: The work plan was prepared by ADRA-Peru, which included a circulation plan for the mobile kiosk and responsibility of each facilitator in the mobile kiosk.
- *Facilitator’s instruction manual*: This manual provided a guideline to government programs to support housing reconstruction. It included BONO 6000, BANMAT card, Techo Propio and other financial program supported by Fondo MIVIVIENDA and land registration supported by COFOPRI.
- Posters were used to invite people to the mobile kiosk.
- *Information booklet*: It shows government programs to support housing reconstruction with illustrations and simple explanations. The information includes BONO 6000, BANMAT card, Techo Propio and other financial programs supported by Fondo MIVIVIENDA and land registration supported by COFOPRI. The booklet was authorized by the MVCS.
- *Mobile Kiosk*: It was “a center” of activities to provide information and consultations on housing reconstruction.
- *Mascot*: As well as the mobile kiosk, a mascot was prepared as a symbol of the activities, which aimed to attract people’s participation.
- *Uniform*: All the facilitators or consultation staff at the mobile kiosk wore a uniform with the logo of JICA, ARDA and MVCS. The uniform was used to identify the facilitators in the field and make them conspicuous to the people for attention.

The details of all materials and outputs are presented in Annex 2 Report: Volume 5

## 5.4.4. Lessons Learned

Through the implementation of the project, the following issues were identified:

- *Methodology*: An outreach approach like the mobile kiosk proved to be an effective way of disseminating information to the people. The mascot was important in attracting people’s attention. Through the activities we learned that more media publicity like radio and TV was needed to disseminate the information effectively.
- *Materials delivered*: The material with many graphics and illustration was important to understand the information for the people.
- *Liaison with Authorities*: The activities of the mobile kiosk functioned as a catalyst for people to gain access to information. If people need further information and assistance, a system to liaise with authorities concerned should be provided.

## **5.5. Evaluation of the Pilot Projects**

### **5.5.1. Objectives and Methodology**

#### **(1) Introduction**

After completing all the activities of the pilot projects, the JICA study team conducted surveys to evaluate the impact of the pilot projects, i.e., how the pilot projects contributed to the promotion of safer housing reconstruction and the extent to which people had been encouraged and had their views on safe housing changed by the intervention of the pilot projects. We conducted two types of surveys for the above purposes: one was data collection from all 33 municipalities; the other was semi-structured interviews with people who had participated and not participated in the activities of the pilot projects.

#### **(2) Building Survey**

The building surveys were made before and after the pilot projects, which were implemented on April and November, 2008. The building survey in November was made using some questions selected from the building survey in April to enable some numerical comparison of the two survey results.

#### **(3) Interview Survey**

The interview survey of 199 people was conducted during the period from November 5 to 13, 2008. Of the subjects, 134 persons participated in the activities of the pilot projects. For comparative purposes, another 60 people were interviewed who had not participated in any activities of the pilot projects. In addition, we conducted interviews with 6 albaniles to gain an understanding of recent housing reconstruction activities.

### **5.5.2. Limitation of the Surveys**

The before and after surveys were intended to capture the qualitative and quantitative impacts of the pilot projects. However, the results of the survey would not reflect the real impact of the projects for three reasons:

1. The evaluation surveys were implemented just after the pilot project. The participants of the project may not have had time for change their activities. Therefore, the results of the survey underestimate the impact.
2. The projects implemented in the affected area are not only this JICA funded project, but also projects from other donors, NGOs and the Peruvian government. The results of the survey cannot differentiate the impacts of other projects and the pilot projects performed by the JICA study team.
3. In pilot project 1, the activities of the team finished on November 2008, but the involvement of residents in the supervision of house construction has not yet occurred. Therefore, the actual impact of the project is not known.

### **5.5.3. Results of the Interview Survey**

#### **(1) Results of Building Survey**

The comparison of quantitative results from the building survey between April and November did not lead to substantial project impacts.

