PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER

Housing Recovery in Chile: A Qualitative Mid-program Review

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ABSTRACT

The magnitude 8.8 earthquake, and subsequent tsunami, which struck the south central region of Chile on February 27, 2010, affected 75% of the population of the country and damaged or destroyed 370,000 housing units (about 10% of the housing in 6 regions). Within 6 months, the Ministry of Housing and Urban Development published a plan to repair or rebuild 220,000 units of low- and middle-income housing with government assistance within four years. In October 2012, at the midpoint of a 4-year program, 84% of those housing units have started construction and 54% are complete and occupied. Several factors contribute to the program's success: (1) strong leadership at the national and local levels; (2) use of existing programs and institutions; (3) flexibility to adapt programs over time; (4) a strong technical staff; (5) a robust economy; and (6) political will. When compared to housing recovery programs in other countries, Chile's program stands out, combining both top-down strong government management and bottom-up citizen participation. The reconstruction plan also included goals for improved design and construction of social condominiums, updated zoning plans, road and infrastructure improvements, heritage recovery, and new master plans for impacted cities. While the housing reconstruction will be completed within the four-year time frame, the master plans require a longer implementation time. Going forward, the earthquake may have a legacy far beyond the successful housing replacement. Chile's efforts to use the recovery planning efforts to expand national urban policy will help to provide a larger planning framework at the local level where citizens can participate in the physical, social and economic decisions necessary for ongoing community development.

Keywords: Housing, Recovery, Urban Planning, Reconstruction

ACKNOWLEDGMENTS

This report is based on extensive interviews conducted during two trips to Chile: 5 days in February and 15 days in October 2012. The trips were organized by the Ministry of Housing and Urban Development (MINVU) and funded by the United Nations Development Program (UNDP). Interviews were conducted with individuals with positions in the current government, the previous government, regional offices, technical assistance, academia, businesses, local officials and families who received government housing subsidies.

These include Minister Rodrigo Peréz, Pablo Ivelic, coordinator of the Housing Reconstruction Program, Maria Ignacia Arrasate, Program manager, Felipe Kast, in charge of Emergency Camps, Andres Iacobelli, former undersecretary of MINVU, Pablo Allard, former coordinator of the Urban Design and Historic Patrimony Program, Fernando Fodón, former Regional Administrator of O'Higgins Region VI and currently working at the Ministry, Luis Eduardo Bresciani, former coordinator of urban development in the previous administration and currently an academic, Clarisa Ayala, Director of SERVIU in Maule, Luis Valenzuela, an academic planner involved in post-earthquake data collection, Pía Mora and María Ignacia Polanco, academics with the Center for Public Policy, Catholic University and Ned Strong, Director of the Harvard Program in Latin America.

At the local level, Diego Vergara, Mayor of Paine, Claudio Guajardo, Mayor of Rio Claro, Román Pavez, Mayor of Vichuquén, Marco Marín, Mayor of Lolol, Gonzalo Tejos, Mayor of Emperado and Duverlis Valenzuela, Mayor San Rosendo.

Builders included Julio Watson, South zone manager of Inmobiliaria Sinergía (MINGATEK), Linares; Franz Iraira Quezada, Yasna Iraira, and María Cristina Quezada, Constructora Iraira Limitada; Felipe Hernán Carrasco Hurtado and Hugo Ricardo Carrasco Hurtado, HURTADO Y CARRASCO; Bernardo Heredia and Rodrigo Pereira, SERVICIOS Y CONSTRUCCIONES LC.; Marcelo Retamal, Ingeniería y Construcción Cardenal; SALFA; Small builders include Sergio Reyes Valdivia.

Architects included MOEBIS, designers of mitigation parks, and those involved in technical assistance: Patricia Jiménez, Rodrigo Cháves Rodríguez, Guillermo Vasquez, Carol Loyola, Claudio Deney, Yasna Cortez, Carolina Vergara, Cristián Lopez. Hardware store owners or managers include Ferretería Ramirez, Doñihue and Ferrever Ltda. in Lolol.

Social Leaders included: Maria Angelica Torres, Ximena, Toledo, and Ivonne Vera in Dichato, and Cristina Carter, Las Heras, Talca. More than two dozens beneficiaries opened their homes and construction sites to show the work completed and in progress.

Towns and cities visited include Paine in the Santiago Metropolitan region. In Region VI (O'Higgins) towns include Doñihue, Machalí, Rancagua, San Fernando, Santa Cruz and Lolol; in Region VII (Maule) towns include Curicó, Talca, Linares, Río Claro, Vichuquén, Curepto, Constitución, and Empedrado; in Region VIII (Biobío) towns include San Carlos, Chillán, Coliumo, Dichato, Tomé, Talcahuano, Concepción, Coronel and San Rosendo.

Many thanks are due to all the people who gave so generously of their time, but in particular, Maria Ignacia Arrasate, without whom the research could never have happened.

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Study Overview

1.1 INTRODUCTION

At 3:34 a.m. local time on Saturday, February 27, 2010, a great earthquake of magnitude (M) 8.8 struck the south central region of Chile. The earthquake occurred on the interface between the Nazca and the South American plates, with a rupture zone extending over an area approximately 500 km long and 100 km wide. Over 12 million people (about 75% of the population of Chile) experienced intensity VII or stronger shaking. In the first month following the main shock there were 1300 aftershocks, with 19 in the range of M 6.0–6.9. The earthquake produced a tsunami that caused major damage over more than 500 km of coastline [Moehle and Frost 2012]. The earthquake and tsunami together resulted in 526 deaths (with 31 persons still missing). The earthquake damaged highways, bridges, railroads, ports and airports as well as 40 hospitals and over 4000 schools[1] [MINVU 2010, 2011]. Estimates suggest that approximately 50 to 100 multistory reinforced concrete buildings were severely damaged and 4 collapsed partially or totally. Lifeline infrastructure generally performed well, given the magnitude of the event, but failure of some elements led to power outages affecting much of the population for days. However, given Chile's long history of frequent earthquakes, rigorous building codes and standards for infrastructure operability served to limit damage and save lives.

The earthquake was Chile's largest disaster in terms of property and economic loss. The total estimated loss of US$30 billion (18% of Gross National Product) is composed of US$21 billion to physical assets (including buildings, housing, roads, and schools)[2] and US$9 billion in business and indirect losses. An estimated US$7 billion to US$8 billion of the loss will be paid for with insurance and the remainder by government or private individuals [AACH 2012; Siembieda, Johnson, and Franco 2012].

