

**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

Main

May 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.

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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.

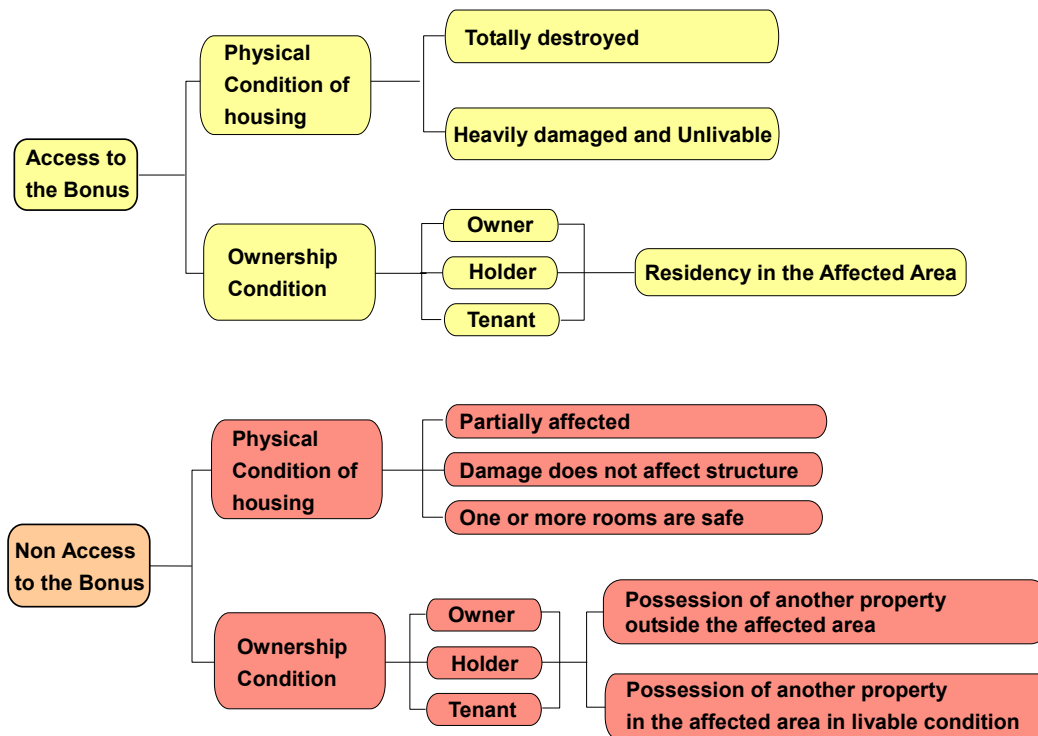
Source: Field survey for 33 district municipalities, JICA Development Study, April of 2008

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

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
GRDP	Gross Regional Domestic Product
GTZ	Deutsche Gesellschaft for Technische Zusammenarbeit
IGP	Geophysics Institute of Peru
IHD	Human Development Index
ITR	Interim Report
INDECI	National Institute of Civil Defense
IMP	Metropolitan Institute of Planning
INEI	National Institute of Statistics and Information
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
OJT	On-the-Job-Training
PRA	Participatory Rural Appraisal
SEDAPAL	Lima Water and Sewer Company
SENCICO	National Training Service in Construction PERU
SIAF	Financial Management Integrated System
SINADECI	National System of Civil Defense
SUNARP	National Superintendency of Public Registration
SNIP	National System of Public Investment
UNDP	United Nations Development Program
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 7.9 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. Objectives of the Study

The Study aims at achieving the following three objectives:

- To formulate an acceleration 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 consists of the provinces of Ica, Pisco and Chincha.



Figure 1.3.1 Study Area Location Map

1.4. Counterpart Agency

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

The following committees were set up for this study.

- Steering Committee in Peru
- Counterpart (MVCS)

The members 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
Ing. Juan Sarmiento Soto (Presidente del Comité Consultivo)	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 Ananias 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. 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 km², 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 (Table 2.1.1). The study area is 14,838.55 km² 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 km² or 38% of the province is located in the mountain zone.

Table 2.1.1 Geographical Areas of Ica Region

REGION / PROVINCE	TOTAL		ZONES			
			COAST		MOUNTAINS	
	Km ²	%	Km ²	%	Km ²	%
TOTAL ICA REGION	21,305.51	100.00	18,923.31	88.82	2,382.20	11.18
CHINCHA Province	2,987.35	100.00	1,838.33	61.54	1,149.02	38.46
PISCO Province	3,957.15	100.00	3,052.01	77.13	905.14	22.87
ICA Province	7,894.05	100.00	7,894.05	100.00	0.00	0.00
PALPA Province	1,232.88	100.00	904.84	73.39	328.04	26.61
NASCA Province	5,234.08	100.00	5,234.08	100.00	0.00	0.00

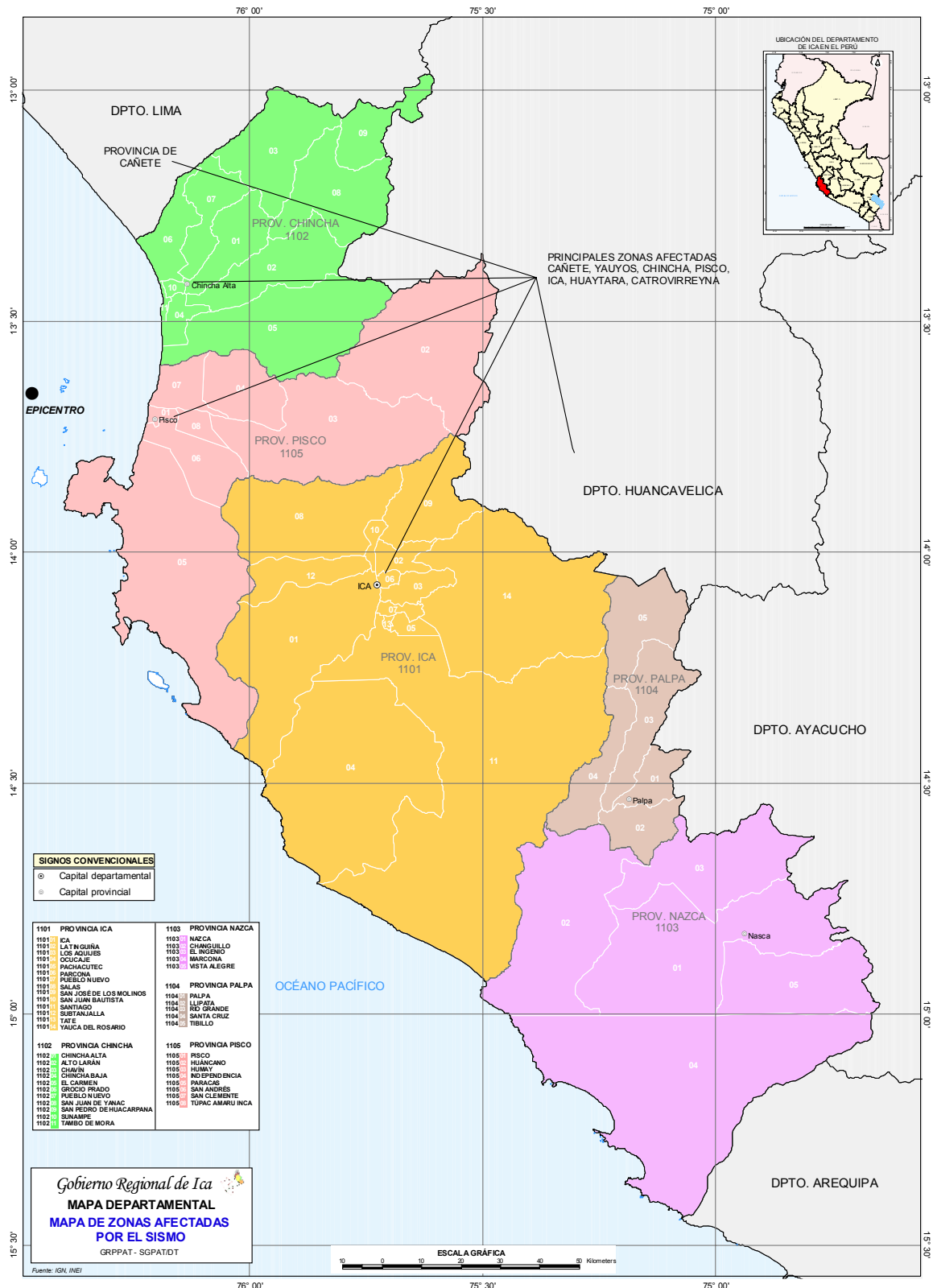
Source: INEI – ICA, Statistics Summary 2000 - 2001

The coastal zone is mostly occupied by desert. The cities and villages are located in the river valleys which form pampas and agricultural land. Between the cities of Pisco and Ica are half moon dunes. The Paracas Peninsula, which contains one of the most important natural environments on the coast, lies to the south of the port of Pisco. The “Paracas” winds are strong marine breezes that blow in Pisco and Paracas districts, sometimes reaching exceptionally high speeds. To the east, the Ica Region includes the Andean slopes that drain into the rivers. The weather is mild in the whole region. The humidity is high in the coastal zone and decreases towards the mountain zone. In the costal area, rainfall is very rare and is

normally less than 15 mm per year, although there are sometimes heavy rains in the mountains.

2.1.2. Administrative Structure

The Republic of Peru is administratively divided into 24 regions called “*región*”. Each region is governed by a President and regional government. 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*”. There are 14 districts in the province of Ica (Ica, La Tinguina, Los Aquijes, Ocucaje, Pachacutec, Parcona, Pueblo Nuevo, Salas Guadalupe, San Jose de Los Molinos, San Juan Bautista, Santiago, Subtanjalla, Tate, Yauca del Rosario), eight districts in the province of Pisco (Huancano, Humay, Independencia, San Andres, San Clemente, Tupac Amaru Inca, Paracas, Pisco), and 11 districts in Chincha (Alto Laran, Chavin, Chincha Alta, Chincha Baja, El Carmen, Crocio Prado, Pueblo Nuevo, San Juan de Yanac, San Pedro de Huarcapana, Sunampe, Tambo de Mora). 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.



Source: INEI

Figure 2.1.1 Administrative Boundaries of Ica Region

2.1.3. Population and Housing

The Ica Region had a total population of 665,592 inhabitants in 2005 (Table 2.1.2), 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.

Table 2.1.2 Population of the Ica Region by Province, 2005

	Population 2005 Census	%
Chincha	181,777	27.31
Pisco	116,865	17.56
Ica	297,771	44.74
Palpa	13,363	2.01
Nasca	55,816	8.38
Total Department of Ica	665,592	100.00

Source: INEI

Table 2.1.3 shows the population growth of Ica region by district. The Ica province had a higher population growth rate of 1.65% per annum from 1993 to 2005, compared to the region's 1.36% per annum during the same period. High annual population growth can be seen in the districts of La Tinguina (2.59%), Los Aquijes (2.50%), Salas (2.63%), San Juan Bautista (2.41%) and Sabtanjallas (5.66%) in Ica province. Chincha province also had a higher population growth rate of 1.60% per annum from 1993 to 2005. High annual population growth can be seen in the districts of Alto Laran (3.48%), Chavin (2.32%), El Carmen (2.34%), Grocia Prado (2.02%) and Pueblo Nuevo (2.10%) in Chinca province. On the other hand, Pisco province had a lower population growth rate of 0.94% per annum from 1993 to 2005, except for the district of Independencia (2.16%). The Ica district had the largest population with 117,839 inhabitants in 2005, followed by Chincha Alta district with 56,085 inhabitants, and Pisco district with 54,193 inhabitants in 2005.

Table 2.1.3 Population of Ica Region by District, 1993 and 2005

	Area (km ²)	Population in 1993	Population in 2005	Population Density 2005 (Persons/km ²)	Annual Growth Rate, 1993-2005 (%)
ICA REGION (TOTAL)	21,327.83	565,686	665,592	31.21	1.36
ICA PROVINCE	7,894.05	244,741	297,771	37.72	1.65
Ica	887.51	106,381	117,839	132.77	0.86
La Tingüina	98.34	22,180	30,156	306.65	2.59
Los Aquijes	90.92	11,176	15,026	165.27	2.50
Ocucaje	1,417.12	3,305	3,496	2.47	0.46
Pachacutec	34.47	4,534	5,659	164.17	1.86
Parcona	17.39	40,283	46,889	2,696.32	1.27
Pueblo Nuevo	33.12	4,447	4,582	138.35	0.25
Salas	651.72	10,190	13,921	21.36	2.63
San Jose de Los Molinos	363.20	5,453	5,734	15.79	0.42
San Juan Bautista	26.39	8,553	11,382	431.30	2.41
Santiago	2,783.73	15,028	21,427	7.70	3.00
Sabtanjalla	193.97	8,747	16,931	87.29	5.66
Tate	7.07	3,133	3,699	523.20	1.39
Yauca del Rosario	1,289.10	1,331	1,030	0.80	-2.11
CHINCHA PROVINCE	2,987.35	150,264	181,777	60.85	1.60
Chincha Alta	238.34	49,748	56,085	235.32	1.00
Alto Laran	298.83	4,285	6,463	21.63	3.48
Chavin*	426.17	735	968	2.27	2.32
Chincha Baja	72.52	11,321	12,052	166.19	0.52
El Carmen	789.90	8,797	11,607	14.69	2.34
Grocio Prado	190.53	14,674	18,658	97.93	2.02
Pueblo Nuevo	209.45	36,763	47,150	225.11	2.10
San Juan de Yanac*	500.40	946	863	1.72	-0.76
San Pedro de	222.45	1,357	1,434	6.45	0.46
Sanampe	16.76	17,594	21,815	1,301.61	1.81
Tambo de Mora	22.00	4,044	4,682	212.82	1.23
PISCO PROVINCE	3,957.15	104,512	116,865	29.53	0.94
Pisco	24.56	52,019	54,193	2,206.56	0.34
Huancano*	905.14	2,041	1,528	1.69	-2.38
Humay	1,112.96	4,347	5,499	4.94	1.98
Independencia	272.34	8,634	11,166	41.00	2.16
Paracas	1,420.00	1,196	1,252	0.88	0.38
San Andres	39.45	12,531	14,134	358.28	1.00
San Clemente	127.22	14,202	17,351	136.39	1.68
Tupac Amaru Inca	55.48	9,542	11,742	211.64	1.74
PALPA PROVINCE	1,232.88	13,427	13,363	10.84	-0.04
NASCA PROVINCE	5,234.08	52,742	55,816	10.66	0.47

Note: *Mountain Region

Source: INEI

National Census of Population and Housing recorded the number of houses by type of building material (Table 2.1.4). 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. In Ica province, 30,913 houses or 50.8% were constructed of bricks or cement blocks and another 26,114 houses or 42.9% were constructed of adobe. In Pisco Province, 11,717 houses or 50.2% were constructed of bricks or cement blocks and another 39.6% or 9,244 houses were constructed of adobe. The situation was quite different in the Chincha province. Some 25,105 houses or 67.7% were constructed of adobe and only 9,810 houses or 26.5% were constructed of bricks or cement blocks. 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 2.1.4 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 ¹	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.

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

When we look at the 2006 regional GRDP by economic sector (Table 2.1.5), 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. The construction sector shows a high growth rate of 13.1% per annum over the period from 2001 to 2006, followed by the manufacturing sector with 11.1% per annum, mining sector with 9.3% per annum and agriculture sector with 9.1% per annum. These figures indicate that the leading economic sectors in Ica region are the agriculture, manufacturing and commerce sectors, which together generated 55% of the regional product in 2006.

Table 2.1.5 GRDP in Ica Region by Activity, 2001-2006 at 1994 Constant Prices

Unit: (S/ 1,000 soles)

Sector	2001	2002	2003	2004	2005	2006
Agriculture	489,735	492,869	520,209	573,321	619,294	757,977
Fishing	34,926	63,009	35,349	32,671	56,741	39,966
Mining	128,876	130,280	147,865	178,451	191,746	201,519
Manufacturing	528,348	594,302	571,264	638,819	880,220	895,571
Electricity and Water	49,250	53,204	57,453	61,993	71,683	73,899
Construction	101,041	120,095	143,748	162,006	156,506	187,324
Commercial	398,206	402,399	419,118	440,647	468,526	522,078
Transportation and Communication	249,567	261,598	271,198	290,317	323,419	331,760
Restaurants and Hotels	116,858	121,847	126,012	132,277	141,573	148,679
Government Services	160,408	174,742	198,925	203,644	217,458	235,033
Other Services	447,456	467,604	489,735	514,337	539,031	569,503
TOTAL	2,704,671	2,881,949	2,980,876	3,228,483	3,666,197	3,963,309

Source: INEI

The quality of life in the region can be identified through the Human Development Index (IHD), which was prepared by DRTPE (Ica Labor Socio-Economic Observatory). Table 2.1.6 shows IHD in the Ica region by province. The overall IHD score of the Ica Region was the third highest in the country in the 2005 assessment. The IHD has three components: (i) life expectancy; (ii) educational achievement; and (iii) monthly family income. In the Ica Region, the average life expectancy is 73.4 years (76.1 years of age in the Lima Region); the literacy rate is 96.5% (97.8% in the Lima Region); and the average family income is S/.438.7 soles per month (S/.696.5 soles in the Lima Region). In general, the quality of life in the Ica Region is relatively high and the region is characterized as a developed zone in the country with a large economically active population.

Table 2.1.6 IHD in Ica Region, 2005

	Population 2005 (N. of inhabitants)	Overall IHD 2005	Life Expectancy (years)	Literacy Rate (%)	High School Registration Rate (%)	Educational Achievement Rate (%)	Monthly Family Income (NS/.)
Lima Region	7,817,956	0,7075	76,1	97,8	89,3	95,0	696,5
Ica Region	665,592	0,6481	73,4	96,5	89,8	94,3	438,7
Ica	297,771	0,6513	73,4	97,1	90,5	94,9	445,8
Chincha	181,777	0,6421	72,6	96,6	87,9	93,7	438,0
Nasca	55,816	0,6461	73,1	94,4	92,2	93,7	447,3
Palpa	13,363	0,6251	61,6	93,5	91,3	92,8	388,9
Pisco	116,865	0,6525	74,8	96,2	89,6	94,0	423,3

Prepared by: DRTPE – Ica Labor Socio Economic Observatory

Source: PNUD (2006), Report on Human Development Peru 2006

Although the quality of life is relatively high in the Ica Region according to IHD, there are several poor districts socially and economically. The social indicator of poverty in the Ica Region was prepared by National Cooperation Fund for Social Development (FONCODES) in 2006. The level of poverty in the Ica region by district is shown in Table 2.1.7. The poorest districts were Chavin, San Juan de Yanac, San Pedro de Huacarpana in the Chincha province. All these poorest districts are located in the mountain zone. The second poorest districts were: Alto Laran, El Carmen in Chincha Province; Huancano, Humay and Independencia in the Pisco Province, and Yauca del Rosario in Ica Province. On the other hand, the districts of Ica, Pueblo Nuevo and Tate in Ica Province and the district of Chincha Alta are classified as not poor.