## **(2) Results of Interview Survey**

There was no clear evidence indicating any difference between project districts and non-project districts. Therefore, a comparison was made between participants and non-participants.

### **a. Pilot Project 1**

- The participants in the workshop of prototype drawings mentioned that the standard drawings were very useful to get building permission. They would like to know more about ways of modifying the drawings to create a room size adequate for them.
- Among the 134 people who participated in the pilot project, about 20 wanted to reconstruct their houses by using the prototype drawing prepared by the Study Team.
- All OJT officers who participated said the training by the JICA Study Team was useful and half of them said they are able to process more building permit applications after the training. Also, the participating officers thought the permit process had shortened since the training.

### **b. Pilot Project 2 and 3**

- Most of the participants in the SENCICO training at Pueblo Nuevo had a positive impression.
- The majority of participants in the one-day training said that the booklet they received was very informative.
- The people who watched the drama commented that safe housing construction can be achieved by proper construction method and technical supervision.
- The pilot projects contributed to dissemination of the building permit system.

## **(3) Implications**

The findings generally supported the assumptions made in the draft master plan. However, some findings indicate requirements not included in the draft. Those findings should be reflected in the master plan by modifying the strategies and projects.

The major findings are summarized below.

### **a. Characteristics of the project participants**

Regarding the schedule of housing reconstruction, nearly 90% of the people who did not participate in the activities of the pilot project answered that their housing reconstruction will take more than a year. On the other hand, the participants in the pilot projects had a clear picture of how long their housing reconstruction would take. About 30% of the people answered that they will start reconstruction of housing within a year. This means that the participants require information on house construction because they had already had a schedule for construction. Therefore, continuous efforts are needed to disseminate information on safe houses to residents.

### **b. Construction workers**

The albaniles interviewed varied in age, qualifications and experience. One of the most interesting answers from the albaniles interviewed was that since the earthquake many clients were more and more serious about antiseismic construction. They said that they need more technical expertise in antiseismic construction. Some participants mentioned that albaniles did not have proper knowledge about housing construction, especially for safe

house against earthquake. The answer confirmed the findings of Phase 1 of propose pilot project that technical training for construction workers is needed. The albaniles are the main players in housing construction in the affected area, but they have not gained the trust of the residents to construct houses that are safe against earthquakes. In the pilot project areas, the extension and training for construction workers was not included because of time limitation. However, it appears that it would be a powerful tool to promote the construction of safer houses.

**c. Increase of house construction without building permit**

The number of house construction without building permit has increased in the affected area. The project bank system should be applied to the whole damaged area to register the prototype drawings and educate the government officials.

**d. Financial aspects of housing construction**

There is clear evidence that the number of construction projects has increased since April. One of the reasons is the distribution of the BONO 6000 and increased applications for the Techo Propio program. In this sense, financial assistance from the government provides very strong impetus for housing construction.

**5.6. Extension of Pilot Project 1 “Facilitation of Safer Housing Reconstruction”**

**5.6.1. Background**

Pilot project 1, “Facilitation of safer housing reconstruction”, was implemented in the three pilot project districts of Pueblo Nuevo, Independencia and La Tinguina. It was confirmed that the implementation methodology of the pilot project was effective and practical in the building permit section of district municipalities. As a result, it was approved by municipal council that the applicants of building permit with the prototype drawings could obtain the building permit without any technical evaluation of the municipalities. The system is called Project Bank.

**5.6.2. Implementation Method of Extension of the Pilot Project 1**

**(1) Objective**

The project aims at registration of the prototype drawings in Project Bank in the eight municipalities.