Chile is a country with stable institutions and a prosperous economy, but like many emerging and developed economies, it is a nation with income inequality and many marginal structures (particularly adobe housing) at high risk in earthquakes. The government, through the Ministry of Housing and Urban Development (MINVU) has a long tradition of improving housing conditions for low-income families and working to eliminate informal housing. In the 1980s, thousands of "sanitary units" (a concrete structure with a kitchen and bathroom) were installed on home sites lacking these amenities. In fact, in many of the earthquake/tsunami-

[1] The data on earthquake losses is reported in MINVU documents but the original source is data from the Ministry of Interior.
[2] According to the MINVU Reconstruction Plan, US$10 billion of the total losses was in public infrastructure.

impacted zones, these units were the only structures left standing (Figure 1.1). Over the past 20 to 30 years, the government has also built social condominiums,[3] providing home-ownership to 60% of the lowest quintile of income [Pérez 2012, personal communication]. This history of experience in improving housing conditions by the Ministry is a crucial element in the government's capacity to respond to the housing needs after the earthquake in February 2010.

Figure 1.1 View of sanitary units amid damage two weeks after the tsunami in Dichato, Chile. (Photo courtesy of Pablo Ivelic)

This report provides an overview of the status of the housing recovery program in Chile at the mid-point, two years after the plans were published (and two and a half years after the earthquake. The report is divided into four chapters. Chapter 2 reviews the overall housing recovery program in terms of its development and implementation, as well as the integration of urban planning and heritage recovery. Chapter 3 discusses community involvement and local impacts of the construction process. Chapter 4 compares the recovery experience in Chile to those in other nations, to identify key elements of successful programs. Chapter 5 concludes with recovery lessons and challenges based on the Chilean experience.

[3] Social condominiums are government built housing for low-income and vulnerable populations. Each family is given ownership of their unit and has the right to sell it after a five-year period.

2 Housing Program Decisions And Implementation

Overall, the earthquake damaged 370,000 housing units. The Chilean government is rebuilding or repairing 222,000 units (60%) for low- and middle-income families, while the remainders have been financed through insurance[4] and private funds [AACH 2012; ONEMI 2010; Siembieda, Johnson, and Franco 2012; SVS 2012]. Of the 222,000 targeted for government assistance, 109,000 involved repairs of damaged homes and 113,000 required rebuilding [MINVU 2010, 2011]. Within a few months after the earthquake, a national reconstruction plan was developed which required special legislation and funding through various business taxes and (non-affected) property tax increases. The plan covered major sectors including infrastructure, hospitals, schools, heritage sites, etc. Housing, a central element of the plan, is managed by the MINVU. The Ministry, whose mission is to improve the quality of housing for vulnerable populations, felt that the earthquake and tsunami overturned four years of housing program efforts to reduce the already existing housing deficit.

In the immediate aftermath of the earthquake, however, emergency response was in the hands of an outgoing administration and the scale of the losses had to be understood by an incoming government. After 20 years of rule by a center-left coalition (*Concertación*), Sebastián Piñera (of the center-right coalition *Alianza*) assumed the Presidency on March 11, two weeks after the earthquake. The transition is important to recovery planning. The new government wanted to show they could do things better, and organized for a national effort, but at the same time, new political appointees were inexperienced, with limited knowledge of staff and programs. Three key individuals were brought into the MINVU within days of the earthquake: Andres Iacobelli, as undersecretary and architect of the reconstruction program; Pablo Ivelic, as coordinator of housing reconstruction; and Pablo Allard, as coordinator of urban design and historic patrimony.[5] Together they evaluated conditions in the disaster zone and began assembling data on damage and the number of families affected, estimating a need for US$2.5 billion in housing as the administration took office.

The timeline for the housing recovery, combined with other key recovery actions, is shown in Table 2.1. Many important decisions were made in the first months after the earthquake and the housing recovery program was in the planning phase at the same time that emergency

[4] According to data provided by insurance companies to the Chilean Securities and Insurance Supervisor (Superintendencia de Valores y Seguros [SVS]), as of August 31, 2010, 156,000 claims had been paid.
[5] A fourth individual, Francisco Irarrázaval, joined the MINVU leadership team later, as coordinator of social condominiums. Immediately following the earthquake, he served on the President's emergency committee.

housing (typically known in the U.S. and other nations as "temporary" or "transitional" housing) were under construction.

As the recovery program ramped up and programs were put in place, 60% of the housing subsidies were allocated 1 year after the earthquake and 100% were allocated 2 years after the earthquake. Two-thirds of the housing was under construction by the second anniversary.

2.1 CRITICAL DECISIONS

Eight critical decisions were made early in the development of the housing recovery program. The decisions provided a balance of strong central government leadership with significant efforts to engage local communities and involve citizens in housing decisions.

2.1.1 Government Funding

Funding by the national government for the repair and replacement of housing was timely and adequate. The government was able to fund the recovery in part because of a robust economy and in part because the earthquake impacted a large portion of the population, so that new taxes and targeted programs were politically acceptable across the political spectrum. The budgetary sources for the recovery included taxes on copper mining, tobacco, and non-affected high value properties, international donations, and reallocation among various government budgets [MINVU 2010, 2011].

2.1.2 Use Existing Programs

Given the structure of the Chilean government, with strong ministries and regional staff offices, the second critical decision was to use the existing ministries and their programs and budget lines for the recovery effort. The government consciously chose not to create a "super-minister" or special agency for reconstruction. Instead, MINVU was given charge of the reconstruction of cities and housing, and Public Works took on roads and other infrastructure. These were the largest recovery domains, but other ministries, such as Health and Education, managed programs in their areas as well. Initially, a Committee of Emergency worked directly under the President, but this was replaced with a committee of Ministers (Comité Interministerial de Ciudad y Territorio) to coordinate reconstruction policies at a national level, and Governors (Intendentes) to coordinate the intervention at a local level. These groups met monthly with the President on the reconstruction planning.[6] One critique of this strategy is that the government lost an opportunity to build local capacity for urban regeneration with new rules and programs, but Ministry authorities did not want to delay reconstruction with new tools and processes. Thus the decision was to use and adapt existing programs.