Table 2.1.7 Social Indicators of Poverty in Ica Region, 2006

Province	District	Population 2005	Index of Lacks 1/	Quintile of the Lacks Index 2/	% of the population without:			Women Illiteracy Rate	% Children 0-12 years old	Malnutrition Rate 1999
					Water	Sewerage/ latrines	Electricity			
ICA	ICA	117,839	0.0234	5	5%	6%	7%	3%	22%	11%
	LATINGUÑA	30,156	0.0560	3	11%	9%	12%	5%	25%	18%
	LOS AQUIJES	15,026	0.1015	3	20%	19%	21%	5%	25%	26%
	OCUCAJE	3,496	0.0804	3	19%	14%	31%	10%	24%	11%
	PACHACUTEC	5,659	0.0709	3	6%	15%	17%	4%	25%	22%
	PARCONA	46,889	0.0557	3	7%	10%	12%	4%	25%	19%
	PUEBLO NUEVO	4,582	0.0363	4	9%	11%	11%	2%	22%	18%
	SALAS	13,921	0.1141	3	26%	18%	25%	5%	27%	21%
	SAN JOSE DE LOS MOLINOS	5,734	0.0943	3	13%	37%	23%	9%	24%	16%
	SAN JUAN BAUTISTA	11,382	0.0749	3	5%	10%	40%	4%	26%	14%
	SANTIAGO	21,427	0.0944	3	12%	15%	20%	9%	26%	21%
	SUBTANJALLA	16,931	0.0654	3	9%	13%	24%	4%	27%	12%
	TATE	3,699	0.0497	4	15%	12%	18%	2%	25%	11%
	YAUCA DEL ROSARIO	1,030	0.4235	2	88%	36%	97%	16%	20%	24%
CHINCHA	CHINCHA ALTA	56,085	0.0444	4	10%	7%	11%	3%	25%	15%
	ALTO LARAN	6,463	0.1633	2	36%	22%	48%	9%	27%	13%
	CHAVIN	968	0.8043	1	75%	100%	82%	43%	22%	37%
	CHINCHA BAJA	12,052	0.1267	3	51%	14%	31%	6%	25%	17%
	EL CARMEN	11,607	0.1961	2	50%	28%	41%	11%	26%	17%
	GROCIO PRADO	18,658	0.1490	3	26%	10%	22%	6%	27%	33%
	PUEBLO NUEVO	47,150	0.0790	3	19%	3%	16%	5%	28%	19%
	SAN JUAN DE YANAC	863	0.7276	1	54%	63%	89%	17%	28%	54%
	SAN PEDRO DE HUACARPANA	1,434	0.8371	1	42%	96%	56%	22%	34%	61%
	SUNAMPE	21,815	0.0726	3	17%	6%	12%	4%	26%	24%
	TAMBO DE MORA	4,682	0.1010	3	36%	33%	20%	3%	25%	15%
PISCO	PISCO	54,193	0.0350	4	8%	12%	7%	3%	25%	9%
	HUANCANO	1,528	0.2641	2	62%	32%	23%	10%	27%	31%
	HUMAY	5,499	0.2972	2	46%	73%	30%	14%	26%	20%
	INDEPENDENCIA	11,166	0.2436	2	67%	23%	53%	11%	27%	14%
	PARACAS	1,252	0.0859	3	39%	10%	31%	4%	25%	12%
	SAN ANDRES	14,134	0.0787	3	21%	16%	18%	4%	28%	10%
	SAN CLEMENTE	17,351	0.1291	3	28%	16%	18%	10%	28%	21%
	TUPAC AMARU INCA	11,742	0.0947	3	15%	16%	19%	5%	28%	18%

Note 1): This is a value between 0 and 1. This index is obtained by means of the factor analysis, by the method of the main components.

Note 2): Weighted quintiles per population, where 1=Poorest and 5=Not so poor

Prepared by: FONCODES/UPR

Sources: Census of population and Housing, 2005 - INEI, Census of School Height, 1999 - MINED

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



Source: INDECI

Figure 2.2.1 The August 15, 2007 Earthquake

The earthquake was caused by the friction of the Nazca 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 was felt with intensities of V (MMI) in the capital city of Lima and II-III (MMI) in the cities of Chiclayo

and Arequipa. This earthquake was one of the highest magnitudes (of released energy) experienced in Peru during the last 50 years.

A special feature of the earthquake was the long duration of its process of rupture or release of energy, about 4 minutes, during which two significant ruptures occurred, the second one 70 seconds after the first one. The occurrence of these two ruptures was easily noticed by the population and later, several aftershocks occurred. The heavily damaged areas were Chincha, Pisco, Ica and Cañete provinces, near to each other and located about 300 km south of the capital city of Lima. Up to 07:00 am in the morning of August 16th 2007, more than 250 aftershocks were recorded. One occurred at 00:16 am and another one at 05:35 am on August 16th with magnitudes of 6.0 ML and 5.8 ML respectively, which affected Pisco city and its surroundings with intensities of IV (MMI).

The city of Pisco was the most damaged by the earthquake. On August 16th the city woke-up without basic services and with telecommunications problems. About 70% of its infrastructure collapsed, according to official sources. Local people spent the night outside in squares and parks; many people from rural areas arrived in the cities asking for help. In the early period after the earthquake, access to the city of Ica was difficult because of damage to the road network.

A large tsunami occurred about one hour after the earthquake. It was confirmed that the run up height of waves was between 2-3 m, but reached 10 m at Yumaque beach in Ica.² The tsunami damaged fishing villages on the coast, and since these fishing villages are distant from the cities, they did not receive immediate assistance.

2.2.2. An Initial Damage Investigation Conducted by INEI

The earthquake tragically resulted in huge damage in the regions of Ica, Lima and Huancavelica. According to records³ provided by the National Institute of Statistics and Information (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 regions⁴. 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.

The INEI's damage investigation classified the houses into five categories of degree of damage (Box 2.2.1).

² Defense Ministry Peruvian Navy, Directorate of Hydrography and Navigation, Post Tsunami Report, August 2007.

³ INEI, Census of the Area affected by the August 15, 2007 Earthquake, 2007.

⁴ 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.

Box 2.2.1 Classification of Damaged Houses by INEI

1. Completely Destroyed: houses with walls and roofs fallen or destroyed
2. Heavily Damaged: houses with severe damages and most walls fallen or destroyed, which are unlivable condition.
3. Partially Damaged: houses with partially damaged structure, walls or roofs, which need repair.
4. Slightly Damaged: houses with slight cracks or minor damage, which are livable.
5. Non Affected: houses without any damage.

Source: INDECI

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.

The province of Chincha had the most severe damage to housing by the August 15, 2007 earthquake. Of the 48,804 houses that existed before the earthquake, 17,708 houses or 36.3% were totally destroyed and another 6,891 houses or 14.1% were heavily damaged with unlivable condition. The combined total of these two categories was 24,599 houses, which correspond to more than half of the total houses that existed in the province. In Ica province, there were 27,024 houses in the categories of totally destroyed and heavily damaged with unlivable condition, which corresponds to 33.3% of the total houses in the province. In Pisco province, there were 13,245 houses totally destroyed and heavily damaged with unlivable condition, which correspond to 36.6% of the total houses that existed in the province.

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

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

Table 2.2.2 shows the number of people by the degree of damage in the three provinces. Among the total population of 642,243 inhabitants, 218,430 lost their houses completely and the houses of another 61,257 inhabitants were heavy damaged and in unlivable condition.

Accordingly, the August 15, 2007 earthquake caused significant damage to the people living in the three provinces; nearly 280,000 inhabitants or 43% of the population lost their houses by complete destruction or heavy damage and unlivable condition.

Table 2.2.2 Number of People Affected by the Earthquake in Ica, Chincha, and Pisco

Province	Total Number of Population	Number of 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: INE I

2.2.3. Damage Investigation Conducted by INDECI

There was a criticism of the damage investigation conducted by INEI. The INEI's damage investigation was unreliable because of unclear criteria in the classification of degree of damage. In addition, it was said that the INEI's investigation was conducted by mainly nonprofessionals⁵. Therefore National Institute of Civil Defense (INDECI) made additional investigations to identify damages to houses caused by the earthquake. Each district committee of civil defense was responsible for implementation of damage investigations in the jurisdictions, and INDECI compiled the records. Actually, the damage investigations have been conducted several times by the district committee of civil defense and the records took a long time to finalize.

Table 2.2.3 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.

⁵ Based on the interviews with officials in the MVCS and the local governments.

Table 2.2.3 Number of Houses Damaged by the Earthquake

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

2.2.4. 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 survey⁶ 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 2.2.2.

⁶ 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 ⁷	
		

Source: JICA Study Team, April of 2008

Figure 2.2.2 Photos of Housing by Type of Structure

Table 2.2.4 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. The buildings constructed of masonry without concrete frame were not strong enough; about 34% of the buildings in this category were totally collapsed and another 17% were heavily damaged by the earthquake. The buildings constructed of quincha (cane and mud), on the other hand, were strong against earthquake, due to the elasticity of the materials.

When we compare the distribution of damages of the buildings constructed of confined masonry by district in the Figure 2.2.3 and adobe by district in the Figure 2.2.4, the damages

⁷ The photo of (5) Quincha shows a wall of weaved canes. The mud as finis materials is used to put on the weaved canes.

to buildings constructed of adobe were distributed through all districts. On the other hand, the damages to buildings constructed of confined masonry were identified in certain localities such as coastal areas where the sub-soil was soft and liquefaction occurred. This fact highlighted that the damage level by the earthquake depends not only on construction material or building structure but also on local characteristics and surface geological conditions.

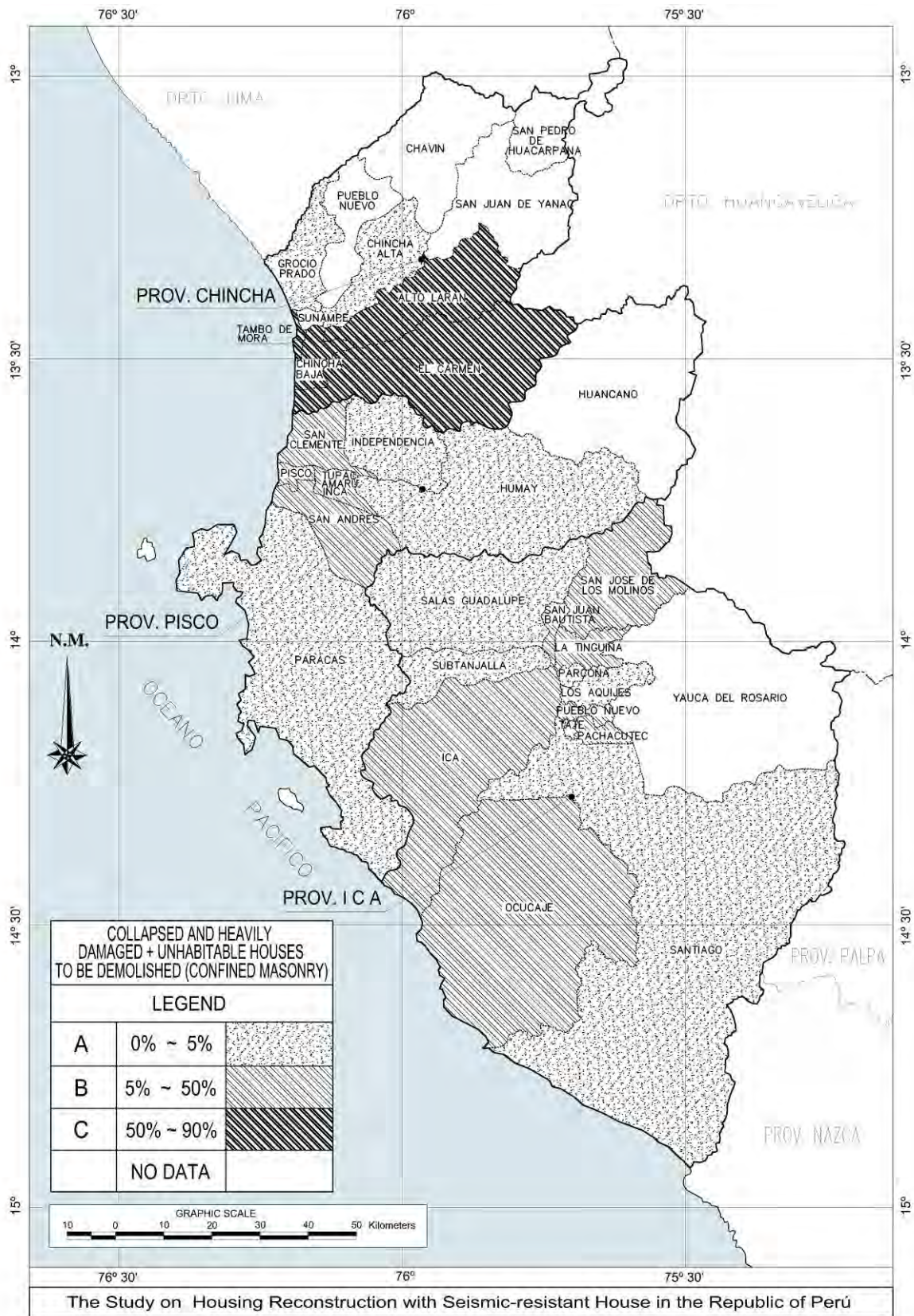
Table 2.2.4 Damage Level by Type of Housing Structure

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)

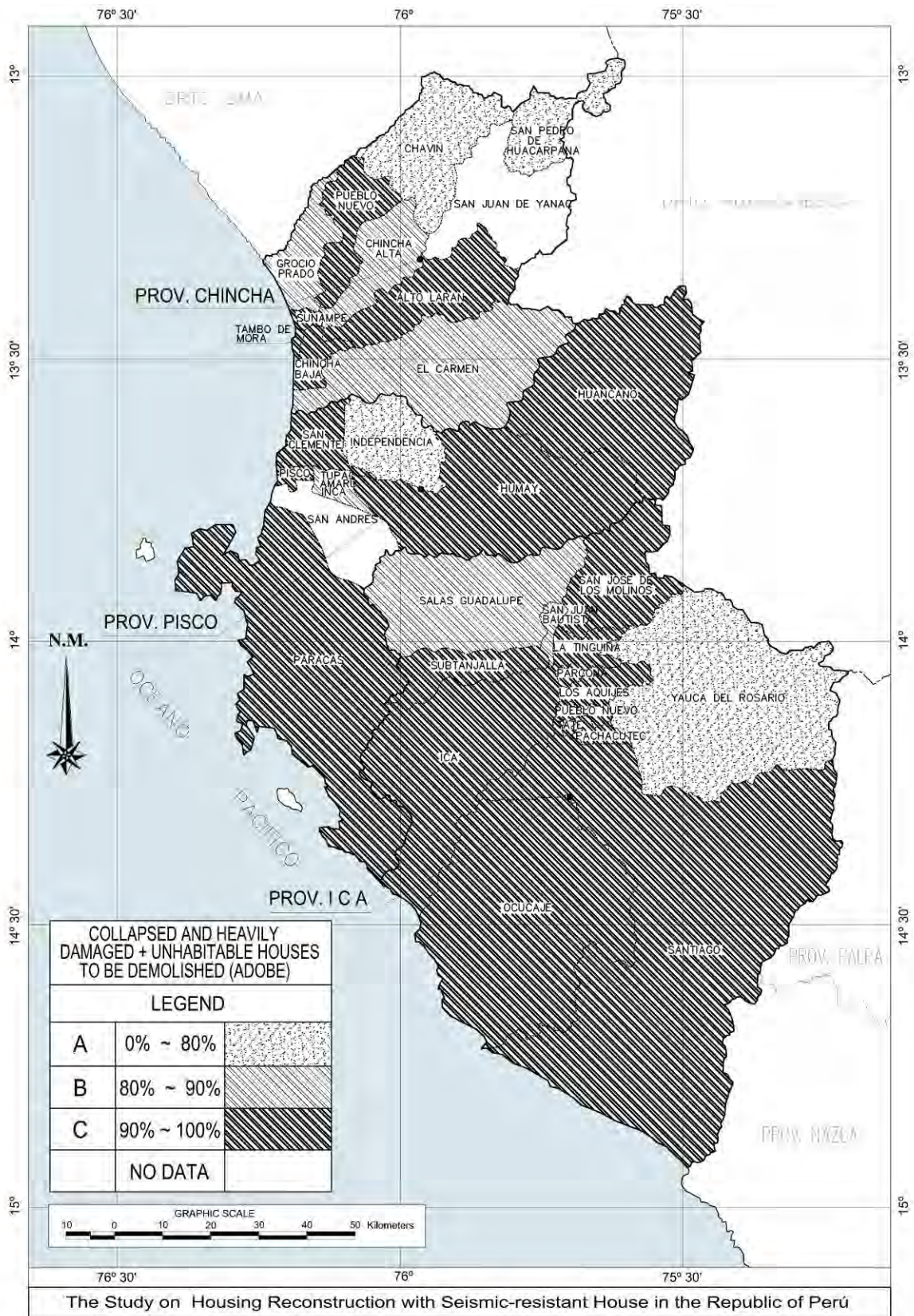
Note: Note: The sample number of district municipalities differs in the type of building structure. The number is 9 districts in (1) reinforced concrete, 26 ones in (2) confined masonry, 25 ones in (3) masonry without concrete frame, 31 ones in (4) sun-dried brick, and 17 ones in (5) cane and mud.

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



Source: Field Survey Results

Figure 2.2.3 Damage Ratios of Confined Masonry Houses by District



Source: Field Survey Results

Figure 2.2.4 Damage Ratios of Sun-dried Brick (adobe) Houses by District

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 response⁸. 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.

One component of SINADECI is the Multi-sectoral Commission for Disaster Prevention and Response (CMPAD), which was created by Supreme Decree 081-2002-PCM is responsible for coordinating, evaluating, prioritizing and supervising measures for damage prevention for areas of the country that are in imminent danger of responding to rehabilitating areas affected by large scale natural or technological disasters. Each sector carries out prevention works, counteract imminent disaster risk, emergency and rehabilitation works, and reconstruction works⁹. It is presided over by the President of the Cabinet and is composed of twelve (12) ministers. The INDECI acts as technical secretariat of the CMPAD.

The civil defense committees are integrated bodies of execution function of civil defense activities in a specific area. They are classified into regional, provincial and district civil defense committees. The civil defense committees are responsible for disaster management activities, including prevention, preparedness, emergency response, and rehabilitation and reconstruction in their jurisdiction. Main functions of the civil defense committees are:

- Planning, coordinating and controlling civil defense activities

⁸ Article 5, Decree-Law 19338.

⁹ Article 8, Decree-Law 19338.