**(2) Method**

The pilot project is to be implemented effectively and efficiently by using results and experiences in the phase 2 study. The work items are:

- a) Dispatch of local engineer for capacity development of municipal officers on dissemination of the prototype drawings
- b) Delivery of outputs prepared by the pilot project 1
- c) Evaluation of capability of technical officers in Building Permit Section
- d) Facilitation of creation of Project Bank

### 5.6.3. Work Items and Implementation Schedule

#### (1) Dispatch of local engineers to municipalities

OJT of the building permit administration improved by Project Bank with the prototype drawings and a workshop of dissemination of the prototype drawings were implemented in a month at all the municipalities. Three (3) local engineers were employed as trainers of OJT and dispatched to the municipalities. Ten (10) days including transfer were considered as implementation duration per municipality. Seismic resistant structure expert of the team went to municipalities to supervise local engineers during the OJT and workshop, and to facilitate the creation of a project bank.

Through the OJT, the project bank was created in eight municipalities (see Annex 2 Volume 8).

#### 5.6.4. Necessity of Continuing Dissemination Activities of the Prototype Drawings

In order to disseminate the prototype drawings, the following three measures to be taken were discussed with and approved by MVCS:

- a) Expanded dissemination of use of the prototype drawings by efforts of mayors
- b) Expanded dissemination of the prototype drawings to construction companies
- c) Expanded dissemination of use of the prototype drawings via CAPECO's monthly magazine

**Table 5.6.1 Necessary Actions of Disseminating the Prototype Drawings for Safer Housing**

Policy	Promoted by	Implementation body	Activity	Goal
Expanded dissemination of use of the prototype drawings by efforts of mayors	MVCS	Mayors	Dissemination activity of using the prototype drawings to local inhabitants	Housing reconstruction by using the prototype drawings
Expanded dissemination of the prototype drawings to construction companies	MVCS	Construction companies registered in MIVIVIENDA	Recommendation of using the prototype drawings to the construction companies	
Expanded dissemination of use of the prototype drawings via CAPECO's monthly magazine	JICA study team	CAPECO	Introduction of the prototype drawings to construction companies through CAPECO's monthly magazine	

Source JICA study team

## **CHAPTER 6 ACCELERATION PLAN FOR HOUSING RECONSTRUCTION**

### **6.1. Revision of the Plan**

In this study, Study Team prepared an interim report and proposed a draft of acceleration plan for housing reconstruction on June 2008. After submission of the interim report, Study Team implemented three pilot projects in each one district from three provinces. The Study Team finalized acceleration plan for housing reconstruction through the experience and lesson learned from the pilot project implementation.

The pilot projects conducted by the JICA study team from July to November 2008 were successful in resolving some of the problems of housing reconstruction. The effectiveness of the strategies used in the pilot projects was confirmed, yet the period of their implementation was not enough to change the whole situation. The housing reconstruction has started and will take long time. The plan should very clearly take into account the time factor.

On the basis of the existing conditions, the important policy directions are summarized as follows:

#### **(1) Review the building permit system by using the project bank**

The district governments that implemented the pilot projects confirmed the effectiveness of adopting prototype drawing and related materials and registering them in the project bank. The project bank is an effective tool for simplifying the building permit system and extending it to the other 30 district governments.

#### **(2) Extension work to residents and construction workers**

The interview survey conducted in November 2008 made clear that too little information about housing reconstruction is being provided to residents especially outside the pilot project areas. Such extension work to residents should be continued. Construction workers should also be informed about the minimum requirements for constructing houses that are safe against earthquakes.

#### **(3) Requirement for financial support**

The government financial support programs are BONO 6000 and Techo propio. More than 40% of applicants for BONO 6000 have already received their payment. The government will continue to pay the rest of the applicants. The Techo Propio program covers the whole country, but the government should specify the numbers of applicants that can be granted from earthquake-affected areas.