[6] Later, the coordination was delegated to an executive committee led by senior staff from the Ministry of Interior Affairs, which typically coordinates all regional issues with the governors. This executive committee met weekly and coordinated with regional and local governments.

Table 2.1 Timeline of Earthquake Housing Recovery Key Events 2010–2014

Year	Month	Date	Event or Key decision or key date for action/close of action
2010	February	Feb. 27	M 8.8 earthquake strikes S. Central Chile, 3:34 am local time.
			4538 schools and 40 hospitals damaged, plus public infrastructure.
			Data collection on housing loss by various agencies local and national.
	March	Mar. 11	President Piñera assumes office.
			Ministries of Public Works, Health, Education begin rebuilding programs.
			President appoints 2 coordinators for reconstruction (emergency and reconstruction).
			Decision to operate Housing Recovery through MINVU existing programs.
			Announce owner-site program and others.
			Create PRES / PRU (new planning instruments).
		Mar. 29	Piñera announces the housing reconstruction program funded at US$2.5 billion.
	April	Apr.11	Mayors assigned task of creating a registry.
			Begin taking applications for subsidies at local SERVIUs; expand staffs to meet demands.
			Creation of Committee of Ministers to oversee reconstruction.
			Emergency schools finished; all students start classes.
			Ministry negotiates w builders. Builders' housing plans require certification by Ministry.
	May		First allocated subsidies are disbursed.
	June	June 21 (4 months after)	80,000 emergency houses completed (95% located at the owners site, only 4500 in emergency villages).
	July		Creation of Executive Committee to oversee reconstruction (led by Ministry of Interior Affairs).
			Start first construction of housing (from 3 construction companies).

Year	Month	Date	Event or Key decision or key date for action/close of action
	August	6 months after	Registry of Victims closed.
2011	January		
	February	1 year after	Subsidies allocated 60%; In construction 35%; Completed 5% (repairs & construction).
	May		Rodrigo Pérez becomes Minister of Housing and Urban Development.
	August		New housing programs (Do It Yourself [DIY] and Urban Densification) begin.
	November		Pérez creates New Department of "City Projects" area to expand urban planning.
	December		Create rent program for people in camps to avoid 2nd winter in camps.
	February	2 years after	Subsidies allocated 100%; In construction 67%; Completed 37% (repairs & construction).
			Completion of Roads/bridges (99%).
			Hospital repairs 96% completed.
			Dichato Festival initiated.
	August	2.5 years after	Subsidies allocated 100%; In construction 82%; Completed 53% (repairs & construction).
2013	January…		
	February…	3 years after	Estimate 210,000 In construction (95%); Completed 150,000 units (68%).
	December		
2014	January…		
	February	4 yrs after	Assume 95 % + completion of housing recovery construction.
			Completion of school rebuilding or repairs.

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2.2.3 Clarify Need and Identify Beneficiaries

In order to design recovery-focused programs, the government needed data on the extent of the damage and social conditions. Baseline data on damage was collected by the Oficina Nacional de Emergencia del Ministerio del Interior y Seguridad Pública (ONEMI)[8] in coordination with local municipalities. In addition, the outgoing administration contracted with several universities to undertake risk mapping in relation to the damage assessment and this was not easily coordinated

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[7] Later, the coordination was delegated to an executive committee led by senior staff from the Ministry of Interior Affairs, which typically coordinates all regional issues with the governors. This executive committee met weekly and coordinated with regional and local governments.

[8] ONEMI is a national government agency that is equivalent to the Federal Emergency Management Agency (FEMA) in the United States.

with the incoming administration. Misunderstandings led to contract disputes and only two universities continued the data mapping at the same time that multiple agencies and independent entities were surveying damage with little coordination. It should be noted that no government is well prepared for this level of data collection. Typically agencies collect data for their own use, so the formats are not necessarily coordinated with those of other agencies. Damage data collection is one area in which a single government super-coordinator would have been useful and more efficient. MINVU took whatever surveys on damage were available from local governments and overlaid these with census data, social conditions, and building typologies to develop preliminary estimates of housing need.

A third critical decision made by MINVU was to identify what portion of the population should be beneficiaries of a government recovery program. They chose the lowest three quartiles—60% of the population. It was hard to match income and need to actual conditions. Even a middle-class person with a job who had lost their home would need help. Thus the program was generously aimed at low- and middle-income populations who did not own a second home, and whose annual income was below US$12,000 per family per year, and whose home value was less than US$88,000.[9] Essentially, anyone with housing damage who did not own a second home could apply for a subsidy.

2.2.4 Empower Local Communities

A fourth decision was that MINVU gave mayors six months to create a Registry of Disaster Victims—names attached to each damaged building, with information on whether the building needed repair or replacement. The registry served as the basis for all housing subsidies, and it gave a critical responsibility to local government to represent the needs in their communities. This kept the municipalities in the loop and served to link the municipalities with the regional and national programs.

2.2.5 Replace Housing On-Site

The fifth and perhaps most critical decision was to subsidize housing demand rather than direct supply. A "supply-side" subsidy entails government contracting with large local or international companies to build thousands of units on green-field sites. The "demand-side" subsidy was focused on keeping families in place. It meant putting emergency shelters on individual home sites and planning for rebuilding on those same sites. Practically speaking, this meant that the housing reconstruction program would be scattered over thousands of towns and rural regions, on individually owned sites. The decision was not popular with the building industry, or with many politicians, as it was seen as slow and cumbersome. However, two years into the recovery, it is clear that this was the single most important decision made. The use of existing home sites kept people in their communities, with access to their jobs and family members, and the recovery was on their land, where they could monitor the construction. This decision applied to the great majority of disaster-impacted families. Only about 4000 families were housed in temporary emergency camps (out of the 80,000 emergency units constructed), because their home sites or

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[9] Chile has experienced significant economic grown in recent decades with average personal income increasing from US$2200 in 1990 to US$12,200 in 2010.

social condominiums were in the tsunami zone or because they were renters in damaged homes who needed new alternative housing.

2.2.6 Codes, Local Management, and Housing Choice

Three additional decisions were part of the overall housing recovery program development, and further exemplify the balance between a strong government role and citizen involvement. First, the Ministry established strict construction norms for all new housing—with particular focus on materials, structure, thermal capacity, and habitability (in terms of minimum unit size). Essentially every builder had to have their model units certified by Ministry engineers before it could be presented to a family or community. Second, funding for technical assistance, inspection, quality control, and oversight was built into the subsidies and this went to local architects, local governments, and Ministry offices. Finally, although housing recovery programs were tailored to specific types of damage and specific social conditions, one key principle was that all families would be able to choose from a variety of building types and contractors. For families, the capacity to choose a model home gave them an active role in their own recovery process.