- Formulating civil defense plans
- Preparing updated inventories of human and material resources available for response to emergencies
- Identifying hazards, analyzing vulnerabilities and assessing risks in order to protect life and property
- Organizing and implementing the emergency operation center (COE) to facilitate decision-making for disaster management
- Responding to emergencies by providing immediate support to the population affected
- Promoting and providing training to authorities and citizens in civil defense actions
- Proposing the declaration of State Emergency by reason of disaster
- Carrying out Civil Defense Technical Safety Inspections
- Planning, coordinating, supervising and implementing prevention works with the participation of executing entities.

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 (FORSUR¹⁰) 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. According to the Law, the functions of FORSUR were defined as follows¹¹:

- Conduct a general evaluation of effects by August 15, 2007 earthquake;
- Approve rehabilitation and reconstruction plans and projects;
- Give priority to works and investments to be executed by the ministries, regional, provincial and local governments and the private sector within the framework of rehabilitation and reconstruction plans approved by FORSUR; and
- Coordinate rehabilitation and reconstruction works to be executed by the ministries and other public entities in the framework of FORSUR objectives.

Although FORSUR was established two weeks after the Earthquake, it has not operated smoothly. After many changes to the law, FORSUR was finally enacted into existence on January 8, 2008, nearly five months after the Earthquake.

¹⁰ The idea of FORSUR is based on the disaster management in Columbia.

¹¹ FORSUR (2008), Reconstruction Plan for the South, P. 16.

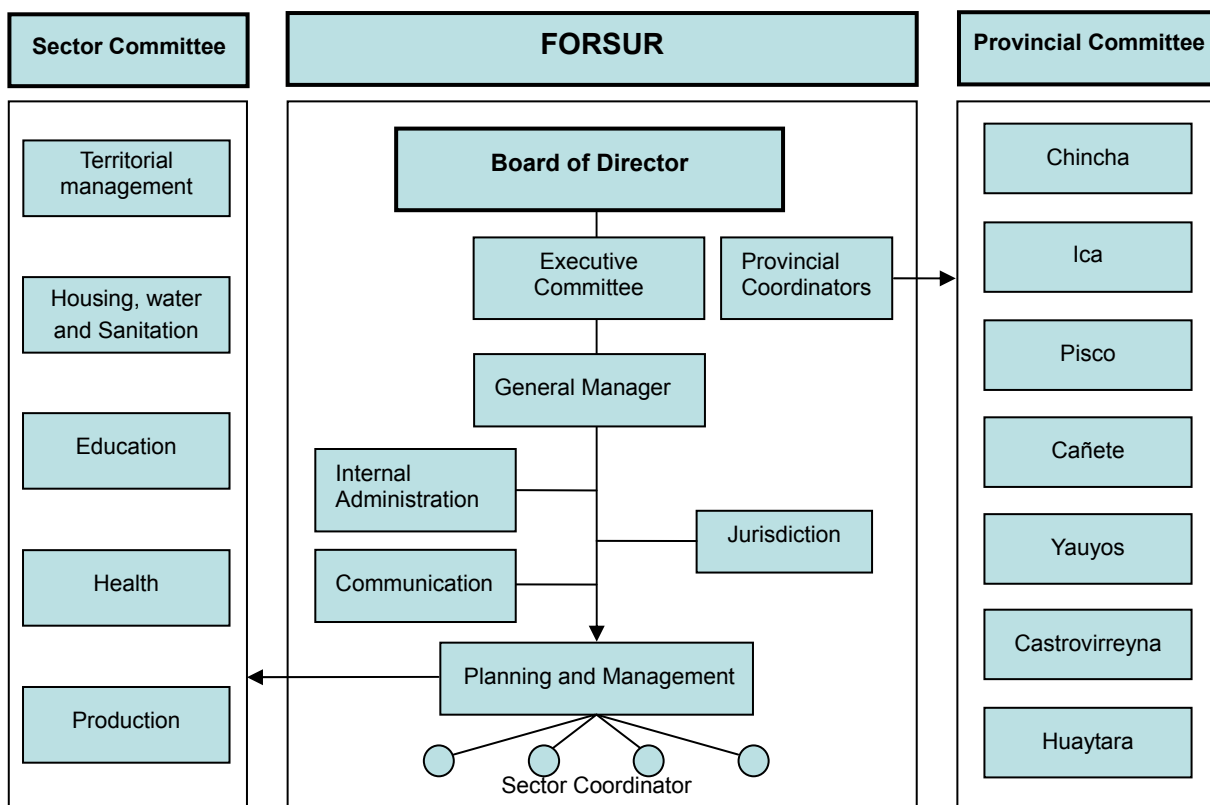
According to the law, FORSUR is not an execution agency but a funding entity for the purpose of rehabilitation and reconstruction in the earthquake affected area of the south. It finances projects when the sectors, regional and local governments concerned do not have sufficient budgets to execute the projects. The role of FORSUR is coordination among the sectors and among the national, regional and local governments and private sector. Besides, 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 (SNIP¹²) 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 charge of coordination with the public and private entities as well as the provincial and sector committees. Figure 3.1.1 illustrates an organization chart of FORSUR.

FORSUR has sector committees as well as provincial committees. There are five (5) sector committees: (i) territorial management, (ii) housing, water and sanitation, (iii) education, (iv) health, and (v) production. Each sector committee is represented by a corresponding ministry, and its role is the provision of a sector reconstruction master plan defining general policies, guidelines and technical standards for the formulation and approval of projects. The sector committee involves ministries, international agencies, NGOs and the private sector. On the other hand, FORSUR has seven (7) provincial committees, including Cañete and Yauyos in Lima Region, Chincha, Pisco and Ica in Ica Region, and Huaitará and Castrovirreyna in Huancavelica Region. Each provincial committee is represented by the provincial mayor with the participation of the district mayors in the province. The provincial committees give technical support to the mayors for project prioritization and execution.

¹² SNIP is the organization which approves the projects implemented by district, regional and central government.



Note: Prepared by the Study team.

Source: FORSUR (2008), Balance y Plan de Reconstrucción del Sur, p. 25

Figure 3.1.1 Organization Chart of FORSUR

As discussed above, the decision-making process of FORSUR is quite complicated and involves many actors, including the central, regional and local governments as well as private sector. It is also noted that even after a project is approved by the Board of Directors, it takes more than 2 months to transfer the money to the entity responsible for the execution of the project. There is a great obstacle and delay in the implementation of rehabilitation and reconstruction work. In fact, some provinces in the earthquake affected area do not perceive the efforts of FORSUR. As a result, the affected population tends to take reconstruction steps on their own.

(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”). The Reconstruction Plan of the South has four general objectives¹³:

- Recover the habitat of the affected area;

¹³ FORSUR (2008), Balance y Plan de Reconstrucción del Sur, PP.49-50.

- Improve the quality of life;
- Improve institutions concerned with prevention, risk control and vulnerability of disaster; and
- Promote technical assistance.

FORSUR divided reconstruction activity into the three stages¹⁴: (i) emergency stage, (ii) transition stage, and (iii) reconstruction stage. In the emergency stage, the major activities are medical support for injured people, debris removal and immediate infrastructure recovery. This stage takes about 2-4 months. In the transition stage, major activities are: diagnosis of the damaged area; coordination between sectors and national, regional and local governments; preparation of seismic risk map; and preparation of temporary housing. This stage takes about 4-12 months. In the reconstruction stage, the major activities are housing reconstruction, development of education and health facilities to recover the normality of life in the affected area. This stage takes about 1-2 years. In this framework, the reconstruction work starts around 6-16 months after the earthquake.

By December 10, 2007, FOUSUR had funds available totaling 194.2 million soles from various sources (Table 3.1.1).

¹⁴ FORSUR (2008), "Balance and Plan of Reconstruction of the South," PP.30-39.

Table 3.1.1 Reconstruction Fund in FORSUR, as of December 10, 2007

Source	Million soles
Donation from overseas	22.4
Public Treasure resources	100.0
Bank commission Interest	55.6
Nation Fund to Finance the Entrepreneurial Activity of the State (FONAFE ¹⁵) initial contribution	14.3
Charity show	1.9
Total	194.2

Source: FORSUR (2008), Balance and Plan of Reconstruction of the South

FORSUR estimated that a total investment of 1.29 billion soles would be necessary for rehabilitation and reconstruction of the south. Table 3.1.2 shows the amount of investment needed by sector. The housing sector needs the biggest investment followed by the education sector, and health sector in Table 3.1.2. It is noted that there is a huge gap between FORSUR's available funds and the investment needed for rehabilitation and reconstruction.

Table 3.1.2 Investment for Rehabilitation and Reconstruction by Sector

Sector	Value (million soles)	%
Housing	500*	38.7
Water and Sanitation	149	11.5
Health	155	12.0
Education	324	25.1
Urban Development	141	10.9
Production	23	1.5
Total	1,292	100.0

Note: * Include Housing reconstruction bonus and Techo Propio program

Source: FORSUR (2008), Balance and Plan of Reconstruction of the South, p. 33.

By April 2008, FORSUR had identified 616 projects as high priority: 290 projects in housing, water and sanitation sector; 178 projects in the education sector; 100 projects in the production sector, and 48 projects in the health sector. Among the 616 projects, 188 were approved by February 11, 2008 with a total value of 258 million soles. The distribution of the approved projects by province is shown in Table 3.1.3. Ica province was the recipient of the largest allocation followed by Pisco province and Chincha province. These three provinces accounted for more than 95 percent of the total investment approved by FORSUR, as of February 11, 2008.

15 FONAFE is a corporation that manages the funds generated by State owned companies. Also it promotes entrepreneurial activities of the State.

Table 3.1.3 Approved Projects by FORSUR, as of February 11, 2008

Province	No/ of Projects	Value (million soles)
Pisco	49	72.5
Chincha	23	33.1
Ica	17	143.8
Cañete	17	5.1
Yauyos	69	1.5
Castrovirreyña	6	0.7
Huaytara	7	1.3
Total	188	258.0

Source: FORSUR(2008), Balance and Plan of 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. BFH is a government subsidy under the Techo Propio program to promote housing acquisition and construction for people throughout Peru, not only earthquake victims in the south¹⁶. In order to receive the benefit of BFH, people need to submit a land registration certificate. Thus, FORSUR approved finance for Commission for the Formalization of Informal Property (COFOPRI) to provide legal clearance for the informal land in the earthquake affected area. More detailed discussion of the BONO 6000, Techo Propio program and COFOPRI is provided in the following section.

FOR SUR also financed updating of micro-zoning studies in the affected area, which identifies high risk zones from natural disasters including earthquakes and floods. The micro-zoning studies for Pisco and Chincha municipalities in 2001¹⁷, and the micro-zoning study for Ica municipality in 1999 were prepared by Peru National University of Engineering (CISMID). After the August 15, 2007 earthquake, FORSUR financed updating of the micro-zoning study for Pisco municipality¹⁸ and it was prepared by Center for Seismic Investigation and Disaster Mitigation, CISMID in November 2007. FORSUR also financed the formulation of an urban reconstruction plan for Pisco and it was prepared by Metropolitan Institute of Planning (IMP) based on the updated micro-zoning map.

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. Prior to the establishment of the MVCS, there was little coordination between key government institutions on housing development policies. Thus, the MVCS plays an important role in housing reconstruction in coordination with other government agencies.

¹⁶ There is a special fund of approximately 600 million soles for Techo Propio program.

¹⁷ The micro-zoning studies for Ica and Chnicha municipalities were conducted under Sustainable City Program funded by UN-HABITAT

¹⁸ The micro-zoning studies of Chincha Baja and Tambo de Mora were validated by the CISMID and financed by the World Bank

The MVCS is a leading agency responsible for policy formulation of reconstruction in the earthquake affected area of the south. It provides the following policies and framework for housing reconstruction:

- Promote the access to subsidies granted to families in the framework of the reconstruction process and current government programs;
- Promote technical assistance for construction and repair of houses affected by the earthquake;
- Promote legal assistance to reduce illegal property ownership and to facilitate the access of families to the bonus;
- Facilitate the articulation of the new housing reconstruction program with the current housing programs of the government;
- Promote the articulation and inclusion of temporary housing as part of the final housing programs
- Promote the implementation of new housing projects for families relocated from high risk areas
- Promote the implementation of projects with basic housing solutions for tenants
- Strengthen the capacity of communities for self management and self construction (technically assisted).

The organization chart of the MVCS is illustrated in Figure 3.1.2. 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, SENCICO, Lima Water and Sewer Company (SEDAPAL) and National Real Estate Superintendence. Under the recent decentralization policy, these technical and financial institutions have their own budgets and programs and they have operated in each region in collaboration with regional and local governments. On the other hand, MIVIVIENDA is a financial institution to support housing acquisition and construction and it has operated directly under the central ministry. The roles and functions of each institution are described below.

SENCICO is an institution to provide training, investigation and regulation in relation to building construction techniques. It has provided construction training with certification to all types of occupations, including professionals, operative workers, and high school graduates. In addition to the technical training, SENCICO has promoted and disseminated procedures and use of economic materials based on national resources. SENCICO has also provided regulations for building design and construction in the country.

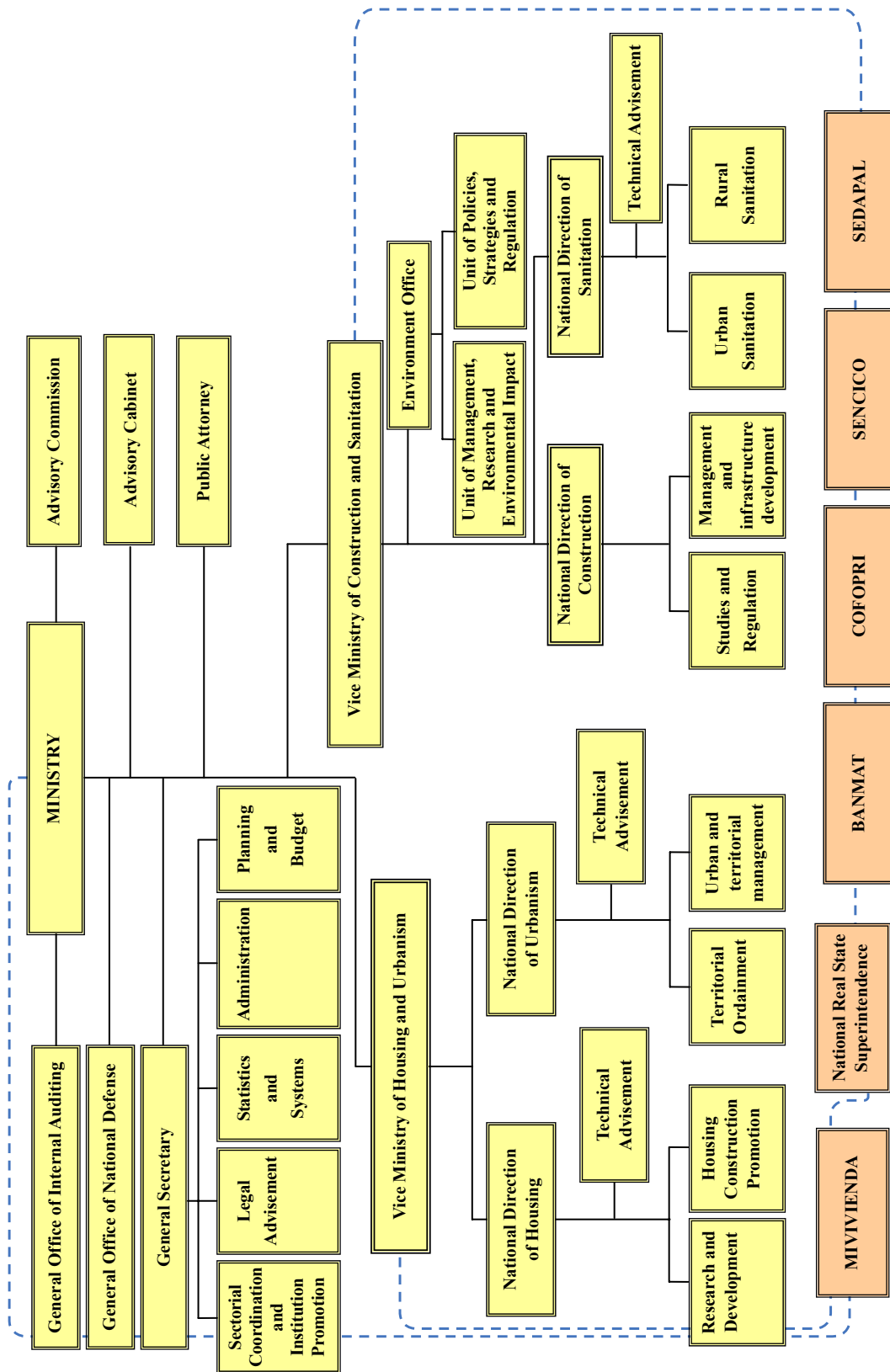
COFOPRI is a decentralized institution in the housing sector of the MVCS. The role of COFOPRI is to formalize informal human settlements (asentamientos humanos) in the

territory of Peru. The COFOPRI also regularizes property registration in the state housing programs. After the August 15, 2007 Earthquake, public entities realized that many victims do not have formal property registration. More than 70% of the houses have no land registration in Ica region. Thus, FORSUR requested COFOPRI to provide legal clearance of the lands in the affected area. Up to April 11, 2008, COFOIPRI supported the procedure of the registrations, and National Superintendency of Public Registration (SUNARP) had issued property registrations in the affected area¹⁹.

Bank of Material is a financial institution to support housing construction. It has distributed BANMAT Card to eligible families of the earthquake victims. The BANMAT Card is similar to a debit card with a certain monetary value. By using the BANMAT Card, affected families can purchase housing construction materials from eligible shops and also receive cash for labor costs of housing reconstruction up to 10% of the total value. By the end of August 2008, a total of about 28,000 BANMAT Cards were delivered in the affected area.

MIVIVIENDA (the meaning is “My Home”) is a financial institution to support new housing acquisition and construction through ordinary financial credit. MIVIVIENDA has provided three specific programs with different target groups based on housing value. They are: 1) Mivivienda credit for the housing value from 87,500 up to 175,000; 2) MiHogar loan for the housing value from 35,000 up to 87,500; and 3) Techo Propio for the housing value from 18,425 up to 33,500. The details of these programs are discussed in Section 3.2.3.

¹⁹ MVCS, Policy and Plan of the Housing Sector for the Quick Recovery and Reconstruction, April, 2008 (Política Y Plan del Sector Vivienda, para la Recuprana Y Reconstruccion Sismo del 15 de Agosto de 2007)



Source: MVCS

Figure 3.1.2 Organization Chart of the MVCS

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, Construction and Sanitation is limited to organizing and supervising housing reconstruction and urban development¹³.

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.” The Action Plan provided a legal and institutional framework that regulates emergency and post-emergency actions required for rehabilitation and reconstruction in the earthquake affected areas. It consists of: vision, objective, strategies, programs and projects, and institutional responsibility. The Action Plan paid much attention to security measures of disaster prevention to protect the lives of the people. It emphasized the importance of coordination and capacity development in national, regional and local governments, the private sector and civil society.