### **6.2. Importance of the Plan**

Based on the experiences gained from the pilot projects, the draft plan should be revised and modified. In our view, the acceleration plan for housing reconstruction is in our view a guide to promote and accelerate housing reconstruction safer against earthquakes. It covers the reconstruction of collapsed and heavily damaged houses and is characterized as an action-oriented strategic plan. The application and use of the plan will generate proper strategies and effective design of projects and activities. Attention to seismic-resistance in housing construction is essential to reduce the risk of damage in future earthquakes. One of



the important findings from the pilot project implementation is that the housing reconstruction work will take time. The draft report focused on short-term projects that can be implemented without major policy change. This is despite the plan recognizing that housing reconstruction will take 10 years.

### **6.3. Planning Issues**

The issue confronting the study is how to enhance housing construction that will provide safety against earthquakes but in a short time and with limited financial resources. This is a very difficult task for the governments and affected people. The Study addressed the housing reconstruction issues in the affected area and its findings are summarized as follows.

#### **(1) Participation of Residents in Housing Reconstruction**

Despite strong demand for housing construction, the supply of safe houses is very limited in the affected area. When construction companies are involved in the housing reconstruction process, there are few problems in quality control, but in many cases albenir take the lead role in the reconstruction of houses. Their level of technical knowledge is not reliable and they may not have the skills to build a safe house.

The affected person should be involved in the housing reconstruction process and share responsibility for the building quality. The owner of the house should supervise construction and should be responsible for its quality. The government should provide technical knowledge to the people through the distribution of easy-to-understand materials.

#### **(2) Efficient Building Permit Issuing System**

The building permission system should be simplified and facilitated so that the decision as to whether a house is safe against earthquakes can be made quickly. The number of government officials should be increased as soon as possible to enhance the speed of issuing building permissions.

#### **(3) Technical Support of Safer Houses**

Construction of houses that will be safer against earthquakes requires technical support to be provided by the government. One of the targets of extension efforts to promote safer houses is the affected people, who are the direct stakeholders in the housing reconstruction. They also have to play an important role in the housing reconstruction process. Affected people themselves should understand housing construction techniques following minimum requirement, which is developed by the study, and have basic knowledge of supervision

The other target group is the brick construction workers known as albanil, who are the key people at housing reconstruction sites. The field investigation survey found that there are many technical problems in construction, such as inappropriate concrete mixtures or poorly formed wall and column joints. Many house owners ask albanile to reconstruct their houses, but due to albanile having inconsistent technical levels and knowledge, there is no guarantee that the reconstructed house will be safer against earthquakes. The interview survey with albanile shows that they would like to receive technical training in safer house construction techniques. A training program should be developed for them.

#### **(4) Continuous Effort for Housing Reconstruction**

Post-earthquake housing reconstruction takes time and requires continuous effort. The government should work on the housing reconstruction issue continuously for the longer term.

## **(5) Education Program for the Public**

The survey results show that most of the people in the affected area do not understand the importance of houses that are safer against earthquake. It is essential to educate people in the importance of construction of seismic resistant houses.

## **6.4. Goal and Objectives**

The goal of the housing reconstruction enhancement plan is “to establish effective measures to promote the reconstruction of seismic-resistant housing in the earthquake damaged areas, including Ica, Chincha and Pisco provinces”. Based on the existing conditions and analysis of impediments, the objectives of the plan are to implement housing reconstruction without delay.

The plan consists of a set of objectives to facilitate housing reconstruction:

Objective-1: Encouraging participation of the affected people in the process of housing reconstruction.

Objective-2: Strengthening the capacity of government institutions to support housing reconstruction.

Objective-3: Dissemination of seismic-resistant construction techniques in housing reconstruction.

Objective-4: Technical training for construction workers

## **6.5. Strategies and Projects**

Fourteen strategies were formulated taking into account the above mentioned policy directions.

Objective-1: Participation of the affected people in the process of housing reconstruction, the following strategies are proposed

- (1) Standardization of the Housing Reconstruction System
- (2) Dissemination of the Construction Approval
- (3) Extension of Construction and Supervision Manuals for Residents

Objective-2: Strengthening the capacity of government institutions to support housing reconstruction.