2.3 THE HOUSING PROGRAM OPTIONS

Over 70% of the homes to be rebuilt or repaired were on sites where the beneficiaries lived. This meant that a major issue was developing a process for rebuilding individual homes over thousands of kilometers and in rural and urban localities. For owners eligible for subsidy, a variety of options were available: funds to repair existing houses, funds to acquire a new house, new houses on the owners' land, houses on new sites, or units in new social-housing developments (see Figure 2.1 and Table 2.2). Owners could complete modest repairs on damaged houses with subsidy funds used to purchase materials from a local source. Owners could use contractors for more complex repairs with subsidy funds. Repair funds were disbursed in three increments (30%, 30%, and 40%) with inspections to insure that funds were used for construction.

Owners needing full reconstruction could select models from precertified contractors, do their own construction or buy an existing house. For those selecting contractor-built homes, community residents were allowed to choose from models based on presentations from several predominantly local builders, some of whom offered prefabricated homes and some of whom offered site built homes, all of which were precertified for engineering standards by the Ministry. Once the community voted, the builder received the contract for that community. Such contracts provided some advantages of scale for the builders in remote regions (and at the same time encouraged competition among builders). The typical subsidy for each house is about US$18,000 to US$20,000. Additional funds were added for extra site-work, water, or sewer systems [MINVU 2011, 2012a]. All the units were designed so that families could add rooms or special finishes after the house was completed.

Figure 2.1 Some of the government sponsored housing types and options available [MINVU 2012c].

Families without land—those in damaged social condominiums, renters, and those doubled-up in single units—were accommodated in temporary camps, while new social condominium projects or new single family house developments were designed and completed. Social condominiums were designed on sites selected for pre-organized groups of families, that is, families who signed up to participate in the project. New developments and acquisition subsidies were designed for non-land owners such as renters or families who shared space in damaged homes.

Table 2.2 Breakdown of number of units for repair and rebuilding program options [MINVU 2012b].

Problem ► ▼Approach	Repairable Units	Non-repairable Units Land Owner	Non-Land Owner
Self Led	12,000 Bank of Materials (for repairs)	5000 Acquisition 1000 Do It Yourself	17,000 Acquisition Subsidy
State Led	12,000 Social Condo Repair Buildings	8000 Social Condo Demo/Rebuild	30,000 New Development
Third Party Intermediary	85,000 Repair Subsidy	48,000 Precertified Houses	4000 Urban Densification

These projects typically improved on previous housing quality in terms of unit size (from older units that were 27–38 m^2 to new units at 50 m^2), services, and site amenities. In cities such as Talca, where 30% of the housing stock was severely damaged, additional subsidies enabled builders to increase density on inner-city sites in an attempt to counteract the rush to build on the periphery. The variety of program options demonstrates a serious commitment to housing choice and at the same time, to recognition of the variety of needs and family circumstances.

2.4 IMPLEMENTATION

Both the large-scale urban redevelopment projects and the homeowner on-site rebuilding programs are time consuming and complex to implement. The first estimations of housing damage was provided by ONEMI and surveys made by Ministry of Social Affairs using an instrument called Encuesta Familiar Unica de Emergencia or Unique Emergency Family Survey (Ficha EFU), with input from local mayors. While the Ministry was designing the housing recovery program, mayors were given the task of creating the Registry of Disaster Victims for families that needed help to rebuild. The registry, which had to be created and complete within 6 months, helped to define the number of subsidies needed and began the subsidy application process with the families. Then regional offices of the Ministry, Servicio de Vivienda y Urbanismo (the SERVIU),[10] which are normally tasked with implementing Ministry policies, worked with the mayors in their region to understand the social, legal and technical problems after the earthquake and to process all applications for housing subsidies. In total, the Housing Reconstruction Program, through the regional SERVIU offices, would allocate over 220,000 subsidies (half for repair and half for new construction).

2.4.1 Regional Management of Housing Subsidies

The regional SERVIU offices had to augment their office staff. In the O'Higgins region, for example, the staff normally served 6000 families per year, but after the earthquake, they needed to assist 30,000 families. Some offices, such as the Maule office in Talca, had to deal with the loss of their offices (just as some municipalities lost buildings) at the same time that they increased staff and organized services. These offices were the government's main point of contact for local victims and they were not only helping families with applications for subsidies (which could include paperwork to clarify land tenancy), they were also looking for existing homes to buy or rent, negotiating land purchases, attempting to limit land speculators, attempting to limit duplicate or fraudulent applications, and reaching out to local financial and construction companies [Fodón 2012, personal communication]. The leaders of the local SERVIU had a particularly difficult job trying to provide services and manage unrealistic expectations by victims and politicians.

Additionally, the SERVIU offices recognized that in some urban areas, the demand was "double the size of the problem" in the sense that often two families shared a damaged house or there were renters in the damaged units [Ayala 2012, personal communication]. For example, in central Talca the registry included 1200 owner-site families, 1800 renters (plus 3700 in need of home repairs as well as an existing housing deficit suggesting a need for another 1600 urban units). Such information led the Ministry to develop special subsidies for increasing housing density in urban settings.

Both the local SERVIU offices and the program planners at the Ministry met with local and national building contractors, to bring them into the process early in the planning stage. The

[10] There are two branches on the Ministry of Housing and Urban Development (MINVU) in the regions: the SEREMI (Secretaría Regional Ministerial / Regional Secretary) branch represents the Minister and has political responsibilities, while the SERVIU (Service of Housing and Urban Development) implements Ministry policies and programs has some autonomy from politics.

Chamber of Contractors (Cámara Chilena de la Construcción [CChC]) was initially opposed to the owner-site programs. In fact, given the economy and the demand for contractors in the northern mining regions, the on-site program opened opportunities for small local builders and expansion-potential for companies that had already worked with SERVIU on rural subsidy and social housing programs, and for companies developing prefabricated housing.