The Action Plan is a guideline focusing on disaster prevention and reconstruction activities with the following recommendations:

- Conduct post-disaster survey and seismic micro-zoning studies to identify the risk of natural disaster. Housing reconstruction and urban development should be made to guarantee the safety of the population;
- The reconstruction of cities should be carried out by a multidisciplinary team consisting of a seismic engineer, urban development planner, urban reconstruction and disaster prevention experts;
- To reconstruct the cities incorporating disaster prevention measures, capacity development of the regional and local governments and civil society is necessary;
- Develop a special investment bank for the purpose of rehabilitation and reconstruction to execute the programs and projects properly;
- Promote participation of civil society in the activities and actions of rehabilitation and

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

reconstruction in the affected area;

- Strengthen the functions of INDECI through the development of regional emergency centers and technical commissions at regional and district levels.
- Optimize public investment in reconstruction of the area with disaster prevention.
- Modification of regulations (Ministerial Resolution No. 125 and 454-2007-Housing) governing access to BFH for the earthquake victims.
- Provide training of construction technologies and safety measures against earthquakes for professionals, technicians and workers.
- Relocation of settlements in areas with high risk from natural disaster.

Some of the recommendations proposed in the Action Plan were accepted and financed by FORSUR.

(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 low¹⁴ since the decentralization of power is not matured and also the national policy is not disseminated to nationwide.

¹⁴ 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).

Table 3.1.4 Outline of Building Administration system

Administration level	Organization	Role
National level	Congress	To promulgate laws(ex. Law of Urban Developments and Building Regulation)
	MVCS	-To promulgate regulations regarding housing, construction and sanitation (ex. Regulation of urban habilitation permit and building permit) -To make a housing policy and formulate housing programs in cooperation with Regional government
Regional level	Regional government	-To promote housing programs -To make technical assistance to provincial and district level
Provincial and district level	Provincial municipality	-To approve TUPA (administrative process text)
	District municipality	-To execute building permit

Source : Supreme Decree No.024-2008-Vivienda
 Law 27867" Regional Government Organization Law"
 Law 27779" Law which modify the organization and function of ministries"
 Law 27972" Law of municipality organization"
 Legislative Decree No.560" Law of Executive Power"

As an example, the building permit system is taken to explain. National Regulation of Construction, which is most important regulation of building design and construction, establishes the technical criteria and requisites for the design and execution of construction. The regulation is of compulsory application during the constructive process.

Law of Urban Developments and Building Regulation (Law N°29090) was promulgated on 25th of September, 2007 for the purpose of simplification and acceleration of the process of issuing building permits. The point of amendment of building permits are in response to the two important principles of speedup and simplification for better administration of public function stipulated in Law of General Administrative Procedures (Law N°27444)

The major amendments in the issuing building permits are summarized.

The issuing building permit is classified into four types according to the size and height of the building. For proposed buildings with a floor area of less than 120 m², drawing application for a building permit requires only the submission of architectural drawings; it is not necessary to submit structural, electrical and sanitary drawings.

Table 3.1.5 Amendment of Law of Urban Development and Building Regulation on Building Permit and Site Inspection

Case	After the amendment			Before the amendment
	Required drawing	Period of issuing permit	Site inspection under Construction	
Case 1: Housing with a floor area of less than 120 m ² in one lot of land	1) Drawings of project bank, or 2) General layout plan, floor plan, detailed architecture drawings, structural drawings and certificate of professional authorization	1 day after receiving the application	Site inspection is made by district government. When construction mistakes and errors are found, the inspector orders the suspension of construction.	A complete set of drawings including architectural, structural, electrical and sanitary drawings. It took a long time to issue building permit after the application was submitted.
Case 2: 5 storied or less than 5 storied housing with a floor area of from more than 120 m ² to less than 3,000 m ² for uni-family or multi-family use	A complete set of general layout plan, floor plan, detailed architecture drawings, structural drawings, electrical drawings and sanitary drawings	-ditto-	-ditto-	
Case 3: More than 5 storied housing with a floor area of more than 3,000 m ² for uni-family or multi-family use	-ditto-	At least 20 days	Construction owner can choose whether the inspection is made by a district municipality or by an urban auditor. When construction mistakes and errors are found, the inspector or auditor orders the suspension of construction.	
Case 4: Shopping center, commercial building and industry building, etc. with a floor area of more than 3,000 m ²	-ditto-	At least 20 days	Site inspection is made by the district municipality. When construction mistakes and errors are found, the inspector orders the suspension of construction.	

Source: information from Interview with staff of MVCS

Local government needs to issue lots of building permits to facilitate housing construction after the earthquake. Before the amendments shown in Table 3.1.5, the issuing of permits was a length process. Most of the houses were constructed without building permits. Local governments were likely to let the house owners construct without building permits for lack of manpower and budgets of the construction section.

Dissemination of building permits in local population can be affected by construction administration service of local governments. The local government needs to educate the population to know the importance of building permits and submit the application. The local government also needs to show the local population a good plan to facilitate the building permits. 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 m² 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 m² 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 province (Table 3.2.1). 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.

Table 3.2.1 Number of Temporary Shelters Provided

Unit: house

	Province			Total
	Chincha	Ica	Pisco	
(a) No. of temporary shelters provided*	4,970	6,260	6,802	18,032
(b) No. of houses collapsed or heavily damaged with unlivable condition**	24,599	27,024	13,245	64,868
(c)=(a/b) Percentage of provision of temporary houses in the houses with unlivable condition	20.2%	23.2%	51.3%	27.8%

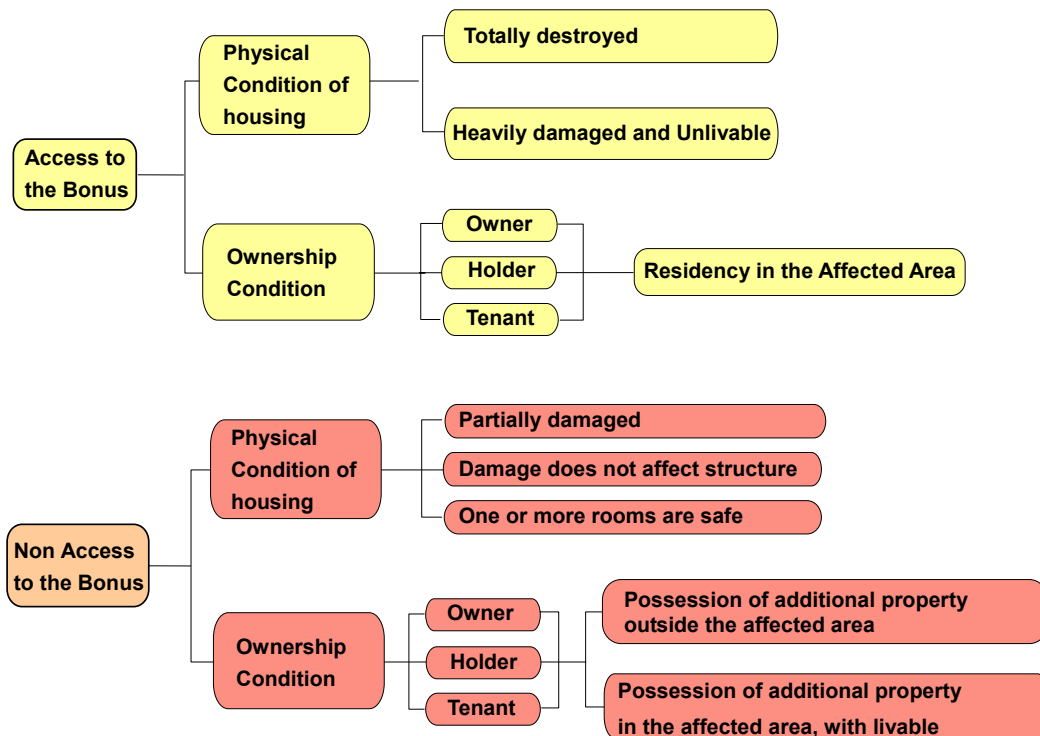
Note: * No. of temporary shelters provided is based on the interview survey with 33 district municipalities conducted by JICA Study team on April of 2008

**The numbers of houses collapsed or heavily damaged with unlivable condition is based on the damage investigation conducted by the INEI.

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. If the physical condition of a house is partially damaged or slightly damaged and it is still in livable condition, the family is not eligible for the BONO 6000. The BONO 6000 is also not available to victims that own another house in livable condition in or outside the earthquake affected area. Access to the BONO 6000 for earthquake victims is illustrated in Figure 3.2.1.

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. In the rural area, it is under consideration that affected victims can receive the construction material kit and tools with BANMAT card.



Source: MIVIVIENDA

Figure 3.2.1 Access to the Housing Reconstruction Bonus (BONO 6000) for the Earthquake Victims

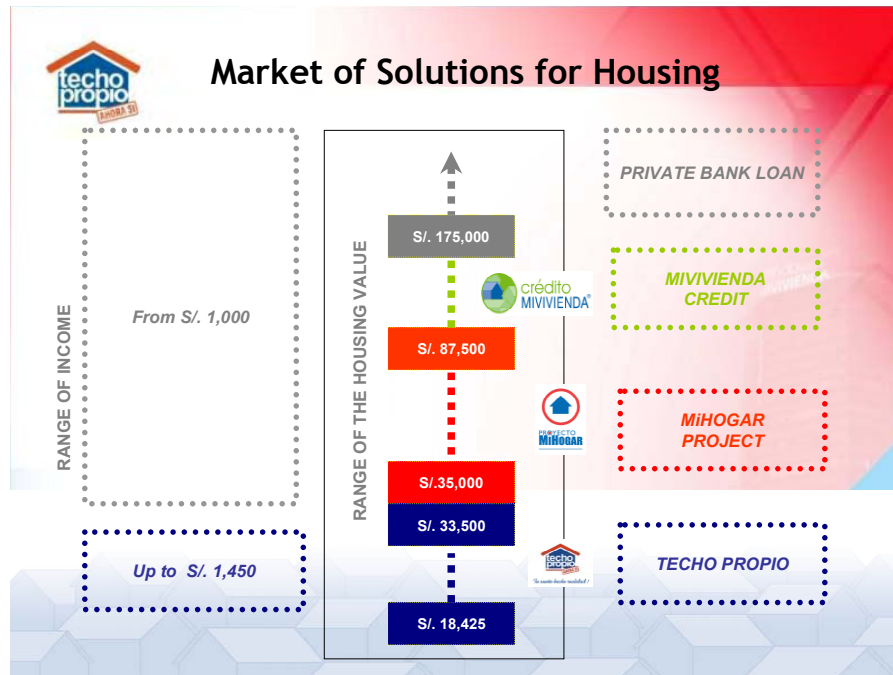
3.2.3. Other Housing Reconstruction Support Programs

Beside the BONO 6000, the MVCS has provided other housing construction and reconstruction support programs, including Techo Propio, MI Hogar and FENIX. Figure 3.2.2 illustrates the construction and reconstruction support programs for housing available to the earthquake affected families.

BANMAT has provided a financial program called “FENIX” to support housing reconstruction exclusively for the earthquake victims. It offers credit of up to 41,400 soles with an interest rate of 8% per year for a maximum period of 30 years. To apply for the FENIX financial program, the earthquake affected families have to provide the following documents:

- Certificate issued by District Committee of civil defense to prove that the house has totally collapsed or is heavily damaged and in unlivable condition;
- Certificate to prove that the applicant has no other livable house; and
- Land registration certificate

MIVIVIENDA has provided financial support for housing acquisition and construction through ordinary financial credit. MIVIVIENDA has provided three types of financial programs with specific target groups of income range and house value. They are: (i) Mivivienda Credit for house values over 87,500 and up to 175,000 soles; (ii) MiHogar Project Loan for house values from 35,000 up to 87,500 soles; and 3) Techo Propio for house values from 18,425 to 33,500 soles. These financial programs are illustrated in Figure 3.2.2.



Source: MIVIVIENDA

Figure 3.2.2 Financial Programs Provided by MIVIVIENDA

3.2.4. Techo Propio Program

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. The maximum value of a house under the Techo Propio program is 33,500 soles. The application process evaluation usually takes three (3) months on average.

There are three types of Techo Propio program. They are: (i) acquisition of a new house; (ii) construction of a house on owned land, and (iii) improvement of an owned house. In the case of acquisition of a new house, a family can receive BFH of 13,400¹⁵ soles. In the case of construction of a house on owned land, a family can receive BFH of 13,400 soles, if the land value is over 2,490 soles. In the case of housing improvement, a family can receive BFH of

15 Regulation about BFH has revised that the amount of BFH increased from 13,400 soles up to 17,500 soles from October, 2008.

6,700 soles. In any type of Tech Propio program, the applicants need to satisfy the following requirements:

- Applicant must have a family, not be a single person,
- Average family income is less than 1,450 soles per month,
- Applicant has not received any other housing support program,
- If applying for acquisition of a new house, applicant cannot own another house,
- If applying for construction of a house on owned land, applicant must have land registration certificate.

3.3. Training of Housing Construction Technique

3.3.1. Training Programs Provided by SENCICO

After the August 15, 2007 Earthquake, various training courses in building construction techniques have been provided by government institutions, NGOs and international donors to promote housing reconstruction. There is a vocational training institute SENCICO. SENCICO is a national institute in the MVCS and it has regional training centers throughout the country. The training center in the Ica region is located in Ica municipality (see Figure 3.3.1). The major purpose of SENCICO is to provide vocational training in the field of building construction for workers who already have experience. When trainees complete the training course, SENCICO issues them a certificate.

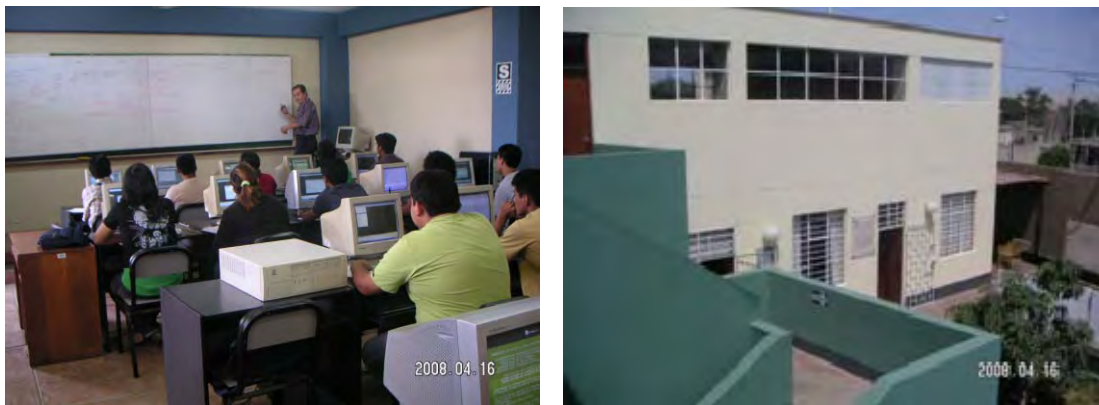


Figure 3.3.1 SENCICO's Training and Regional Training Center in ICA

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. The type of training courses and number of participants are summarized in Table 3.3.1. In addition to the provision of training courses, SENCICO has provided booklets to disseminate fundamental construction technique for reinforced adobe.

**Table 3.3.1 Training Courses Provided by SENCICO-Ica in the Affected Area
(as of February 2008)**

Course	Location and Participants
Masonry Course	Huancavelica (40); Ica (17)
Short course: preliminary masonry work	Ica (30)
Short course: simple wall construction	Ica (10)
Basic masonry repairing	Ica (20)
Basic framing and iron works in buildings	Pisco (60)
Basic masonry in building	Pisco (120); Ica (148); Chincha (20)
Masonry basic maintenance	Ica (10)
Concrete block elaboration	Chincha (16)
Adobe elaboration	Ticrapo (81)
Housing construction with concrete blocks	Nazca (18)

Source: SENCICO

Table 3.3.2 shows more recent training courses provided by the SENCICO. One of the recent training courses was conducted at Grocio Prado district in Chincha province. It was a one month training course in construction techniques for reinforced adobe houses. The SENCICO sent a trainer to the training sites and a total of 60 people participated in the training. Most of the trainees were laymen who had no prior knowledge of construction. The training was funded by a Non-Governmental Organization (NGO¹⁶) and was provided free of charge. The participants varied in age and gender, from young mothers to middle-aged men. From an interview with the SENCICO, the following features of the training were noted:

- The training was implemented at relatively inconvenient locations in Grocio Prado district and was given little attention by other people. The training location should be at a more convenient site to provide a stronger positive impact on the people to promote housing reconstruction.
- The participants were not provided with any learning materials. Adequate training materials would be necessary to learn more effectively, especially for the people who do not have any prior knowledge of building construction.

¹⁶ The NGO funded the training project was Lucha Contra el Hambre.



Figure 3.3.2 Training of Reinforcing Adobe House Construction Provided by SENCICO at a Site of Grocio Prado in Cincha Province

Table 3.3.2 Recent Training Courses Provided by SENCICO-Ica

a) period	b) Financial partner	c) course	c) participant	d) place
March to April of 2008 (1 month)	NGO(Comisión Episcopal de Acción Social)	Reinforced adobe with polymer grid construction course After completing the course, the NGO provided the participants with the materials for the construction of their own houses.	20 ordinary people without any knowledge of construction work	Pisco province (Humay)
April to May of 2008 (1 month)	NGO (Lucha Contra el Hambre)	Reinforced adobe with polymer grid construction course	20 ordinary people without any knowledge of construction work	Chincha province(three places of El Salto de la Liza, El Carrizo and El Porvenir in district of Grocio Prado)
February to June of 2008 (5 months)	NGO(Compañía de Jesus)	4 courses such as Masonry, Electrical installations, Sanitary installations and Reinforced concrete work After completing a set of the courses, certificate of expert knowledge in construction is issued by SENCICO/ICA.	80 ordinary people without any knowledge of construction work	Chincha province(Pueblo Nuevo)

Source: Information from an interview with SENCICO-ICA

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. Table 3.3.3 summarizes the training programs conducted in

Chincha and Ica provinces since the earthquake to improve the administrative capacity of local government.

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, financial management integrated system (SIAF), and building regulations. These training were provided by support of the central government, donors and NGOs.