- (4) Preparation of Manuals on the Issuing of Building Permits
- (5) Preparation of Manuals on the Issuing of Building Permits
- (6) Promotion of Land Registration for Access to Financial Resources for Housing Reconstruction, such as BFH
- (7) Strengthening the Capacity of Public Institutions, including District Municipalities and INDECI etc., to Develop Effective Measures for Housing Reconstruction
- (8) Utilization of the Project Bank System
- (9) Control of Illegal Housing Construction

Objective-3: Dissemination of seismic-resistant construction techniques in housing reconstruction.

- (10) Diffusion of Construction Measures for Safe Houses through Media, Pamphlets, Handbooks, Workshops and Community-based Training
- (11) Establishment of Support Mechanisms for Affected People
- (12) Establishing Disaster Prevention Education Mechanisms and Modules in Schools, including Theoretical and Practical Learning of Disaster Prevention
- (13) Developing Model Houses to Disseminate Seismic-resistant Construction Techniques and Knowledge.
- (14) Financial Support Program

Objective-4: Technical training for construction workers

- (15) Diffusion of Seismic-resistant Construction Techniques to Workers and Professionals to Promote Housing Reconstruction

In order to achieve the goal and objectives, 14 projects are listed by strategies. The list of projects is shown as follows:

**Table 6.5.1 The List of Project**

Strategies	Name of the Project
<b>Encouraging participation of the affected people in the process of housing reconstruction</b>	
(1) Standardization of the housing reconstruction system	a. Prototype drawings of seismic resistant house b. Manual of construction method of seismic resistant houses c. Illustration of minimum requirements of safer houses
(2) Dissemination of the construction process	d. Illustration of construction process
(3) Extension of construction and supervision manuals for residents	e. One-day training
<b>Strengthening the capacity of government institutions to support housing reconstruction</b>	
(4) Preparation of manuals on the issuing of building permits	f. Manual of building permit for safer houses
(5) Promotion of land registration to permit access to the financial resources of housing reconstruction, such as family housing bonus	g. Practical training of the officials of the land title section
(6) Strengthening the capacity of public institutions	h. Practical Training of officials of the land use planning and building permit section
	i. Dissemination of financial mechanisms of government funded programs
(7) Utilization of the project bank system	j. Building permit approval system by utilization of project bank system
(8) Control of illegal housing construction	k. Strengthening of district government control capacity
<b>Dissemination of safe house construction techniques in housing reconstruction</b>	
(9) Diffusion of construction measures for safe houses through media, pamphlets, handbooks, workshops and community-based training	l. Exchange of information and knowledge on safe house construction
	m. Movies for seismic behavior with shaking table
	n. Brief drama to promote safe house
	o. Utilization of mass media
(10) Establishment of support mechanisms for affected people	p. One stop kiosk for housing reconstruction
	q. Affected person support house in district government
(11) Diffusion of safe house construction techniques to workers and professionals to promote housing construction	r. Technical training targets for affected people
	s. Technical training targets for skilled labor
	t. Dissemination of reinforced adobe model house
	u. Extension of techniques for constructing houses that are safe against earthquakes
(12) Establishing disaster management education in schools, including theoretical and practical learning of disaster prevention	v. Preparation of text books and materials about earthquakes and the concept of safe houses
(13) Developing model houses to disseminate seismic resistant construction techniques and knowledge	w. Model house construction
	x. Small scale safe house explanation kit
(14) Financial support program	y. Utilization of Techo Propio program

Source: JICA Study Team

## 6.6. Action Plan

In order to facilitate housing reconstruction, an action plan is formulated covering a period of 10 years from the earthquake. The implementation agency of the action plan is mainly the various layers of government. The private sector should carry out actual construction.

The future housing reconstruction program will be implemented effectively in the three-term framework.