For example, Mingatek (later renamed Sinergia), a manufactured housing producer, moved their small company from the south of Chile to Linares (a town located midway between the O'Higgins and Biobío regions) in May 2010 to take advantage of the post-earthquake demand. They met with Ministry officials to create designs that would meet regulations and developed five model houses for different site conditions. In two years they have built the company to produce 50 houses per month with 100 employees in the plant and 170 in the company. Three medium sized builders (Iraira Ltd, Hurtado y Carrasco, and S&C LC.), who each had previous experience with SERVIU rural projects, all had to restructure their businesses to meet the demands of the owner-site reconstruction program. Each of them chose to develop a house kit of construction materials that would fit on one truck, and hire local labor. While all found the transition slow, all report significant growth for their companies. At the same time, micro-contractors who previously built one or two houses per year also were able to compete for local projects and grew their businesses as well.[11]

At the national level, the MINVU housing reconstruction team focused on tailoring the programs to meet the variety of needs. Pablo Ivelic created pilot programs in each region as test cases for managing the subsidy-application paperwork, certifying land ownership, providing access to water and sewer, as well as providing families with a mechanism for choosing contractors and house designs. These processes were frustratingly slow at the beginning but became more efficient over time.

2.4.2 Social Condominiums Program

Although the majority of the housing effort would be on repair and rebuilding on owner-sites, about 20,000 units of social condominiums needed repair or rebuilding and these presented unique problems. Social condominiums are similar to public housing in the U.S. with the main difference being that in Chile the residents own the units. Families qualify for the program through a "scorecard" that estimates a family's social vulnerability. In the 1980s, when the program began, the scorecard was based on a social worker evaluation of a family's housing conditions, amenities (refrigerator, plumbing), and the number of people per unit. Today (since 2006), the scorecard is based on family income (as opposed to housing conditions).

Families living in social condominiums are in the lowest-income bracket in the country. Many of the damaged units were older buildings in poor condition with small (28 m^2 or 300 ft^2) units, as shown in Figure 2.2 (a). When the Ministry evaluated the cost of earthquake repairs plus the cost of bringing the units up to current standards, they decided to build an additional 30,000 units in new developments (beyond the 8000 which were severely damaged). The new

[11] All of the builders expect to maintain their businesses after the surge of earthquake related construction based on the contacts they have made and the experience gained during the reconstruction.

developments for displaced non-land owners—families who were renters, or who shared housing with other families including both single family homes and condominiums, all at the 50-m^2 standard—bringing the total to 38,000 new units.

The inhabitants of damaged social condominiums could not shelter on site, and in some cases, families in tsunami-impacted coastal communities had no safe site to return to. For the 4350 families without alternatives, the government built 107 emergency camps, which were supported with access to schools, day care, job training, health clinics, and other government social services. The process of assembling (or clearing) sites, preparing for the infrastructure, developing designs, and working with families took almost two years. A unique feature of social housing in Chile is that families are organized by community leaders into groups for the purpose of applying for social housing as a group with their individual vouchers. Needless to say, the family organizing process took time and effort. In addition, some families in older condominiums may have sold or rented their units, thus adding complexity to the process of organizing families into groups for new social condominiums.

(a) Damaged and vacant social condominium buildings.

(b) New development for Villa Cordillera inhabitants, Rancagua, Chile.

Figure 2.2 Buildings in Villa Cordillera. (Photos courtesy of Mary Comerio)

For the Ministry, this meant that only a small percentage of the social condominiums and new developments would be ready for occupancy by the second winter after the earthquake. In order to provide an alternative (especially for the elderly and families with small children), the Ministry devised a rent-subsidy program—allowing camp dwellers to opt out of the camps and rent a housing unit with government assistance until their new unit was complete. The numbers of families in various emergency camps who took advantage of the option ranged from 17% to 55%, but it was important that people felt empowered by the choice.

2.4.3 Completion Rates

One year after the earthquake, 60% of the subsidies were allocated, 35% of the housing was in construction and 5% was complete. By the second anniversary in February 2012, 100% of the subsidies were allocated, 67% was in construction and 37% had completed construction—

although the majority of the projects completed were home repairs, with only 10% new construction. Despite all government efforts, many towns had not seen much new construction on the second anniversary of the earthquake, leading to frustration, as exhibited in Figure 2.3.

Figure 2.3 **Handmade sign in Cauquenes, Chile, February 2, 2012. Translation: "Reconstruction is like God. Everyone knows it exists, but nobody has seen it." (Photo courtesy of Michael Dear)**

In fact, the construction component of the housing recovery program took time to ramp-up and is now running smoothly, and the pace of production has increased. Further, the decision to build on-site replacement housing made it both more complex and less visible than new developments because the reconstruction is blended into the existing urban fabric. With all the subsidies allocated as of February 2012, seven months later (October 2012), the percentage of units with construction started has increased to 84% and the percentage completed to 54% (see Table 2.3) [MINVU 2012b].

The reconstruction program is scheduled for completion in four years and appears to be on track (see Tables 2.1 and 2.3). It is an astounding effort to combine new, safe building technologies, with local vernacular lifestyles and cultures, improve the welfare standards for a significant portion of the population, and at the same time, give that population a sense of control over their lives and fate.

Table 2.3 MINVU housing program subsidy statistics with project start and completion rates as of September 2012 [MINVU 2012b].

	# Subsidies Assigned	# Projects Started	# Projects Completed	% Projects Started	% Projects Completed
Programs for Repairable Houses					
Bank of Material	12,550	7,009	4,135	56%	33%
Repair Subsidy	96,298	85,845	78,521	89%	82%
Programs for Owners w/non-Repairable Houses					
Voucher for purchase or construction	5,310	5,288	2,508	100%	47%
Assistance for Self-help construction	997	254	45	25%	5%
Owner Site with EGIS (social housing management entity)	14,940	14,453	6,758	97%	45%
Pre-certified house voucher	32,575	19,772	10,948	61%	34%
Programs for Non-Land Owners and Social Condos					
Acquisition of Existing houses	17,089	16,585	4,768	97%	28%
Urban Densification	3,716	1,533	0	41%	0%
Rebuild social condominiums and New Devpts.	38,943	36,218	13,369	93%	34%
Total	**222,418**	**186,957**	**121,052**	84%	54%

Of course, it was extremely difficult to accomplish housing reconstruction quickly—the process of creating and managing such a high-volume housing program takes time. The first year involved not only program planning, but also the creation of the registry and the management of the application process. While construction was begun at the end of the first year, it took a second year to streamline the delivery process across many regions. The Chilean housing program is, in fact, much faster than recovery programs in most other nations.