Table 3.3.3 Training Programs Provided for Local Government Officials

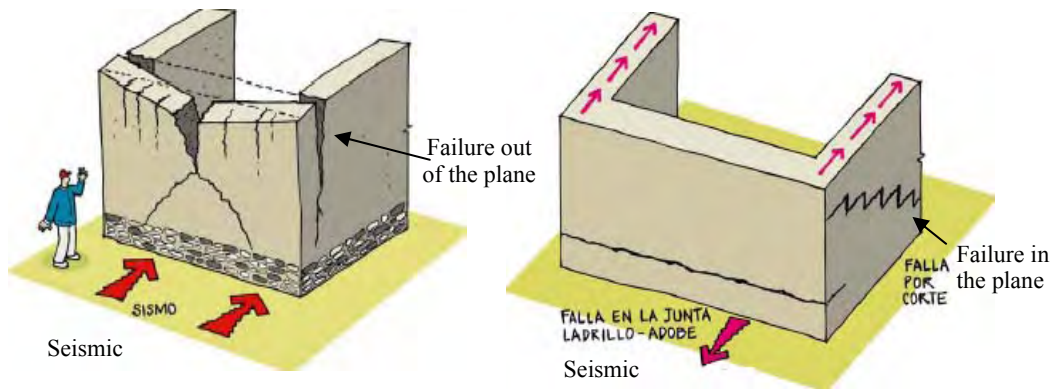
Training Programs	Local governments participated	Major supporting and implementation organizations
<ul style="list-style-type: none"> • Housing Construction technique with Adobe • Techo Propio program • Housing Construction technique with Quincha 	3 districts in Chincha province	ICA Regional Government, COPROVIDIE
<ul style="list-style-type: none"> • SIAF • Building regulation system • Housing construction technique with seismic-resistant (polymer grid) • Housing construction technique with seismic-resistant • Housing construction technique with reinforced adobe 	4 districts in Ica province	Ministry of Economy, Pontificia, Universidad Católica, CARE, JICA, MVCS

Source : Information is based on Interviews with the 33 district municipalities in the study area, Prepared by JICA Study team, April of 2008

3.3.3. Dissemination of Reinforced Adobe Houses

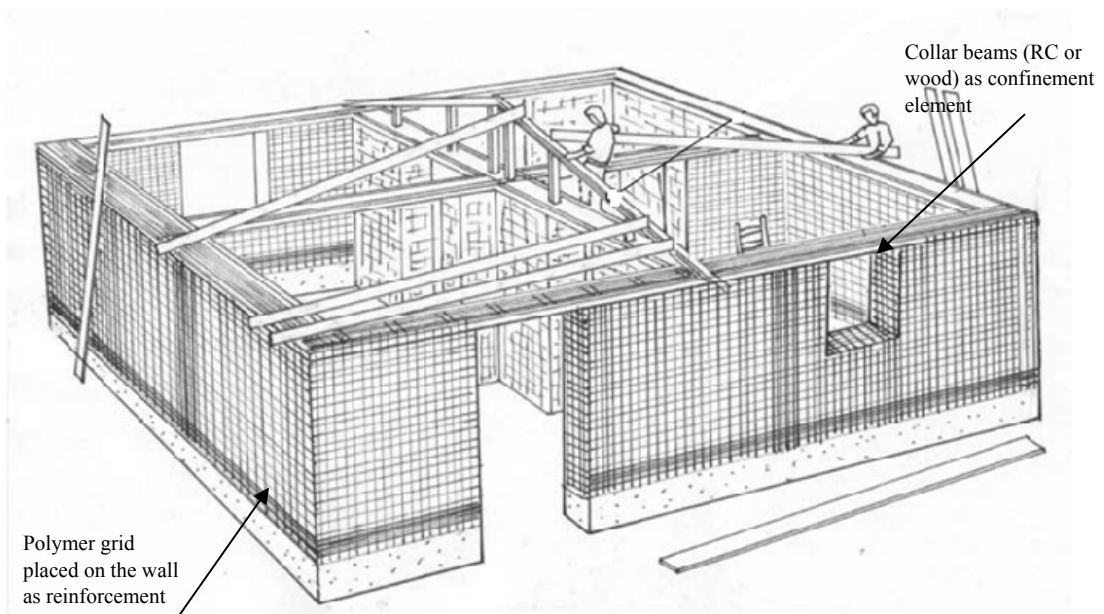
In order to disseminate the way of reconstruction with reinforced adobe, the Catholic University received a finance of 218,000 soles from FORSUR to train the people in the rural area. The training of reinforced adobe construction has been carried out since January 2008. In this training program, the Catholic University provided instructors and material kit with wood, cement, fiber cement and polymer mesh to reinforce adobe structure. 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.

Through the training program, model houses were constructed to demonstrate the reinforced adobe house to the people. The model house has a floor area of 50 m² and consists of 2 bed rooms and 2 multipurpose rooms, and its construction cost was US\$2,500 excluding labor costs. Figure 3.3.4 illustrates reinforced adobe house using polymer mesh proposed by the Catholic university.



Source: Illustration from "Manual para Rehabilitacion de Viviendas de Adobe y Tierra Pisada, AIS Colombia"

Figure 3.3.3 Failures Out of the Plane and in the Plane



Source: Illustration from "Manual Adobe Reforzado con Geomallas"

Figure 3.3.4 Illustration of Reinforced Adobe House Using Polymer Mesh

Another training of reinforced adobe construction method has been carried out by a support of JICA. The training was conducted in Salas Guadalupe district and took for 2 months. The JICA proposed a method of adobe wall reinforced with canes placed vertically (Figure 3.3.5). Through the training program, one community building and two model houses were constructed with reinforced adobe. The model house has two bedrooms, kitchen, dining room and toilet with a total floor area of 69 m². The electricity and water supply are installed.



Vertical canes for reinforcement



Casting of concrete for foundation

Source: *Pictures from Bulletin Information on Damage to Adobe Houses by Peru Earthquake August 15, 2007 and Activities after the Earthquake

Figure 3.3.5 JICA Model House of Reinforced Adobe

The Peruvian government announced it would provide “adobe kits” for the earthquake victims, especially in rural areas. The adobe kit is based on the concept that the earthquake affected people can receive the necessary materials for constructing houses of reinforced adobe in a package so that people can construct houses of reinforced adobe by themselves . Initially, a Peruvian authority estimated that an adobe house with the size of 18 m² can be constructed by the provisions of BONO 6000. However, a recent cost estimation by the Catholic University shows that the resources provided under BONO 6000 are sufficient to construct an adobe house with a size of only 8 m². The installation of electricity and water supply is not included.

3.3.4. JICA Funded Project

The Project “Training and Dissemination of Improved Adobe New Technologies” was formulated by JICA in 2003, 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 in 2005-2007 with the training directed towards the general population, particularly the masons.

As achievements in this stage of the project, the following were constructed according to the objective mentioned above: one house in Lunahuaná province in Lima, two houses in Pacarán province in Lima, one communal center in Zúñiga province in Lima, one house and one nursing home in Huangascar in Lima and one community center in Huac-Huas in Ayacucho.

The second stage (2007-2009) 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.

After the earthquake it was decided to extend the project to the areas affected by the earthquake by constructing a community center in Salas Guadalupe (Ica), two houses in Lunahuaná (Lima) and some construction to be defined in Huangascar (Lima).

The MVCS and BANMAT asked the donors to provide adobe model houses with a cost of S/ 6000 so that BONO 6000 could be used. At first JICA and COSUDE and Deutsche Gesellschaft for Technische Zusammenarbeit (GTZ) explained the impossibility of building a house at such a low cost. JICA then submitted a model of 60 sq.m at a cost of US\$ 6,450, which consists of US\$ 4,000 in construction material and US\$ 2,450 in labor costs.

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 following four steps: (i) investigation of physical damages of housing conducted by the government; (ii) evaluation of eligibility for housing reconstruction bonus, so-called BONO 6,000, provided by the government; (iii) application of government housing support programs, including BONO 6000, Techo Propio and other programs; and (iv) application for building permit to local government for approval of housing construction. The overall processes of housing reconstruction are illustrated in Figure 4.1.1 and each step is described below.

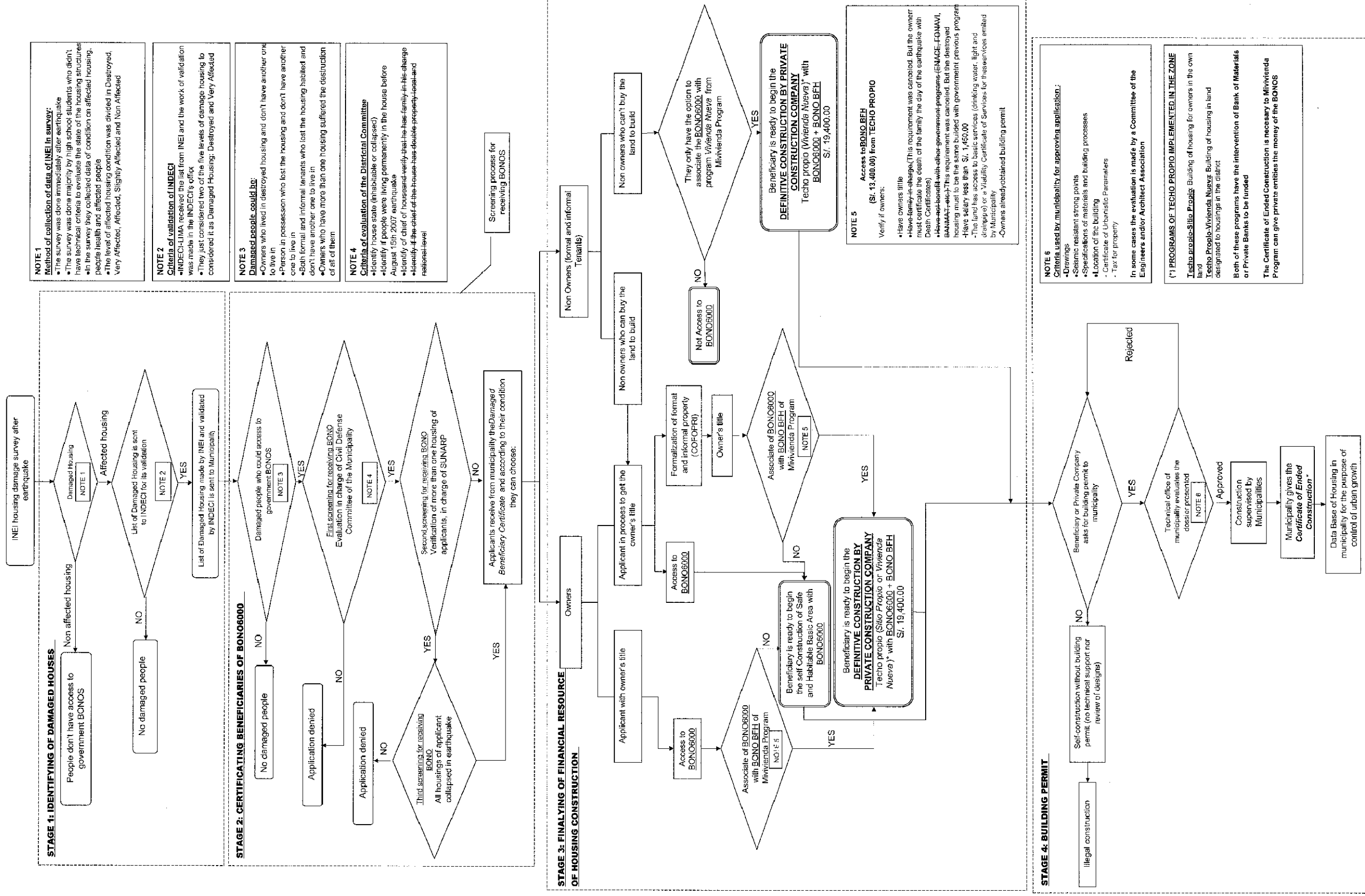
- (1) The INEI conducts an investigation of each house to examine physical damage caused by the earthquake and determine whether the house is in livable or unlivable condition. If a house is evaluated as totally collapsed or heavily damaged and in unlivable condition, the household is eligible for BONO 6000. On the other hand, if a house is evaluated as no damage or only partial damage and livable condition, the household is not eligible for BONO 6000. In this case, the household needs to be repaired by the householders own effort.
- (2) If a house is evaluated as totally collapsed or heavily damaged and in unlivable condition, the household can 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. Once the list is approved by SUNARP, the applicants can receive beneficiary certificates of BONO 6000 from local government.
- (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 household does not have a land certificate for the property, the household would submit the beneficiary certificate of BONO 6000 to the Bank of Materials and receive a BANMAT card, which they can use to purchase

housing construction materials from designated shops. Then, the beneficiaries can start housing reconstruction.

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. Once the application is approved by the Fondo Mivivienda, the beneficiary is eligible for BFH to an amount of 13,400 soles. The beneficiary then selects a type of housing from a list provided by Techo Propio program and signs a contract for housing construction with the Fondo Mivivienda.

- (4) According to the building construction regulations, 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 BONOG000 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 mainly by high school students who didn't have technical criteria to evaluate the state of the housing structures
 • With 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 INDEC
 • INDEC-LIMA received the list from INEI and the work of validation was made in the INDEC'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 District 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 local and national level

Screening process for receiving BONOS

NOTE 5
Access to BONOG000 (S/ 19,400.00) from TECO PROPIO
 Verify if owners:
 • Have owners 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 programs (ENAGE, FONAVI, SANAAR, etc.) This requirement was canceled. But the destroyed housing must 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 TECO 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 designated 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

(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 in the Study Area, 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 the assistance of 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; 7,003 titles in Pisco province; and 3,851 titles in Chincha province. It is estimated that another 5,800 land titles will be issued by the end of 2008 in the three provinces.

Table 4.1.2 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 2007 to August 15, 2008	4,283	7,003	3,851	15,137
Additional Projections of titles to be issued by December 2008	1800	2,500	1,500	5,800

Source: COFOPRI

(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.

Table 4.1.3 Building Permit and the Number of Building Construction

Province	Building reconstruction using only BONO 6000	BONO6000 and Techo Propio Program	The number of building permit 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 on November 2008

(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. Identification of Stakeholders

There is a wide range of stakeholders involved in housing reconstruction activities. First of all, the earthquake affected people or victims are the primary stakeholders because their houses were destroyed or heavily damaged by the earthquake. Most of affected people have a monthly income of less than 900 soles with temporary job status and salaried employment and term workers and fishermen.

Second, the central, regional and local governments are public entities responsible for implementation of rehabilitation and reconstruction policies and projects. Third, the private sector, such as housing construction companies and workers called *albañiles* or masons, plays an important role in actual construction of housing. Furthermore, NGOs and international donors have supported rehabilitation and reconstruction in the study area due to their own policies and objectives. Table 4.2.1 shows the various stakeholders and their activities in relation to the housing reconstruction in the earthquake study area.

The methodology applied in the stakeholder survey is called Participatory Rural Appraisal (PRA), which has been widely adopted as a method to investigate needs and issues of development projects in a participatory manner. By applying the PRA method, Study Team can identify various stakeholders and their specific issues and problems in the housing reconstruction. In the stakeholder survey, semi-structured interviews were carried out to understand the opinions of various stakeholders. In addition, a series of workshops were conducted with each stakeholder group to discuss their specific issues and problems in relation to housing reconstruction.

Within the Ica Region, the stakeholder survey was conducted in La Tinguña, Salas Guadalupe and Santiago districts in Ica province; San Clemente and San Andres districts in Pisco province; and El Carmen and Tambo de Mora districts in Chincha province. These districts are generally characterized as urban settlements and experienced heavy damages to housing from the August 15, 2007 Earthquake. Thus, housing reconstruction is one of the highest priorities in these selected districts. The stakeholder survey was carried out for two weeks from mid April in 2008 by the study team.

Table 4.2.1 List of Stakeholders and its Roles and Functions

Sector	Subject	Roles and responsibility
Affected People /Civil Society	Individuals Religious groups Fishermen's groups Mothers groups s Farm groups (cotton)	Reconstruction of house Reconstructing believers' houses Make funds for members' reconstruction Make funds for members' reconstruction Reconstructing farm workers' houses
Government sector	MVCS Regional government Provincial government District government SENCICO Fond de VIVIENDA BANMAT SUNARP INDECI FORSUR COFOPRI CISMID	Responsible central government organization Organization responsible for reconstruction Responsible for coordination with the district government Technical assistance for issuing reconstruction, building permits Technical Training Housing construction fund Material Bank for Fond MIVIVIENDA Public registry superintendent Confirmation of house property registrations and new registrations Disaster management Fund for earthquake reconstruction Formalization of land registration Technical information
Private sector	CAPECO Construction company Skilled masons (Albañiles) Plus Petrol (gas company) Private Bank	Technical assistance for reconstruction Reconstruction of houses, Provision of construction materials of Techo Propio Reconstruction of houses Reconstruction public areas (parks) Housing Credit
NGO	Peruvian Red Cross ADRA Ayuntamiento de Andalucía ITDG Médicos sin Fronteras	Temporary house construction Built 5000 houses Built 180 adobe houses Built wood houses Provided water and sanitation (toilet and showers for communities)
Donor agency	JICA GTZ UNDP UNFPA	Promotion of reinforced adobe houses Financing study and implementing pilot projects Promotion of reinforced adobe houses Making plan for reconstruction Providing assistance for affected women including land registration issues

Source: JICA Study Team

4.2.2. 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. Table 4.2.2 shows the number of persons interviewed by district.

Table 4.2.2 Number of Persons Interviewed in Ica Region

District (Province)	No. of Persons interviewed
La Tinguina (Ica)	25
Salas Guadalupe (Ica)	38
Santiago (Ica)	32
San Clemente (Pisco)	35
San Andres (Pisco)	33
Tambo de Mora (Chincha)	18
El Carmen (Chincha)	40
Total	221

Source: JICA Study Team

The major opinions raised from the people are summarized as follows:

- 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 interviewed 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.
- There is a lack of information of government supported housing programs. Many people do not know how to use the BANMAT card or how to apply for the Techo Propio in conjunction with the BONO 6000.

4.2.3. Major Opinions from Construction Companies and Workers

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

- The prices of construction materials, such as concrete and brick, have almost doubled since the Earthquake¹⁷. The increase of in price includes not only construction materials but labor cost as well. These factors eventually caused a delay in housing reconstruction in the affected 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.

4.2.4. 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:

- The general situation of the Ica Region is still in a state of emergency. Although many months have passed since the earthquake, the situation has improved little, and housing reconstruction has not proceeded smoothly. Many people are still living in temporary shelters or damaged houses. The living environment is steadily deteriorating.
- 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.

¹⁷ The price of concrete, for example, has increased from about S/20 to S/40 per 1 m³ after the Earthquake, according to interview to *Albañiles*.

- 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.
- The construction of housing that is safe against earthquakes is significantly important to avoid recurrent disaster. Training in construction methods for safe housing should be provided to *albañiles*, construction workers, and local government officials.
- 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

There are several government programs to support housing reconstruction for the earthquake victims whose houses were totally collapsed or heavily damaged and in unlivable condition. 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. This situation has gradually improved through the efforts of the government.

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.

The land registration has been a daunting problem in Peru. In 1995, more than 1.5 million informal properties were located in the eight largest cities in Peru. This led to the foundation of COFOPRI in 1995. By the effort of the COFOPRI, more than 65,000 properties were registered between 1996 and 2002 in the Ica Region only. After the August 15, 2007 Earthquake, SUNARP issued nearly 15,000 land titles in the three provinces. Accordingly, the people who have land titles can apply for BFH or Techo Propio program.

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.
- The BANMAT Card is valid for only three months and plus one month extension, after the issue date. If the building permit takes a long time, the BANMAT Card would expire before the construction materials can be purchased. Thus, the people who want to reconstruct their houses by using BANMAT Card might not apply for a building permit to the local government.