**Table 6.6.1 Action Plan**

1 <sup>st</sup> Phase (2007 to 2010)	2 <sup>nd</sup> Phase (2011 to 2013)	3 <sup>rd</sup> Phase (2014 to 2016)
<ul style="list-style-type: none"> <li>• One day training</li> <li>• Practical training of the officials of the land title section</li> <li>• Practical training of officials of the land use planning and building permit section</li> <li>• Building permit approval system by utilization of project bank system</li> <li>• Exchange of information and knowledge on safe house construction</li> <li>• Utilization of mass media</li> <li>• Affected person support house in district government</li> <li>• Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforce adobe house</li> </ul>	<ul style="list-style-type: none"> <li>• One-day training</li> <li>• Practical training of the officials of the land title section</li> <li>• Practical training of officials of the land use planning and building permit section</li> <li>• Building permit approval system by utilization of project bank system</li> <li>• Strengthening of district government control capacity for illegal construction</li> <li>• Exchange of information and knowledge on safe house construction</li> <li>• Utilization of mass media</li> <li>• Affected person support house in district government</li> <li>Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforce adobe house</li> </ul>	<ul style="list-style-type: none"> <li>• One-day training</li> <li>• Strengthening of district government control capacity for illegal construction</li> <li>• Exchange of information and knowledge on safe house construction</li> <li>• Utilization of mass media</li> <li>• Affected person support house in district government</li> <li>• Utilization of Techo Propio Program</li> <li>• Technical training for skilled labor</li> <li>• Dissemination of reinforce adobe house</li> </ul>

Sources: JICA Study Team

## 6.7. Measures to be taken by the Government

The previous section shows the actual project within the existing legal framework. However, the existing laws and regulation framework could be revised in the long term to facilitate housing reconstruction. The directions of the government actions, which cannot be covered by the project, are summarized as follows:

### (1) Monitoring Price Increases

After the earthquake, construction materials and labor costs increased by about 100% because of speculation and strong demand for construction materials and construction activities. These price increases will lead to higher housing costs. This will cause the problems in low quality of construction and delay in housing reconstruction. Construction costs should be monitored by the government and price increases should be published.

### (2) Land Title Issues

The existing government program has difficulty in supporting those who do not have land title. This problem is not simple as there are several kinds of reasons for no land title. The government should enhance land title determination and other support methods. The United Nations Development Program (UNDP) started to hire professionals and legal experts to enhance land title registration. The project intends to resolve the land title problem on the government side.

### **(3) Building Improvement and Reinforcement of Partially Damaged Houses**

The report focuses on housing reconstruction of houses in the collapsed and heavily damaged categories. However, the problem of partially damaged or slightly damaged houses is not being addressed properly. There is no control over this category of building. However, partially damaged houses should be investigated and standard reinforcement methods should be provided. Inappropriate reinforcement and improvement will not solve the problem of vulnerable houses in Peru.

### **(4) The Extension of Adobe House**

According to the results of the social survey, many affected persons hope to reconstruct houses by confined masonry. One of the reasons is that many affected people have insufficient knowledge of reinforced adobe house technology. It is difficult to extend programs of adobe house construction methods. However, the use of reinforced adobe houses should play an important part in housing reconstruction in the study area, especially in mountainous areas and cost advantaged area. Moreover, if affected people understand the advantages of adobe house, they will want to reconstruct their house by adobe. The implementation organization should work on adobe house in line with the government policy.

### **(5) Review of Existing Housing Reconstruction Program**

The existing housing reconstruction system should be reviewed to enhance housing reconstruction and build safer houses. One way of changing the system is to give incentives to the group contract system. Individual contracts with construction companies are impossible, but there is a possibility to enter contracts for larger groups. The group unit would be a community, relatives and working organizations. The system should provide incentives for the group contract by increasing the amount of money for construction. In the case of the Techo Propio program, the construction company receives the whole contract amount at the end of the contract. Small and medium size companies cannot enter the market because of financial problem. Therefore, it is recommended that the payment schedule be changed to reduce the financial burden on the construction company.