2.5 INTEGRATION OF URBAN PLANNING WITH HOUSING RECONSTRUCTION

The earthquake and tsunami affected 3 metropolitan areas, 5 cities with over 100,000 inhabitants, 45 cities with over 5,000 inhabitants and over 900 rural and coastal towns and communities [MINVU 2010, 2011]. In coastal cities, new master plans were needed for tsunami protection, infrastructure and urban relocations. At the time of the earthquake, all of Chile's cities had basic zoning plan requirements, but little more. Given the need to incorporate risk mitigation with land use conditions and infrastructure investment, the opportunity to develop master plans for impacted cities was led by Pablo Allard at MINVU but coordinated with local efforts.

For example, when a local industry, a cellulose plant in Constitución, wanted to give the city a plan, MINVU developed a method to use their help and develop a model for other cities. They created a new planning instrument, the *Planes Maestros de Reconstrucción Estratégica Sustentable* (PRES, e.g., Strategic and Sustainable Reconstruction Plan) for Constitución. The work was completed in 90 days with an interdisciplinary team and financed by the company. The plan had to be endorsed by the Municipal Council but the plan was referential, not binding. Plans for many other cities followed, including Juan Fernández Island, Curicó, and Talca (the only plan not endorsed by the Municipal Council). Urban designers in Chile developed the plans, some with the assistance of international teams. Because non-governmental organizations (NGOs) or corporations paid for the projects using private consultants, the process moved quickly without requirements for public funds and competitive bids.

The Governor of the Biobío region developed another planning program at the same time. Jacqueline Van Rysselberghe organized reconstruction plans for 18 towns on the coastline following the PRES model, using in-house staff. To develop the *Planes de Reconstrucción de Borde Costero* (PRBC), she took advantage of private donations to pay for risk assessment and tsunami consultants to assist the planning effort. In total, 27 master plans were developed (9 PRES and 18 PRBC). The government funded an additional 110 *Planes de Regeneración Urbana* (PRU) master plans for groups of small towns with assistance from the United Nations Development Program (UNDP). On a local level, the plans helped guide redevelopment. On a national level, the Ministry was able to use the plans to prioritize proposed projects for government funding, based on economic and social need [Allard 2012, personal communication].

In all cases, the planners revised and updated the zoning plans[12] to incorporate risk assessment studies, bringing the concept of resilience into the planning process. This was particularly important on the coast. Although the master plans were referential and non-binding, they created a moral imperative for change in the municipalities. All but one were accepted by the local councils, and will serve in guiding future development decisions. In Dichato and similar coastal towns, MINVU did not want to finance homes to be rebuilt in the high-hazard areas, so they developed land use protocols for a tsunami mitigation park and a commercial zone to buffer traditional residential areas (see Figure 2.4). Some allowances were made for elevated housing in the buffer zone, acknowledging that fishermen needed access to their boats and livelihoods. Although tsunami-resilient design regulations for construction in tsunami flooding areas are not mandatory, all housing built by the Ministry in the buffer zones has been elevated.

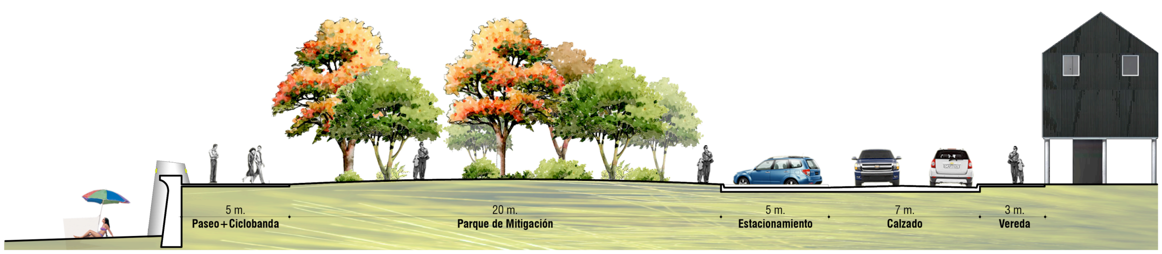

Figure 2.4 Dichato section through plan with tsunami-mitigation park and elevated housing (commercial zone not shown in this graphic) [MINVU 2010].

2.6 HERITAGE CONSTRUCTION

A last challenge for MINVU was historic reconstruction. Adobe houses were 27% of the homes damaged in the earthquake, and 84% were located in the regions O'Higgins, Maule, and Biobío. While some were merely old and poorly built houses, others were located in zones that had been declared Zones of Historic Conservation. In some cities and towns without the historic designation, the new master plans, with input from local authorities, identified and delineated specific areas with historic patrimonial value so that residences could be allocated an additional amount of special heritage subsidy [MINVU 2010, 2011]. These included villages with

[12] Adoption of zoning plans by municipalities can take several years, so these served as reference documents until the plans could be adopted.

continuous facades and or covered sidewalks. In all, approximately 5000 units were designated as having historic value.

In some communities, MINVU encouraged contractors to develop a series of conventionally built reinforced masonry model homes with continuous facades to maintain an urban continuity in the streetscape (see Figure 2.5a). In others, a more traditional historic restoration was needed. In the town of Lolol (Region VI), architects devised a structural system with wood framing inside adobe finishes, while others used a straw-bale method of construction, maintaining the façades and covered sidewalks (see Figure 2.5b). These were not pure historic reconstructions but they allowed families to rebuild safely and preserve the town image, which was seen as crucial to maintaining their attraction as tourism destinations.

Although the National Monuments Council (Consejo Nacional de Monuments) exists for historic designations, there was no institutional framework or funds for repairing or rebuilding damaged historic homes. The homes in the national registry of historic buildings each needed approvals from the National Council, but at the same time the local SERVIU offices did not know how to handle approvals for adobe buildings for which no building code existed and which did not meet SERVIU rules, budget limits, and minimum size requirements. New regulations, checklists and approval processes had to be adapted for heritage projects.