4.3.3. Lack of Knowledge of Safe Housing Construction Technique

The earthquake affected people realized the importance of using earthquake resistant construction methods in housing construction to avoid recurrent disaster; however, most of the people have inadequate knowledge of earthquake mechanisms and their effect on housing. The people usually obtain information of housing construction technique from “*albañiles*” and/or construction workers, but they are not formally trained and do not have proper knowledge of construction techniques to safeguard against earthquakes. Formal training in construction techniques would be necessary for the *albañiles* and construction workers as well as ordinary people.

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. Even if some training was available, they are usually not free of charge. Thus, the people cannot afford to learn basic knowledge on safe housing construction against earthquake.

4.3.4. Immature Housing Construction Industry

The study area is characterized as having a relatively low population density and is mainly agricultural, although there are a few medium-sized cities with more than 50,000 habitants, such as Ica, Chincha Alta and Pisco municipalities¹⁸. Because of the relatively small population size of the area, the housing construction industry is not well developed. Before

¹⁸ They are Ica district with 117,800 inhabitants, Chincha Alta district with 56,000 inhabitants and Pisco district with 52,000 inhabitants.

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.

From an interview with the Peruvian Chamber of Construction (CAPECO), we found that 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. Yet it is clear that the quality of housing could not be maintained without formal involvement of construction companies.

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 skilled labor for construction. The person called “*albañile*” is a skilled laborer 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.

One of the important issues in auto-construction of housing is to maintain a certain quality of construction against earthquake. The stakeholder survey found that in the case of auto-construction there is neither supervisor nor foreman who checks the quality of construction work. The client, usually a house owner, needs to inspect the quality of construction work done by *albañi* or unskilled laborers. Thus, house owners need basic knowledge of construction techniques for safe house against earthquake.

4.3.6. Poor Economic Situation in the Study Area

The recent socio-economic condition in the earthquake affected area is a major factor in the delay to housing reconstruction. 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.

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

Based on the general objectives of the pilot projects mentioned above, the study team prepared concrete ideas for projects to be implemented in the affected area and proposed them in the Interim Report (ITR).

Table 5.1.1 Strategies and Projects Proposed by ITR

Strategies	Name of the Project
Encouraging participation of the affected people in the process of housing reconstruction	
(1) Standardization of the housing reconstruction system	a. Prototype drawings of seismic resistant house b. Manual of construction method of seismic resistant house
(2) Dissemination of construction process	c. Illustration of minimum requirements of safer house d. Illustration of construction process
Strengthening the capacity of government institutions to support housing reconstruction	
(3) Preparation of building permit issuing manuals	e. Manual of building permit of safer houses
(4) Promotion of land legislation to permit access to the financial resources of housing reconstruction, such as family housing bonus	f. Practical training of the officials of the land title section g. Dissemination of financial mechanisms of the government funded program
(5) Strengthening the capacity of public institution	h. Practical Training of officials of the land use planning and building permit section
Dissemination of safe house construction techniques in housing reconstruction	
(6) Diffusion of the safe house construction measures through media, pamphlets, handbooks, workshops and training for community	i. Exchange the information and knowledge of safe house construction j. Movies for seismic behavior in shaking table k. Brief drama to promote safe house
(7) Establishment of affected people's support house	l. One stop Kiosk for housing reconstruction
(8) Diffusion of safe house construction technique to workers and professionals to promote housing construction	m. Technical training targets for affected people n. Technical training targets for skilled labor o. Dissemination of reinforced adobe model house
(9) Establishing disaster management education in schools, including theoretical and practical learning of disaster prevention	p. Preparation of text books and materials for earthquake and safe house idea
(10) Developing model houses to disseminate seismic resistant construction technique and knowledge	q. Model house construction r. Small scale safe house explanation kit

Source: JICA Study Team

The envisaged pilot projects were not intended to stand alone, but be closely related to one another. Through discussion with the local governments, Ica regional government, and the MVCS, the study team proposed four pilot projects.

Three pilot projects are selected to implement in Ica region. The first pilot project composed of prototype drawings of seismic resistant house, manuals of construction method of seismic resistant house, manual of building permit of safer house and practical training of officials of the land use planning and building permit section. The project intends to construct safe house against earthquake by standardization of building permit system as a whole.

The second project aims to promote safe house against earthquake through training and extension. The project composed of illustration of minimum requirements of safer house, illustration of construction process, movies for seismic behavior in shaking table, brief drama to promote safe house and model house construction.

The third project to promote the dissemination of the government supported program. It includes dissemination of financial mechanism of the government funded program and one stop kiosk for housing reconstruction.

(1) Pilot Project 1

a. Project Title:

Facilitation of Safer Housing Reconstruction

b. Project Objectives:

Encouraging participation of affected people in the process of housing reconstruction

Strengthening the capacity of government institutions to support housing reconstruction

c. Beneficiaries:

Affected people and technical officials of the public works sections of local governments in the pilot project areas

d. Project Components:

1. Prototype drawings of houses with good seismic resistance
2. Manual of construction methods for seismic resistant houses
3. Manual for processing building permits for safer houses
4. Practical training of the land use planning and building permit section

e. Project Description:

The Project provides a district municipality with a prototype drawing and an inspection manual authorized by SENCICO for smooth implementation of building permits.

Applicants can select a house that they can afford from among a selection of prototype drawings. After that, the selected drawings can be accepted immediately and a permit issued automatically. In addition, the applicants will be provided with the construction inspection manual for the selected house to easily understand key points of constructing a safer house. The inspection manual will be used for the house owners to self-monitor the construction of their house and also as a check list of key points for safer construction methods for masons.

The Project also provides a building permit manual to facilitate the building permit procedure. The number of houses issued with building permits in the pilot project area will increase, which will accelerate the dissemination of safer houses against earthquakes.

(2) Pilot Project 2

a. Project Title:

Promotion of Safe Housing Construction

b. Project Objectives:

Encouraging participation of the affected people in the process of housing reconstruction

Dissemination of safe construction techniques for housing reconstruction

c. Beneficiaries:

Citizens including affected people in the Pilot Project Areas

d. Project Components:

1. Dissemination of Minimum Requirements
2. Movies of seismic behavior on a shaking table
3. Short drama to promote safe houses
4. Technical training targeted at affected people
5. A cut model house construction

e. Project Description:

The Project is to provide an exhibition of construction technology and knowledge of safer houses. The exhibition is to be located in a population center such as the attached garden of a municipal hall. The Project includes i) a two-month construction training course in confined masonry housing for 20 ordinary people, ii) a one-day training program for disseminating a safer house construction knowledge to various groups of school students and the local community, and iii) some events such as a movie of seismic behavior featuring a shaking table and dramatic re-enactments to contrast good construction and bad construction. The dissemination of technology and knowledge of a safer house against earthquakes will be made by attracting the attention of most of the people.

(3) Pilot Project No.3

a. Project Title:

Dissemination of Government Program of Supporting Housing Reconstruction

b. Project Objectives:

Strengthening the capacity of government institutions to support housing reconstruction

Dissemination of safe house construction techniques for housing reconstruction

c. Beneficiaries:

Citizens including Affected People in the Pilot Project Areas

d. Project Components:

1. Dissemination of financial mechanisms of government funded programs
2. One-stop Kiosk for housing reconstruction

e. Project Description:

A mobile consultation service will be established by the Project to facilitate the dissemination of housing reconstruction subsidy systems such as BONO 6000 and Techo Propio BFH. The mobile service is provided to most of the affected people who do not have access to the subsidy section of the district municipality. An explanation of the subsidy system will be provided to people in familiar surroundings and with support services for following the necessary procedures of the system. The Project will complement the manpower resources of district municipalities and contribute to designating the beneficiaries promptly.

5.1.3. Districts selected for the Implementation of the Pilot Projects

The study team selected priority districts for implementation of the pilot projects. The criteria for the selection of priority districts were:

- Districts with relatively large population and high population density, which are more effective for implementation of pilot projects, compared to districts with dispersed population;
- Districts with a large number of houses destroyed or heavily damaged by the Earthquake, i.e., where housing reconstruction is a high priority;
- Districts with local government showing a strong initiative, a likely key to successful implementation of pilot projects; and
- Districts without support from other donors and NGOs.

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 and Table 5.1.1 summarizes the characteristics of the three districts.

Each district selected for the implementation of the pilot projects are summarized below:

Pueblo Nuevo in Chincha province is an urban district with a total population of 47,150 inhabitants and population density of 225 persons per sq. km as of 2005. There were 10,038 houses affected by the earthquake, of which 6,488 were totally destroyed or heavily damaged and eligible for the BONO 6000.

Independencia in Pasco province is a rural district with a total population of 11,166 inhabitants in 2005, of which 7,681 or nearly 70% were rural population. The population density is very low at 41 persons per sq. km. There were 3,018 houses affected by the August 15, 2007 Earthquake, of which 1,182 houses were totally destroyed or heavily damaged.

La Tinguina in Pisco province is a relatively small district with an area of 98 sq. km. It is characterized mostly as an urban district, except for a small rural population of 3,191 inhabitants. There were 6,071 houses in total affected by the August 15, 2007 Earthquake among which 2,549 houses were totally destroyed or heavily damaged.



Figure 5.1.1 Location Map

Table 5.1.2 Characteristics of Pueblo Nuevo, Independencia and La Tingüina Districts

District, Province and Area	District	Pueblo Nuevo	Independencia	La Tingüina
	Province	Chincha	Pisco	Ica
	Area* (sq. km)	209.45	272.34	98.34
Population	Population in 2005* (persons)	47,150	11,166	30,156
	Urban Population	47,150	3,485	26,965
	Rural Population	0	7,681	3,191
	Population Density in 2005* (persons/sq. km)	225.11	41.0	306.65
Housing Damaged	Total Number of Houses in the District	55,176	12,079	32,662
	Number of Houses affected by the Earthquake**	10,036	3,018	6,071
	Percentage of Houses affected by the Earthquake (%)	18.2	25.0	18.6
	Number of Houses Destroyed**	4,937	947	1,700
	Number of Houses heavily Damaged**	1,551	235	849
BONO 6000	No. of Families eligible for BONO 6000***	6,488	1,182	2,549
	No. of Families received BONO 6000 by Nov. 27, 2008***	473	933	370

Source: * The Population and Housing Census, 2005, INEI

** Census of the Affected Area by the August 15, 2007 Earthquake, 2007, INEI

*** Web site of the MVCS

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. Under the supervision of the Study Team the engineering company prepared “prototype drawings of safer housing construction” and a “manual of construction inspection of safer housing”. The Study Team was responsible for all the outputs.

In the preparation stage, prototype drawings of safer housing were prepared based on the study of minimum requirements for safe house construction against earthquakes. For the purpose of dissemination of the prototype drawings, a series of manuals were prepared.

In the implementation stage, the main activities were dissemination of the prototype drawings through On-the-Job-Training (OJT) to technical staff in the three municipalities and also through workshops to people in those districts. The OJT and workshops were carried out by the JICA Study Team.

(2) Preparation of Prototype Drawings of Safer Housing

The prototype drawings of safer housing were prepared on the basis of the following principles¹:

- The minimum requirements were technical measures to construct safer housing by confined masonry² prepared by the JICA Study Team and authorized by director of CISMID³.
- Taking the future expansion of housing into consideration, the prototype drawings were studied based on the construction budgets of lower income class. These budgets were derived from the provisions available under BONO 6,000 and/or Techo Propio BHF.
- Four prototypes were developed for different house size ranging from a single room to a basic module of housing with bed rooms, social room and service rooms. Each prototype could also be varied according to soil condition and availability of electricity and water/sewerage. In total, 64 complete configurations were available.
- The construction management of the safer housing was assumed to include the auto-construction method. Housing construction by the auto-construction method is needed to ensure appropriate construction due to the low capacity of masons to construct safer housing.
- The design of the structural elements and dimensions/proportions of the architectonic components were determined to deal with the possibility of future earthquakes. The National Regulation of Construction was used for reference.

(3) 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. After obtaining the building permit, housing construction starts and inspection is conducted by 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.

1 See Annex 1 Vol.3 Appendix 1

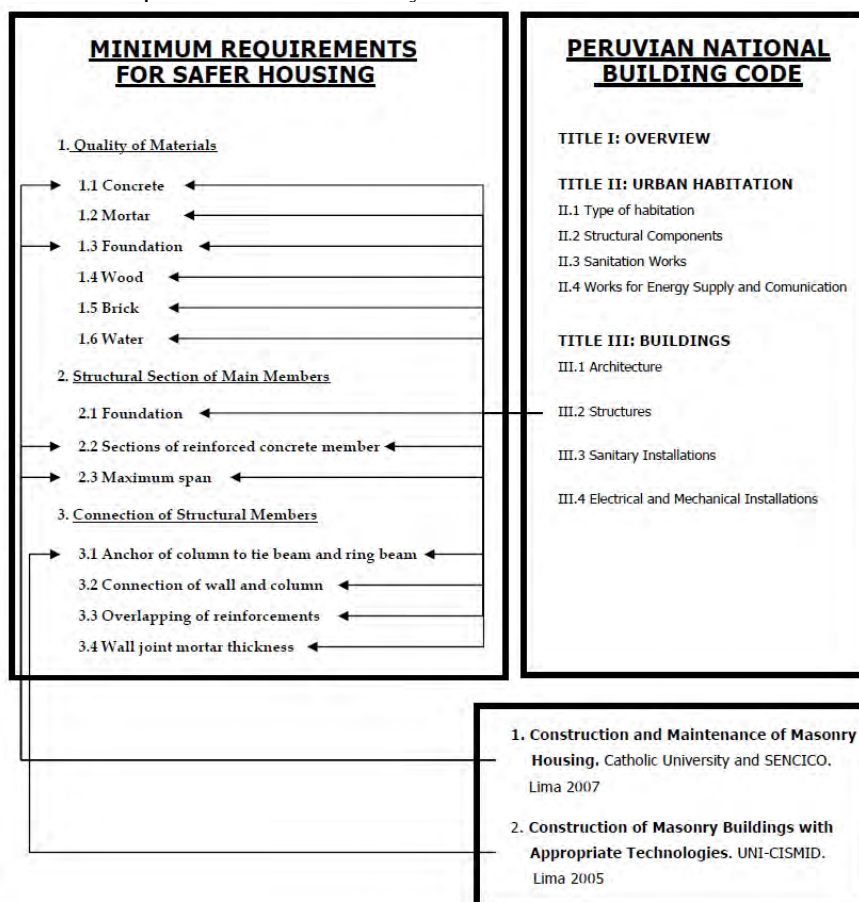
2 See Annex 1 Vol.3 Appendix 2

3 See Annex 1 Vol.3 Appendix 3

(4) Minimum requirements for Safer Housing of Confined Masonry

Minimum requirements for safer housing are minimum technical guidelines to design, construct and inspect safer housing of confined masonry against earthquake. The idea of the minimum requirement follows key requirements for safer housing established by Sub-Project on Housing Administration Capacity Enhancement to improve the Vulnerability of Housing for Central Java and DIY Earthquake Reconstruction Program in Indonesia, which was implemented by JICA.

Technical items required to be kept, which form the Minimum Requirements, were taken into consideration the National Regulation of Construction and some manuals of construction procedures validated by authorized institutions of Peru.



Source: JICA Study Team

Figure 5.2.1 Minimum Requirements and Peruvian Standard

Dr. Carlos Zavala, director of CISMID and associate professor of FIC/UNI provided technical advices for the preparation of the Minimum Requirements.

Minimum Requirements consists of three factors, namely:

1) Quality of Materials

Appropriate quality of construction materials to be used for housing construction

2) Structural Section of Main Members

Appropriate size of structural members for the housing such as parts with reinforced concrete and bricks

3) Connection of Structural Members

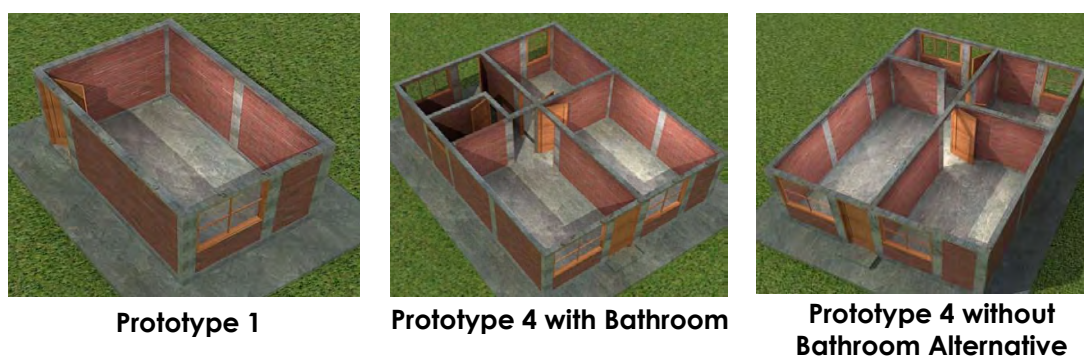
(5) Implementation Schedule

Pilot project 1 was implemented from August to September 2008 in the preparation stage and from October to November 2008 in the implementation stage.

5.2.3. Outputs of the Project

(1) Prototype Drawings for Safer Housing;

The prototype drawings consist of i) prototype drawings, ii) a selection matrix of prototype drawings⁴, and iii) shopping list⁵. 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.



Source: Study on Housing Reconstruction with Seismic-resistance Houses in the Republic of Peru, JICA Study Team

Figure 5.2.2 Three Dimension Images of Prototype Drawings

A selection matrix was prepared for house owners to select the prototype drawings appropriate for their housing reconstruction situation. The selection items of the matrix are i) construction budget, ii) soil type, iii) roof type, iv) availability of electricity, and v) availability of water/ sewerage. A shopping list is a price list of construction materials for the property which will be built based on the drawings.

(2) Manual of Improved Building Permit for Safer Housing⁶ (Officials of the District Government)

This manual consists of three chapters as follows.

4 See Annex 1 Vol.3

5 See Annex 1 Vol.3 Appendix 5

6 See Annex 1 Vol.3 Appendix 6

Chapter I provides the reader with necessary knowledge of improved building permit administration and the required administrative structure.

Chapter II shows a comprehensive flowchart of the improved building permit system and points out important matters at each stage of the flowchart. Chapter III shows the practical procedures in nine steps. Each step accounts for a practical administration procedure within the issuing of building permits and construction processes.

(3) Manual of Monitoring the Construction for Safer Housing⁷ (Residents and Low-skilled Workers)

This manual is applicable for house owners to check whether or not house construction is appropriate. Taking a user-friendly approach, this manual was prepared for people with no construction knowledge to understand appropriate construction methods easily. Comic strip style illustrations show the minimum requirements for safer housing at each stage of construction.

(4) Manual of Simple Inspection for Construction of Safer Housing⁸ (Official of the District Government)

The target readers of this manual are government officials of district municipalities.

Chapter I provides readers with the knowledge necessary for performing simple inspection. Chapter II shows practical procedures for performing simple inspections at the preparation and inspection stages.

(5) Poster of Minimum Requirements for Safer Housing⁹

This poster shows the minimum requirements for safer housing with several illustrations of examples.