The introduction of a registration system for the qualified albañil is another way of improving housing quality. The house can be constructed only by a recognized albañil who has attended a course and received the qualification of construction master. Only government-funded programs can certify the qualified albañil. The district office should update the list of construction masters.

### **(6) Government Support to Affected People**

Many previous studies show that the people heavily damaged by natural disasters are mainly those who are socially and economically vulnerable. This fact also applies in the case of the August 15, 2007 Earthquake in Peru. Many victims of the earthquake in the study area are poor people and they have insufficient resources to reconstruct safe houses. Furthermore, the earthquake brought about a negative impact on the economy in the region, which caused the loss of many jobs especially among the poor. Housing reconstruction is becoming more difficult for the poor people because of the lack of resources and income opportunities. The government should provide direct support programs such as expansion of employment opportunities etc.

## **CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS**

### **7.1. Housing Reconstruction**

The housing reconstruction is the one of the most important aspects to stabilize affected people's life after the earthquake. The principle of housing reconstruction is self-help by the affected people and the government role should be identified to facilitate the housing reconstruction. Therefore, the government should support self-help activities and formulate policies. Especially, the financial needs are the most interested subject for affected people. The government should consider providing financial support programs. In Peru, since there is no program that the government construction public house and distribute them to the affected people, the government support program would be direct to promote housing reconstruction for the individual house.

The affected persons from the 2007 Pisco Earthquake are mainly categorized as poor, and such people should be the target group for the housing reconstruction system. Even, the building permit system has not been fully utilized until now. Therefore, the future housing construction system should address two aspects: the houses should be reconstructed at low cost but using conventional methods that provide better earthquake resistance and the building permission system should be simple and easy to understand for everybody.

#### **7.1.1. Control of Building Quality for Housing Reconstruction**

##### **(1) Building Permit System and Related Regulations**

The use of prototype drawings and related manuals prepared by the JICA study team made the building permit system function by simplifying the system and enabling the affected people to receive the housing drawings at a low price. The effectiveness of the simplified method was accepted by all district governments which implemented the pilot project. The project bank system proved to be effective for improving the functioning of district government as well as assisting residents.

To make the building permit system work, application of the project bank system will be an effective method and the JICA study team's prototype drawings should be extended to the whole affected area as well as the whole of Peru. In future, additional types of drawing should be added to the project bank.

##### **(2) Improve Capacity of Local Government Officials**

In each district government, the building permit should issue in short time and unified standard by capacity development of the officials. Moreover, inspection should be carried out during construction to maintain the housing quality. Therefore, the government should be carried out training for the officials and improve the capability.

##### **(3) Extension of Building Permit Application System**

The results of the interview survey in November 2008 showed that many buildings have no building permit. One of the reasons for this is that the building permit system is not well known among the affected people. The interviewed people answers revealed that 64 percent did not know about the permit system. The district governments do not promote the system because they are already bearing a heavy administrative burden. In order to improve the building quality in the affected area, building permits should be obtained for every reconstructed building. Incentives to apply for the building permit should be established to

increase applicants. For example, priority should be given to the approved buildings in the government support programs. After the preparation of building inspection by the government, the government should strengthen the control of housing without building inspection. It will take long time to extent the whole Peru.

### **7.1.2. Continuation of the Government Housing Reconstruction Support**

#### **(1) Government Housing Reconstruction Support Program**

The monetary support to affected persons should be divided into one time donations, covered whole affected person, and housing support program. The target group of the BONO 6000 is families whose house is categorized as destroyed or impossible to inhabit. There is no support program for families with partially damaged house. The government housing support should be given to the house owners who intend to reconstruct their house according to the law and government regulations.

#### **(2) Long Term Technical Support**

The experience of housing reconstruction after earthquakes in other country's shows it takes a long time to finish housing reconstruction. Therefore, technical support for safe house construction should continue for a long time. The governments should provide safe house construction extension service, technical explanation text, supervisory manuals for the residents.