(a) Continuous façade in Cumpeo. **(b) Adobe/wood construction in Lolol.**

Figure 2.5 Different approaches to historical reconstruction. (Photos courtesy of Mary Comerio)

In Vichuquén (Region VII), a small, isolated, but nationally known town with 400-year-old adobe construction, many families wanted to demolish their damaged homes, but the Mayor, a town native, argued that they should preserve the community. He sought advice from the National Monuments Council, took a team to Cusco, Peru, to learn about adobe construction and received substantial help from a heritage expert working for the Barrick Mining Company NGO. The Barrick Mining Company CEO had a previous relationship with the town and chose to support the repairs, not only with funding, but also with technical expertise. This meant that residential buildings eligible for SERVIU funds (US$30,000 to replace or US$11,000 for repair) could also receive an additional US$3,000 to US$30,000 from the Barrick NGO. Although there is significant variation from house to house, the average NGO grant is US$17,000 above the government subsidy. The construction work has created jobs for 5 small local contractors (not initially in the SERVIU registry), who learned techniques from Peruvian craftsmen and Getty Foundation repair manuals.

The Vichuquén experience is an excellent example of a public-private partnership in recovery but it is not without problems. The approvals process is time-consuming, and repair problems increased as damaged buildings sat vacant through two winters. Equally important, even after repairs, the town will have voids in the urban fabric as some owners may choose not to rebuild (for example, owners of second homes not eligible for subsidy). Further, there are concerns that the town's aging population will not stay or be capable of maintaining the historic properties, and some question whether the investment is appropriate or fair. Perhaps the large investment in these private homes should come with some restrictions on future sales or other measures to maintain the quality and viability of the town for future generations.

By contrast, Curepto, a town with similar architectural heritage buildings (see Figure 2.6), had a very different outcome. Here, in the immediate aftermath of the earthquake, the Mayor received an offer of heavy equipment to demolish heavily damaged buildings.[13] This gave owners clean sites but eliminated the possibility of restoring the heritage buildings. There are arguments for both positions. Graffiti on the side of one building read, "My real heritage is my sons, not this house, so let me demolish." Some owners may want to get on with life, while others want to preserve the old ways. The Ministry took an active role in heritage preservation, targeting funds and creating focused programs and partnerships, but they were also flexible in numerous situations, trying to find the balance between community and individual values.

(a) Vichuquén repair of street façade. **(b) Curepto main street after demolition.**

Figure 2.6 Two approaches to dealing with the damage: repair and demolition. (Photos courtesy of Mary Comerio)

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[13] One interesting case involves a large and heavily damaged building on Curepto's main street (not demolished after the earthquake) that is now in negotiation for government repair funds. One requirement will be that the street corridors and the interior courtyard be maintained as public space—evidence of an increased sophistication in the use of public funding.

3 Community Involvement In Reconstruction

One of the early decisions to make mayors responsible for the registry of damaged homes created an important opportunity for involving local government in the national housing recovery program. There is always an information crisis at the transition between the emergency relief stage and the development of recovery programs, so putting trust in mayors to account for local victims gave them the responsibility to accurately account for their citizen's needs. At the same time, because citizens came to the municipal offices to register, they connected with each other and with local government officials. This was particularly important in the first months after the earthquake, because the local governments were instrumental in linking citizens with emergency housing.

The installation of 80,000 shelters by the national government was accomplished with the collaboration of corporations and NGOs promoting a sense of "national unity" that characterized the emergency phase. Local governments tracked the needs of their citizens, and insured that families had shelter and other emergency aid, whether from the government or from donors.[14] Municipalities received some help for their efforts from MINVU through the Programa de Gestión de Calidad (PGC), which provided funding designated to strengthen a municipality's capacities and hire new professionals.

Similarly, using the regional SERVIU offices to manage applications for housing subsidies not only required each office to bolster its staff, but also took advantage of their local knowledge to manage the reconstruction process. Because they already had regular procedures for individual and social housing subsidy applications, they could use those and adapt their systems and norms for the national programs specific to earthquake reconstruction conditions.

3.1 ON-SITE HOME RECONSTRUCTION

The largest portion of the housing program was dedicated to families who needed to repair or replace a damaged home. Almost three-quarters of the total number of units receiving subsidies went to homeowners for repair (108,839) or rebuilding (53,822) (see Table 2.3). These families documented their housing damage in the registry, and then applied for subsidy through the local SERVIU office. The Ministry devised a number of alternative mechanisms to deliver

[14] The work done by local governments is similar to the "case-management" approach used by some NGOs and some government agencies in various disasters—creating a "one-stop-shop" to assist disaster victims with a variety of needs and problems.

assistance—with the goal of providing the homeowners choice in terms of who did the work and what kind of replacement house they could have.

To complete the repairs, owners could hire a contractor or do the work themselves. If the latter, they could acquire materials though a voucher program at local hardware and building supply stores. For reconstruction, the Ministry initially attempted to allow each individual owner select a model unit, but quickly realized that this was inefficient, because the damage was widely distributed throughout the regions. Instead, they grouped owners together in a town or village and had several builders make presentations on their products. The houses were typically about 50 m^2 in size (538 ft^2), either prefabricated or site-built, and either wood-frame or reinforced masonry, as shown in Figure 3.1 (a), (b), and (c). All were precertified by the Ministry, according to the minimum standards defined by the Ministry and existing construction norms. The families would listen to the presentations; discuss the various models and vote. The builder whose house model received the most votes would receive the contract for that community.

(a) Site-built wood house.

(b) Site-built masonry house.

(c) Prefabricated house.

(d) Elevated house.

Figure 3.1 Varieties of rebuilt houses. (Photos courtesy of Mary Comerio)

This system provided a mechanism for family choice and it also created economic incentives of scale for builders to work in rural regions. In some areas, the local SERVIU would develop a model house design so that small local builders could compete for the jobs. For the families who were living in an emergency shelter on the site, they were there to watch the construction of their homes, they got to know the builders, and they insured that few materials were ever stolen from the site. The builders were able to develop a reputation in the community and almost all grew their businesses, hired local workers and expanded their skill sets. Because the mining industry in the north of Chile absorbed many builders and workers, the opportunities for small- and medium-sized contractors to offer local construction jobs helped the economy of the earthquake-impacted regions.

Families made choices about the model units based on a variety of features. In some cases, people voted for the prefabricated units because they could be acquired quickly. For the elderly, or families with small children, this was often an important criterion. For some, their location influenced their decision. It was impossible to deliver a prefabricated home to some very remote home sites, as the building could be damaged driving over dirt roads. Some builders specialized in designing a model home where all the materials could be packed onto one truck and delivered to the site. In some cases, families chose reinforced masonry because it reminded them of what they had before, whereas in others, people chose wood frame because they were afraid of living in adobe or masonry. Sometimes, features added by the builders would sway the decision. A builder might include solar heating, a bay window, or extra finishes as part of their model, suggesting that the competition among builders increased as each became more comfortable with the program.