(6) Poster of Prototype Drawings for Safer Housing¹⁰

This poster shows prototype drawings for safer housing with some examples of a floor plan, an elevation, and a selection matrix by prototype.

7 See Annex 1 Vol.3 Appendix 7

8 See Annex 1 Vol.3 Appendix 8

9 See Annex 1 Vol.3 Appendix 9

10 See Annex 1 Vol.3 Appendix 10

(7) Leaflet of Prototype Drawings for Safer Housing for the Process of Issuing a Building Permit¹¹

This leaflet is used to show the procedure for issuing a building permit for prototype drawings for safer housing that have been registered in the project bank of the district municipality.

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 sheets¹² 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 test¹³. 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. Table 5.2.1 shows the process for registration in the project bank in each 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 force¹⁴. Therefore, the OJT in the three districts produced excellent results. However, step 3 shown in Table 5.2.1 took time due to postponement of municipality deliberations on the project bank.

11 See Annex 1 Vol.3 Appendix 11

12 See Annex 1 Vol.3 Appendix 12

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

14 See Annex 1 Vol.3 Appendix 14

Table 5.2.1 Progress of Registration of Prototype Drawings in Project Bank

District	Step 1	Step 2	Step 3	
	Checking of prototype drawings by Technical Office of the municipality and preparation of Technical Report approving these prototype drawings	Submit the Technical Report to municipality mayor's office	In Congress of municipality, the creation of Bank of Projects and the insertion of Prototype Drawings for Safer Housing is approved	In use of his attributes the Mayor of the Municipality decided to approve the creation of Bank of Projects and the insertion of Prototype Drawings for Safer Housing
PUEBLO NUEVO				
INDEPENDENCIA				
LA TINGUIÑA			The Technical Report is in the mayor's office waiting for the congress in municipality	

Source: information from the abovementioned three municipalities collected by JICA Study Team, 2008

(3) Dissemination of the Prototype Drawings to Ordinary People

The workshop was held to disseminate the prototype drawings and their application to building permits in the three municipalities. The number of workshops was 14 in three districts. The national engineers dispatched from the JICA Study Team served as facilitators in the workshops.

The numbers of participants were 173 persons in Pueblo Nuevo, 143 in Independencia and 109 in La Tinguina. After holding the workshop, a form to check how many workshop participants made use of the prototype drawings was prepared and delivered to the public works section of each district municipality.

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.

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

(1) Implementation of the Training

The training of minimum requirements of safer housing construction with confined masonry was carried out by two entities: one was the members of the JICA Study Team and the other was SENCICO subcontracted by the JICA Study Team. Under the supervision of the JICA Study Team, SENCICO-Ica prepared the “Instruction Manual” and “Participant Textbook”. The JICA Study Team provided SENCICO-Ica with the drawings of a cut model house based on the minimum requirements of safer housing construction with confined masonry.

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. The cut-model house is convenient for the trainees and neighboring people to understand the minimum requirements of safer housing with confined masonry. The drawings of a cut model house were prepared by the JICA Study Team¹⁵. In this stage, SENCICO-Ica prepared an instruction manual¹⁶ and a participant textbook¹⁷ 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.

After they completed the training, the trainees’ technical competencies were examined by trainers of SENCICO-Ica. All the trainees achieved the competence of about 70% in all training units. The JICA Study Team also examined the technical competence of trainees during and after the training. According to this examination, the trainees learned the minimum requirements to construct safer housing with confined masonry, except the

¹⁵ See Annex 2 Vol.4-1 Appendix 1

¹⁶ See Annex 2 Vol.4-1 Appendix 2

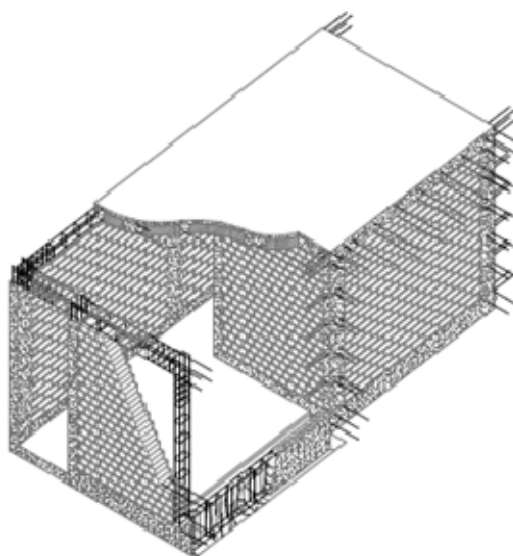
¹⁷ See Annex 2 Vol.4-1 Appendix 3

competence of soil foundation type and overlapping columns. In addition, some trainees became interested in becoming construction workers.

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 as shown in Figure 5.3.1. 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.



Source: Study on Housing Reconstruction with Seismic-resistance Houses in the Republic of Peru, JICA Study Team

Figure 5.3.1 Isometric Drawing of Cut-Model House

(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 step and work in conformity with the minimum requirements by many illustrations due to readers who have no experience of housing construction.
 - Unit 1: Knowing your land and reading the drawings
 - Unit 2: Cleaning, leveling and tracing land
 - Unit 3: Excavating for the foundation
 - Unit 4: Making confined column
 - Unit 5: Building foundation
 - Unit 6: Making framework for reinforced tie beam

- Unit 7: Making formwork for reinforced tie beam
- Unit 8: Building the tie beam
- Unit 9: Installing the first brick rows of the wall
- Unit 10: Building the wall
- Unit 11: Making the framework and pouring concrete in confined columns
- Unit 12: Making the ring beam formwork
- Unit 13: Making the framework for ring beam
- Unit 14: Making the light slab formwork
- Unit 15: Making the framework for light slab
- Unit 16: Building light slab
- 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 idea of this project was to disseminate to ordinary people construction techniques with confined masonry for safer housing against earthquakes. The main component of the dissemination activities was a “One-day Training” for people in Pueblo Nuevo at the site of the cut-model house.

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. Table 5.3.1 shows the program of training. 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.

Table 5.3.1 Program of the One day Training

Duration	Topic	Contents
30 mins	Video Presentation	<ul style="list-style-type: none"> • Presentation in video of “My Safe House”
10 mins	Welcome and Orientation	
15 mins	Video presentation and feedback	<ul style="list-style-type: none"> • Presentation of the video My Safe House and comments from participants.
20 mins	Module 1	<ul style="list-style-type: none"> • What is an earthquake? • What should we do during an earthquake? • Introduction of emergency kit.
20 mins	Module 2	<ul style="list-style-type: none"> • Building Permit • Minimum requirements: the quality of the materials and the structure, Prototype Drawing
30 mins	Module 3	<ul style="list-style-type: none"> • Minimum requirements: Connection of the structure
30 mins	Group review of topics and feedback from participants	<ul style="list-style-type: none"> • Disaster Prevention • Building Permit • Minimum requirements • Comments from Participants
10 mins	Evaluations of the Training	<ul style="list-style-type: none"> • Exit test of participants' knowledge • Certificate presentation

(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. The information included BONO 6000, Techo Propio program, and procedures for land registration and building permit. Knowledge of these topics is essential for the earthquake victims to start their housing reconstruction promptly.

5.4.2. Preparation

Notwithstanding the start of the preparation of the Pilot Project, the Study Team conducted a follow-up survey on the situation of the BONO disbursement in July 2008 and found out that the BONO registration process had been completed and most of the applications were under process. From this finding, the contents of the information campaign by the Mobile Kiosk were modified. It was decided that instead of providing information about application for the

BONO 6000, other housing reconstruction assistance program “Techo Propio” was introduced. People who have land title were also advised that they could combine entitlements from the BONO 6000 and Techo Propio program to construct/reconstruct houses. In line with introducing the assistance program, the Pilot Project would encourage people to make an effort for land title registration.

5.4.3. 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 Tinguina 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.

Before starting the operation of the mobile kiosk, the JICA Study Team organized workshops to provide information on housing reconstruction support programs to operators of the mobile kiosk. In the workshop, representatives from the MVCS, Bank of Materials, COFOPRI, FONDO MIVIVIENDA and SENCICO provided information to participants. With this information a facilitators’ instruction manual was created. At the same time, ADRA-Peru initiated coordination with local governments.

At the mobile kiosk, the facilitators provided information, consultation and support for applications for governmental housing reconstruction programs. The total number of participants in the mobile kiosk was 2,249 people: 1,830 people in Pueblo Nuevo, 532 people in Independencia, and 595 people in La Tinguina. When a high number of people gathered around the mobile kiosk it was better to separate people with the same interests into small groups. Moreover, before the mobile kiosk arrived in a village, facilitators would visit in advance to inform people of the impending visit of the mobile kiosk. If houses were dispersed, the ADRA facilitators would proceed carrying out information house by house. Not all villages and settlements included in the circulation plan could be visited due to time constraints. In some cases there was no guarantee people would be present because of their work schedules, so ADRA instead visited others villages or remained at other villages for a longer time.

5.4.4. 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.

5.4.5. 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. All the data collected from the municipalities and the results of interviews are presented in the Annex 2 Report: Volume 6.

(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. They were as follows:

- 6 municipal officials who participated in the workshop on prototype drawings (pilot project 1); 2 officials each from three municipalities,
- 30 participants from the workshop on prototype drawings (pilot project 1); 10 people each from three municipalities,
- 18 participants from the training held at Pueblo Nuevo (pilot project 2),
- 30 participants from the “half-day training” held at Pueblo Nuevo (pilot project 2),
- 20 participants who watched the “drama presentation” at Pueblo Nuevo (pilot project 2),
- 30 participants who obtained information from the “mobile kiosk” (pilot project 3); 10 people each from three municipalities

For comparative purposes, another 60 people were interviewed who had not participated in any activities of the pilot projects. They were:

- 10 each from Pueblo Nuevo, Independencia and La Tinguina 30 people in total
- 10 persons each from Tambo de Mora, San Clemente, and Salas, 30 in total

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. The reasons are summarized as follows:

- Statistics from the district governments are not reliable. Some district governments do not collect housing reconstruction data properly.
- Since the survey was carried out just after the end of the pilot project, insufficient time had elapsed to evaluate the project impacts.
- The numerical changes could not be explained simply. There were several factors that influenced the changes in numbers.

However, the survey results show the following features:

- Since BONO 6000 has been distributed to about 20,000 families in the study area, the number of houses completed or under construction has increased. Moreover, the number of applications for the Techo Propio program has increased because construction companies have entered the housing reconstruction market. Relatively few companies have obtained contracts and only for 5-6 housing reconstruction projects on average in certain district governments in which it is relatively easy to operate.
- While the number of building construction projects has increased, the number of illegal construction projects has increased as well. About 30% of building construction

projects have permits, which is similar to the situation in April. However, district government number do not include the number of houses constructed by people's own resources. Therefore, the number of illegal construction projects has increased.

- Building site survey results show that the quality of houses constructed has improved slightly. There is no difference between the pilot project districts and other areas. It should be pointed out that in Pisco province the quality of concrete mixture is appropriate because of SENCICO's training program for construction workers.

(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. They realized the need for capacity building and hoped to have more training on construction related procedures, laws, and standards related to their work. The effect of the prototype drawings provided by the JICA Study Team is yet to be seen, but some officers think it has a positive effect and needed to be legislated by the Municipality and included in the Project Bank to ensure that more people can officially utilize them.

b. Pilot Project 2 and 3

- Most of the participants in the SENCICO training at Pueblo Nuevo had a positive impression. They said that the training was very effective to learn the theory and practice of safe housing construction with confined masonry step by step. They would like to share the knowledge with their relatives and friends.
- The majority of participants in the half-day training provided at Pueblo Nuevo appreciated the JICA study team as well as ADRA. They said that the booklet they received was very informative. The participants learned many aspects of construction of safe housing against earthquake, including the basic mechanisms of earthquakes and their impact on housing, minimum requirements for the construction of safe housing

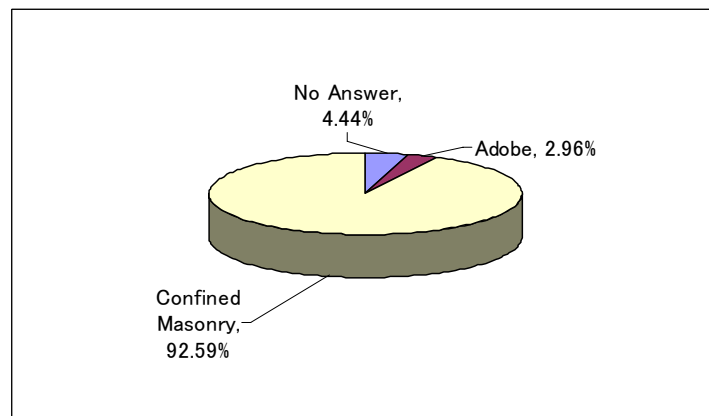
with confined masonry, and the importance of obtaining building permits.

- The people who watched the drama commented that the drama contained a strong message of the importance of safe housing construction. They said that one of the messages in the drama was that earthquake itself might not cause many casualties but rather bad construction or poor quality of materials caused huge human damage. They learned 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. About 64% of the participants in the pilot projects were aware of the importance of building permits to construct their houses, whereas only about 36% of non-participants were aware.

(3) Impact of Project

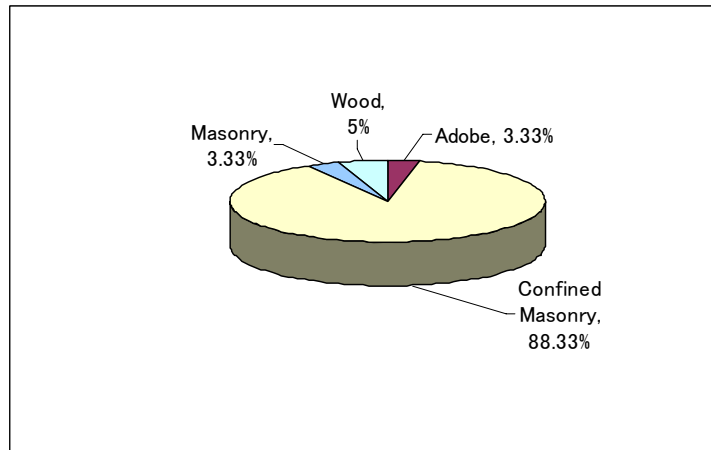
The most important step in the simplification of the building permit system is that prototype drawings were registered in the project bank of all districts. Three district governments issued decrees regarding prototype drawings prepared by the study team. This evidence proved that the JICA Study Team's approach was accepted by the district government.

The most noticeable difference between project and non-project districts was the knowledge on seismic safer houses and their construction. More than 90% of the people who attended one of the activities of pilot projects answered that they preferred their housing with confined masonry, while only 88% of non-participants in the pilot projects preferred confined masonry. This means that participants understood the safety of confined masonry. Participants in the projects pointed out the importance of minimum requirements for safer houses.



Source: JICA Study Team

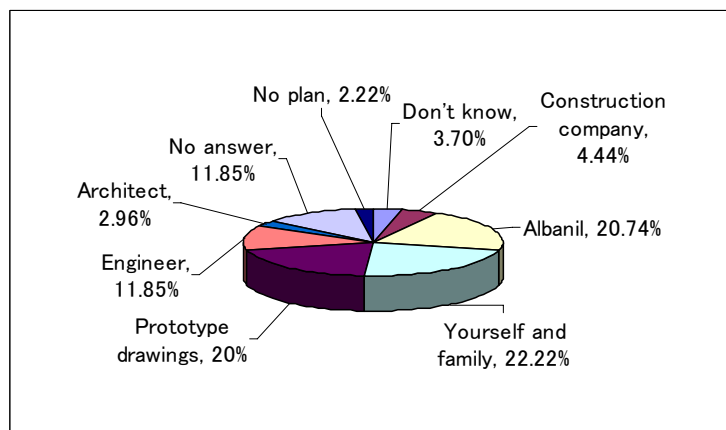
Figure 5.5.1 Types of Structure of Housing Reconstruction (Project Participants)



Source: JICA Study Team

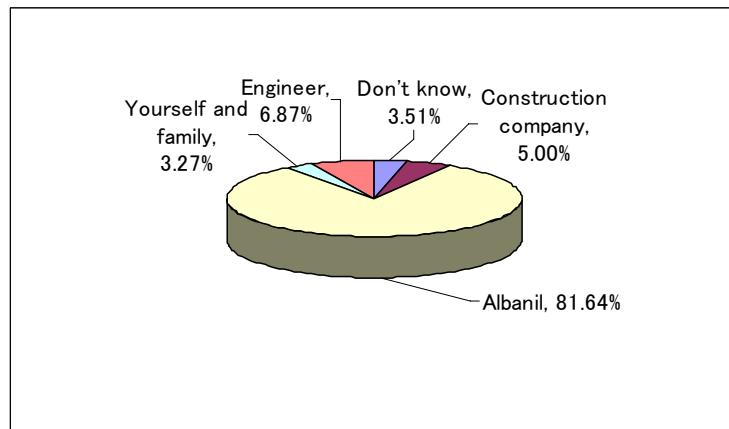
Figure 5.5.2 Types of Structure of Housing Reconstruction (Non Project Participants)

Regarding the question of “who will construct your house,” the people who did not participate in the activities of the pilot project answered albanil, while the participants in the pilot project considered other alternatives, such as architects, engineer, albanil and construction company. This means that the participants in the pilot project acquired proper knowledge of safe housing construction. Some participants mentioned that *albaniles* did not have proper knowledge of housing construction especially for antiseismic housing. The participant tended to be more conscious about the safety of housing construction.



Source: JICA Study Team

Figure 5.5.3 Who Construct your House (Project Participants)

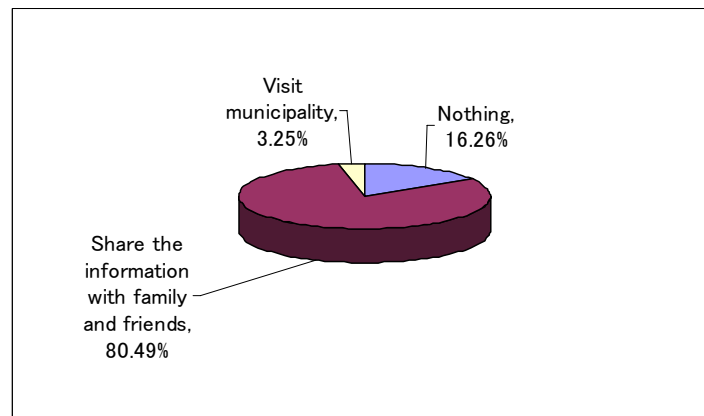


Source: JICA Study Team

Figure 5.5.4 Who Construct your House (Non-Project Participants)

This result of selecting different options indicates the increased knowledge for both project participants and non-participants in the project districts. This shows a positive effect of the project, especially among the population of Pueblo Nuevo where most of the Pilot Projects were undertaken and the participants numbered in the thousands. On the other hand, the population in non-project districts had no information and knowledge of options on construction service providers, resulting in limited answers.