#### **(3) Safe House Research and Training**

The research work for safe house construction should continue into the future. The housing construction research should address not only building seismic reinforcement methods, but also building construction techniques and materials. The results of the research should be compiled and ready to use at site by providing technical explanations and extension to construction workers and affected personnel.

#### **(4) Reconstruction of partially damaged building**

The project deals with reconstruction of confined masonry housing and there is no mention about partially damaged buildings. As the results a check of building seismic capacity, appropriate reconstruction method should be determined to the partially damaged building. The government should prepare the guideline for the reinforcement methods. Without appropriate reinforcement of the building, vulnerable building will still remain and the quality of reconstructed house will be still low.

### **7.1.3. Existing Disaster Management Plan and Housing Reconstruction**

#### **(1) Needs of Reconstruction Plan after a Earthquake**

The experience of the reconstruction after this earthquake demonstrates that the responsible organizations should be determined before an earthquake and procedures for reconstruction should be prepared. Even if the procedures are clear, the reconstruction process take time because of unforeseeable events. Since INDECI is the organization responsible for disaster management, it could be in charge of reconstruction after earthquakes so that preparations for reconstruction can be started soon after the initial disaster response period.

#### **(2) Budget for Reconstruction**

Earthquake reconstruction requires a huge amount of money in a short time. To provide a flexible response by governments, rehabilitation and reconstruction funds and budget should



be prepared before the earthquake. The budget should be secured to finance the activities of the government for a long time. In case of Colombia, a calamity fund was established in 1984 as a special account of the Nation. It has autonomy from patrimony, management, accounting and statistics. It is a trust fund of the State, yet is administrated by La Precisora Ltd., which takes responsibility for all legal aspects.

### **(3) Clarification of the Government Roles and cooperation of NGO**

The central government should issue the policy for housing reconstruction and local government should implement the policy on the basis of its conditions. Other implementation organizations, such as international donor agencies and NGOs should provide assistance in line with policies set by the government.

#### **7.1.4. Reinforcement of Existing House in Peru**

Since Peru is located in the seismic zone, large earthquake like this earthquake will be happened in future. In order to decrease housing damage caused by the earthquake, weak building such as adobe should be reinforced and reconstructed. Especially high seismic zone, existing housing reconstruction should be promoted. The government prepares the guideline and financial support program for targeting those areas. Moreover, the research and development should promote to develop or improve cheap reinforcement methods.

## **7.2. Extension to a Safe House and Preparedness for a Earthquake**

The extension and dissemination to the residents will takes long time but it is very effective tools for promotion of preparedness of earthquake and it is very basic of disaster management. In this study results shows that the people in the affected area have not enough knowledge of preparedness of earthquake and a safe house construction. In order to reduce the building damage caused by the earthquake, the government should undertake education and extension of the public in normal time. Those activities should carried out not only damaged area by the earthquake but also covering whole Peru.

### **(1) Extension and Dissemination of Safe House Construction**

The interview survey done by this study found that the recognition of safe house construction methods and the building permit system are very low. One of the reasons is the low recognition and interest in housing construction before earthquakes. The various layers of government should work on providing extension to and enlightenment of residents at all times, not just in the aftermath of an earthquake. Such activities would lead to housing reconstruction proceeding with fewer problems.

### **(2) Continuous Disaster Management Education at School Level**

Peru is located in an area of high seismicity and earthquakes will occur periodically in the Pacific Ocean and mountainous areas. There needs to be continuous disaster management education at the school level. Enhanced knowledge of the various aspects of earthquakes, such as the scientific mechanism of earthquakes, preparations that can be made at home, disaster management education, etc., will help solve the housing quality problem over the long term. The materials prepared by the JICA study team should be utilized at school level and used to provide education continuously.