More than 70% of participants in the pilot projects answered that “they would like to share the information with family and friends” and another 3% answered that they would visit the municipality to get more information. These answers showed that the pilot projects had a positive impact on the participants.



Source: JICA Study Team

Figure 5.5.5 Next Action of Project Participants

(4) 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. Construction permits are usually only obtained when the people would like to construct houses using funds from the Techo Propio program. The number of government officials and the capacity of officials are also important factors for to obtain building permit application. Most of the people who have received BONO 6000 have not obtained a construction permit from the district government.

The project bank system should be applied to the whole damaged area to register the prototype drawings and educate the government officials by using materials developed by the JICA study team.

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. One participant in the pilot project claimed that although the government has provided housing reconstruction support programs, it is not easy for us to access them. The Techo Propio program in particular has a very limited number of beneficiaries.

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.

The resolution on the creation of a project bank and the registration of the prototype drawings in the project bank was approved by each municipality. In terms of registration of the prototype drawings in Project Bank for the purpose of housing reconstruction, JICA study team has deemed it a first success.

MVCS highly appreciated this project bank with the prototype drawings as a great contribution to housing reconstruction. In order to disseminate the project bank with the prototype drawings to the other affected municipalities and then to disseminate it nationwide in the future, it was decided to implement the pilot project 1 in eight (8) affected municipalities of the project area.

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.

Table 5.6.1 Actual Schedule of the OJT and Workshop

Province	Municipality	February																												March		
		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3
ICA	San Juan Bautisata			A	B	C			D	E	F	G																				
	Los Aquijes											A			B	C	D	E	F									G				
	Parcona																							A	B	C	D			E	F	
PISCO	Pisco			A	B	C			D	E	F	G																				
	San Clemente											A			B	C	D	E	F	G											*	
Ica regional Government																																
Evaluation of pilot project 1 in the three districts implemented in 2008																																
CHINCHA	Chincha			A	B	D			C	E	F	G																				
	Grocio Prado											A			B	D	C	E	F							G						
	Tambo de Mora																								A	B	D	C		E	F	G
supervision of OJT/workshop at the municipalities by seismic resistant structure expert																																

Source) JICA study team

Legend A: orientation, B: training session of the manual of building permit, C: training session of the manual of msimple inspection, D: training session of the manual of watch over construction, E: training session of the manual of building permit (2nd time), F: evaluation, G:workshop

Note1(*) The workshop was planned but not implemented.

(2) Delivery of outputs prepared by the pilot project 1

The following outputs were already prepared by the pilot project 1: the prototype drawings for safer housing, the manual of building permit improved by a project bank with the prototype drawings, the manual of watching over construction of safer housing, the manual of simple inspection of safer housing, the poster of the minimum requirements of safer housing, the poster of the prototype drawings and the leaflet of the improved building permit system. All the outputs were reprinted and used for the dissemination activity.

(3) Evaluation of capability of technical officers in a building permit section

A guide of local government capacity development in building permit process was prepared for the purpose of extending the pilot project of “facilitation of safer housing reconstruction” to the other affected municipalities. This guide shows a methodology of evaluation of capability and organization of municipalities as pilot project areas, a methodology of OJT and workshop and a guideline of practical use of the prototype drawings at the building permit administration (See Annex Volume 8).

(4) Facilitation of creation of 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 5.6.2 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.

The interview survey done in November 2008 found that illegal construction has increased in recent months. This fact is recognized in the ITR, yet it does not propose adequate countermeasures. In addition, the housing reconstruction has been delayed because of a shortage of funds. Financial support from the government should continue in the future.

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. Government officials should be trained at the same time.

(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

Housing reconstruction after this earthquake is proving to be a very difficult and time-consuming process because earthquake damage was an unforeseeable event in the study area and neighboring areas. Many things are new to the people of the affected area. Many of the affected people face difficulties in returning their lives back to normal because of the difficult economic situation, sluggishness of the rehabilitation and reconstruction process, delays in government support, and other reasons. The affected people want to reconstruct their houses as soon as possible, yet face complicated problems in obtaining housing finance and limited technical knowledge about construction, particularly for houses that will be safe against earthquakes. The government also faces problems: the extension of information about safe houses, raising funds for housing reconstruction, and simplification of the building permit system.

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. Houses should be reconstructed to be safe against earthquakes with limited financial resources. There are several issues to accelerate housing reconstruction: affordability, efficiency, effectiveness, and sustainability. A key question is how affordable housing can be supplied in the affected area effectively and sustainably. Although these issues have been discussed for many years by professionals and engineers in the housing sector, there is no simple answer to this question.

As pointed out in the previous section, the affected area effectively had no construction industry before the earthquake. In this area, construction companies would come in from other areas if there was a huge redevelopment project or certain volume of construction contracts. 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. Therefore, the housing construction process should be monitored or properly supervised to maintain the quality of houses with limited financial resources. The answer to the question, therefore, is to involve owners in the supervision of reconstruction of their houses.

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

As the floor area is less than 120 m², a recent change in regulations allows the drawing and application form to be prepared by the resident. However, when the building permit system is simplified, it is questionable whether building quality in the affected area can be maintained. Therefore, the new system for issuing building permits should be simplified and standardized for those who cannot afford to employ an engineer; however, it must maintain building quality.

The existing building permit practice in the affected district is sporadic and unregulated. It takes time to determine whether or not a building is safe against earthquakes. 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 interview survey performed by the JICA study team found that many of the affected people are no in sight of housing reconstruction. More than 90% of persons answered that the housing reconstruction will start one year or longer into the future. 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. The quality of the new house should be better than the previous house. People should understand the importance of seismic resistant houses and prepare to bear the cost of a safer house.

6.4. Goal and Objectives

The goal of the acceleration plan for housing reconstruction 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

JICA Study Team aims at promotion of people's participation to the housing construction and quality of constructed housing by people themselves through the standardization of construction approval. To do this, there are three activities; preparation of standard drawings to submit construction drawing in cheap cost; preparation of the manual supervise housing construction by owner and preparation of poster for minimum requirements of the housing construction. The housing construction process should be standardized throughout the affected area. The process should be clearly understood by the affected people and government officials alike. In order to clarify the rules, manuals and materials should be prepared in an easy-to-understand format. These materials should include:

- Standard drawings for safe houses
- Construction and supervision manuals
- Minimum requirements for construction of houses

(2) Dissemination of the Construction Approval

JICA Study Team proposed method under the strategy of (1) Standardization of the housing reconstruction system should disseminate related personnel. In order to enhance the people's participation in the housing reconstruction process, knowledge and information should be disseminated to government officials, construction workers, construction companies, and affected people by using the materials prepared in the pilot projects.

(3) Extension of Construction and Supervision Manuals for Residents

When the housing reconstruction would start full scale, it should be reconstructed to keep quality of house and to reconstruct within limited time. The role of the district government could include, 1) the building approval is made to submit by the housing owner, 2) the district should determine or the submitted documents for approval, 3) district government should carried out building inspection during construction. However, the building permit system is not popular among the residents and there is no uniform standard for issuing approval. Moreover, the approval process takes time and very complicated. In order to promote supervision by the residents, it should be utilized supervision manual for the residents. District government also distribute supervision manuals to the residents.

In order to achieve objective-2: Strengthening the capacity of government institutions to support housing reconstruction, the following strategies are proposed.

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

(4) Preparation of Manuals on the Issuing of Building Permits

Since the building permit issuing system is not uniform in the affected area, the issuing of building permit manuals should be formulated to cope with the massive housing construction demand. Manuals should follow the construction laws and regulations and be easy to understand by everyone so that government officials from other sections can work with the construction permit issuing section if required.

(5) Promotion of Land Registration for Access to Financial Resources for Housing Reconstruction, such as BFH

Land title registration is a difficult and time consuming process. There seems to be no immediate solution to this problem. However, people without land title may not obtain access to any governmental and non-governmental support. This should be addressed quickly to avoid delays in reconstruction. The number of officials working in this section should be increased to facilitate the land title registration process. Those officials and persons should be trained in practical situations.

(6) Strengthening the Capacity of Public Institutions, including District Municipalities and INDECI etc., to Develop Effective Measures for Housing Reconstruction

The problems of housing construction include the time consuming process of issuing damage certificates and application forms for BONO 6000. Other governmental institutions are not able to help the organizations responsible. Therefore, it must be ensured that government support to the organization is sufficient to implement the tasks.

(7) Utilization of the Project Bank System

The JICA study team prepared materials about confined masonry structures for registering in the project bank. At the same time, government officials should be educated.

(8) Control of Illegal Housing Construction

There are many cases in the affected area of houses being constructed without a building permit. The existing system has shortcomings such as not being recognized by the residents and being time consuming to prepare documents. The approval process, including preparation of drawings, takes time and money. Those problems should be solved and the construction of buildings without permits should be heavily curtailed.

In connection with objective-3: Dissemination of seismic-resistant constructions techniques in housing reconstruction, the following strategies are prepared.

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

(9) Diffusion of Construction Measures for Safe Houses through Media, Pamphlets, Handbooks, Workshops and Community-based Training

The reconstruction measures for safe houses should be disseminated through various sources because many affected people have insufficient information and technical knowledge about safe houses. The utilization of mass media will be an effective method.

(10) Establishment of Support Mechanisms for Affected People

This program intends to resolve the lack of information about the government support programs and the inability of people to complete application forms for them. The information is available in municipal offices, yet many people claimed that they have no time or money to visit the office to obtain the information and apply for support. A mobile service kiosk should visit the affected areas to provide information about and support for the government support program. The focus should be on information related to safe house construction, support for building permit application and the Techo Propio program.

(11) Establishing Disaster Prevention Education Mechanisms and Modules in Schools, including Theoretical and Practical Learning of Disaster Prevention

The dissemination of safe housing may face a problem because of a lack of information about disaster prevention. Education at the school level, such as technical schools and technical training centers, should be changed to include instruction about seismic resistance construction methods. These educational opportunities should be extended to primary schools and secondary schools to teach children more about earthquake disaster management.

(12) Developing Model Houses to Disseminate Seismic-resistant Construction Techniques and Knowledge.

The results of the social survey show that many affected people reacted positively to the idea of having a model house that demonstrates safe housing construction features. This model house will help explain and improve the understanding of the importance of construction and supervision in building a safe house. The model house should be open to the general public and should explain the construction methods very clearly.

(13) Financial Support Program

In the first phase of the reconstruction, Techo Propio program has not progressed because of no land registration. After, the land registration problems has resolved by the efforts of the government and COFOPRI. The prevailing government financial support programs are the BONO 6000 and Techo Propio. Progress in housing reconstruction has been delayed largely because of the financial limitations of the affected persons. Therefore the government financial support program should continue to distribute funds for reconstruction.

In connection with objective-4: technical training for construction workers, the following strategies are prepared.

Objective-4: Technical training for construction workers

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

The construction of safe housing is a new concept in the affected area. The field investigation found many shortcomings in the most common construction methods. There is a strong demand from the affected people and construction workers for technical training on safe house construction. Several training courses should be available to those who want to learn about these construction techniques. Target groups should be the affected persons, construction workers, and government officials.

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

Table 6.5.1 List of Projects

Strategies	Name of the Project
Encouraging participation of the affected people in the process of housing reconstruction	
(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
Strengthening the capacity of government institutions to support housing reconstruction	
(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
Dissemination of safe house construction techniques in housing reconstruction	
(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
(12) Establishing disaster management education in schools, including theoretical and practical learning of disaster prevention	u. Extension of techniques for constructing houses that are safe against earthquakes
	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

The contents of the project are shown as following table;

Table 6.5.2 Description of the Projects

Project Titles	Implementation	Year	Description
Prototype drawings of seismic resistant house	MVCS	2008	In order to receive building permit easier from the government, proto-type drawings are prepared and provided to the affected people.
Manual of construction method of seismic resistant houses	MVCS	2008	During construction, affected person can supervise housing reconstruction by using the manual.
Illustration of minimum requirements of safer houses	MVCS	2008	Minimum requirements for housing construction should be prepared and extended to safe house against earthquake.
Illustration of construction process	MVCS	2008	Construction process is illustrated to understand easily for affected people.
One-day training	Local Government	2008 Until 2016	One-day training should be carried out continuously by the local government.
Manual of building permit for safer houses	MVCS	2008	Manual for building permit issuing is prepared and shorted duration of the building permit issuing time
Practical training of the officials of the land title section	COFOPRI	2008 Until 2013	Delay of land registration is the one of the problem of housing reconstruction process and the official in charge of land registration section should improve capacity.
Dissemination of financial mechanisms of government funded programs	Central Government	2007	Training program should be implemented by the local governments.
Practical Training of officials of the land use planning and building permit section	Local Government	2008 until 2016	Dissemination of the government housing reconstruction program, BONO 6000, is important step to enhance housing reconstruction.
Building permit approval system by utilization of project bank system	Local Government	2008 Until 2013	Based on proto-type drawing, project bank system should be utilized to simplification of building permit issuing system
Strengthening of district government' control capacity for illegal construction	Local Government	2011 until 2016	District government strict control of building without building permit
Exchange of information and knowledge on safe house construction	Local Government	2008 Until 2016	Installation of information exchange post in the district governments
Movies for seismic behavior with shaking table	MVCS	2008	In order to extent safe housing against earthquake, video showing reinforced house and without reinforce house on the vibration experiment has prepared and disseminate safe house against earthquake
Brief drama to promote safe house	MVCS	2008	In order to extend the safe house against earthquake, drama was prepared and showed the affected persons
Utilization of mass media	Local Government	2008 Until 2016	The governments have to utilization of mass-media for safe house for long time.
One stop kiosk for housing reconstruction	MVCS	2008	The government provide information kiosk for housing reconstruction and safe house against earthquake.
Affected person support house in district government	District Government	2008 Until 2016	The district government is established housing reconstruction consultation center.
Extension of techniques for constructing houses that are safe against earthquakes	Local Government	2008 Until 2016	The extension should be carried out by using materials such as resident supervise manual and one day training course.
Preparation of text books and materials about earthquakes and the concept of safe houses	MVCS	2008	Preparation of the materials for one day training course.
Model house construction	MVCS	2008	Construction of model house at Pueblo Nuevo district.
Small scale safe house explanation kit	MVCS	2008	Model for explaining important point of construction

Project Titles	Implementation	Year	Description
Utilization of Techo Propio program	Central Government	2009 until 2016	National level of housing construction program should provide specially damaged area for national level Techo Propio program
Technical training targets for affected people	MVCS	2008	By using the materials developed by SENCICO, training course for safe housing construction should be implemented.
Technical training targets for skilled labor	SENCICO	2008 Until 2016	Technical training courses are providing for the construction workers.
Dissemination of reinforced adobe house	Central Government	2008 Until 2016	Extension of Adobe house should be carried out in the mountain area.

Source: JICA Study Team

The projects include the projects that are implemented by the JICA Study Team and Peruvian Governments. Therefore, the projects which will be implemented at the study area are shown in the action plan.

6.6. Action Plan

The action plan is the projects that will be implemented at the affected area to facilitate housing reconstruction with keeping the housing quality. JICA Study Team has already implemented some of the projects during implementation of pilot projects and the technical materials for confined masonry have been prepared. The governments should carry out to promotion of housing reconstruction by using the materials and experience gained from the pilot projects.

In order to facilitate housing reconstruction with keeping housing quality, building permit should be obtained whole housing constructed in the affected area. The lesson learned from the pilot projects is that the project bank system is one of solution for the existing building permit administration in district level and should be utilized the system in whole study area.

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 the government. The private sector should carry out actual construction.

The first phase (2007 to 2010): The project bank should be extended to whole affected area and implement training for the government officials who in charge of the building permit.

In the first phase, JICA Study Team's proto-type drawing should be extent whole study area and register them to project bank in each district. At the same time, building permit section officials should be trained for building permit administration and established the building permit issuing within short time.

The second phase (2011 to 2013): The building permit administration should implement full scale and the local governments begin to control the housing without building permit.

The whole reconstructed housing should have building permit and construct house in accordance with the government regulations. The residents supervise their own house by using the manual that is prepared by the JICA Study Team. The local government starts controlling the building that has not building permit. The control should be done by the local government officials.

The third Phase (2014 to 2016): The building permit administration should be implemented strictly. The building without building permit should be suspended construction.

The building permit administration should be enforced in full scale. At the same time, extension and dissemination of the safe house against building should be carried out to the construction workers and affected person. Moreover, the government should prepare direct support program to the earthquake victims. One way to address this problem is that Techo Propio program should direct to affected area each year.

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

Table 6.6.1 Action Plan

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

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 Programme (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.

The third approach is simplification of the building permit issuing system by introduction of the project bank system. The experience of the pilot project should be extended to the whole affected area.

(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.

Many affected people cannot start reconstruction because of the limitation of housing construction funds. The government financial support program of Techo Propio should be utilized in the affected area to assure that the number of applicants from the affected area can be met.

CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

7.1. Housing Reconstruction

In this section, the recommendations and conclusions are compiled through the experience gained from the pilot project implementation to formulate a housing reconstruction system in future. Those experience and lesson learned from the pilot project implementation should be compiled and proposed housing reconstruction system for coming earthquake housing rehabilitation and 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

In order to make the building permit system work, it should be easy to use for both district government and residents. Since the existing building permit regulations fully depend on district government to issue building permits, there is no uniform determination criteria proposed by the central government. In order to extend the safe earthquake-resistant house construction to the whole affected area, the central government should prepare guidelines and criteria for the building permission system.

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

Improvement of building quality is one of the important targets for housing policy in the country. The interview survey performed as part of the study found that there is no clear cut criteria for building permit approval and criteria. Moreover, some district governments do not have a building permit section. At the same time, the capacity improvement of officials at the building permit section is the most effective means of controlling housing quality and needs to be implemented continuously.

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 government housing support program should be formulated in such a way as to improve the quality of houses. However, the government housing reconstruction program, BONO

6000, contains no mechanisms for improving building quality. There is, therefore, a possibility that reconstructed houses will still be of a type that is vulnerable to earthquakes. Carefully designed government support program that secure the quality of reconstructed houses should be established in the future.

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

Housing reconstruction after an earthquake is time consuming and is impossible to solve in short time. Reconstruction should be properly addressed in existing disaster management plans, including housing reconstruction methods. In Peru, the responsible organization for disaster management is INDECI, but it does not take responsibility for reconstruction after

earthquakes. According to the regulation, each governmental sector ministry and local governments should have responsibility and there is no organization to take a responsibility for the whole earthquake reconstruction. In the case of the 2007 Pisco earthquake, the government established FORSUR to coordinate the related organization's activities and determine reconstruction policy, but it has not functioned fully.

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.

After the earthquake, donation from the domestic and international will come to damaged area. It is important to determine the distribution methods of collected money to the affected people in advance.

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

In general, the roles of the State in housing reconstruction are not clear because housing is private property and direct support for housing reconstruction is difficult to justify with regard to equity. One of the reasons for government involvement in housing reconstruction the constitutional requirements for securing safe and health lives for all citizens. For this reason, direct support for housing reconstruction could not be justifiable.

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 carry 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.