A housing program that allows families to stay on their home sites and choose a model home has produced genuine satisfaction[15] with the government recovery policy. One important feature of the program is flexibility. The Ministry has developed a capacity to adapt to unique needs and local conditions—such as continuous façade models for some urban settings as shown in Figure 2.5 (a), additional subsidies and specialized technical assistance for historic towns as shown in Figure 2.6 (a), elevated tsunami-resistant housing for waterfront communities as shown in Figure 3.1 (d), technical assistance for do-it-yourself (DIY) home builders, and special sanitary solutions for rural areas. The Ministry's flexibility—not only in house models but also in service delivery and subsidy funds—has certainly contributed to the general satisfaction with the owner-site recovery programs.

At the same time, the overall program is focused on the delivery of housing, and does not solve every family's social or economic needs. The government provided approximately 47,000 additional housing units through acquisition subsidies, new single-family home developments, and social condominiums (see Tables 2.2 and 2.3) for non-land owners in cases where two families were sharing or for renters in damaged units. However, the improved housing quality for two families does not replace the income derived from rent for the owner of the damaged larger home. Similarly, those who ran small enterprises out of their homes—everything from candy stores to machine repairs—also lost space for the economic activities that sustained the family. While this may be a minor criticism of the housing program, it points to a general lack of

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[15] In interviews with more than two dozen families, all expressed delight with their homes. The only complaint was frustration with the necessary paperwork.

integration with economic development, which will be discussed in more detail in Section 3.8 on Urban Planning. While other government programs were involved in efforts to rebuild local economies, it remains extremely difficult for the government to solve all the economic and social problems created by earthquake damage.

3.2 SOCIAL CONDOMINIUMS

The concept of citizen involvement is embedded in the social condominium program. The standard process, in place before the earthquake, required families with vouchers to organize through a committee with a community leader, who would then bring the group application for a social housing project to the SERVIU as part of the project development. This required a good deal of community organizing, but also a long lead-time because all the paperwork had to be complete before construction begins. After the earthquake, residents of social condominiums that were damaged were most likely to be sheltered in emergency camps, and had to be reorganized for new condominium projects. Some families took the option of moving to new developments of single-family homes nearby, but many chose to stay with their condominium group.

Overall, 21 social housing sites had damage. Some were truly uninhabitable because of damage, but others had a combination of repairable earthquake damage with extreme maintenance issues, old and small units, and social problems. For the older developments, the Ministry's calculation was that it would be more expensive to repair the existing buildings and bring them up to a contemporary standard than to simply replace the units. Approximately 8000 units were significantly damaged, but 30,000 additional units were needed to replace the poor quality units and accommodate the additional need from sublet renters and doubled-up families (Tables 2.2 and 2.3).

Each project was unique, not only in terms of physical needs but also in terms of how families made decisions. For example in Dichato, three projects had different outcomes. In one, a 91-unit existing project was left uninhabitable by the earthquake, but the families decided to rebuild on the site (which was not in the no-build tsunami mitigation zone). The community leader, Maria Angelica Torres, was actively involved in organizing families and lobbied for detailed improvements in the project design. This group of families moved into their units at the end of February 2012, two years after the earthquake, and is already planning to apply for subsidies to build extensions on some units.

In the El Molino Emergency village (about 1 km outside of Dichato, on a hill above the town as shown in Figure 3.2 (a), 450 families were displaced by tsunami damage, and many did not want to return to the town. Although the Ministry worked with the social leaders and families to insure that people had housing vouchers, the "freedom of choice" on where to live made the process slower, even as expectations were heightened. The frustrations led to a community strike, which blocked the main road into town in July 2011, and the President sent in Felipe Kast, a former Minister of Social Development, to work with the families. The social leader, Ximena Toledo, believes that the housing development now under construction across the road from the camp is a direct result of Mr. Kast's intervention. In fact, the site negotiations were in progress before the strike, but the high-level intervention helped calm the frustrations of people, who were living in difficult conditions. By October 2012, with 210 prefabricated houses under construction across from the camp and many more in the town, the mood has shifted. Ms. Toledo is already planning for future activities such as training residents to maintain their homes.

The number of homes on the site reflects family choices: 210 wanted to remain on the hill site, shown in Figure 3.2 (b), while others chose to go back to units in the town. Units are assigned in an interesting manner. The social leader gets first pick, followed by the six directors. Families with stores are distributed around the site on corner locations, and the remainder used a lottery. After the initial distribution, some sites were traded among lottery families. A subgroup of the families with elderly or disabled members will be placed in homes at the bottom of the hill for easier health care access.

When the families move into the new units in February 2013, three years after the earthquake, the Ministry will close the emergency camp and give each family the building materials from their emergency unit, worth approximately US$1000 to each family but not salvageable by the government. This settlement technique has been used in other camp closings to encourage families who might want to build an extension to their new homes and to eliminate continued use of the camps as informal housing settlements. In addition, dismantling the camp buildings will discourage families from staying in the camp in order to rent their new homes to tourists for the summer season. Thus, even closing the camps, which should be something to be celebrated, requires work on the part of local officials and social leaders.

(a) El Molino Emergency Village. **(b) New prefabricated housing under construction across the road from the village.**

Figure 3.2 Post-earthquake housing in Dichato. (Photos courtesy of Mary Comerio)

A third social housing project in Dichato provides a unique example of a project that was started before all the families were organized. This project is set back from the shore, but the condominium buildings are elevated to withstand a tsunami equivalent the scale of the 2010 event. Here the social leader, Ivonne Vera, who owns a small store near the site, could only organize 15 families to commit to the condominium site because families could not understand the project design. In this case, the Ministry went ahead with construction of 128 units (half the original planned size), knowing that the housing need in Dichato was great. Now, with units as shown in Figure 3.3 (a) under construction, families are impressed with the development and are asking the Ministry to complete the second portion of the site. This will be done as a general social housing program, not exclusively for earthquake replacement housing.

In Rancagua, the Villa Cordillera social housing project shown in Figure 2.2 (a) was built in the 1980s with 1950 units, ranging in size from 27 to 44 m^2. The project had roof and wall leaks and other maintenance problems before the earthquake, and while the damage could have been repaired, it did not seem reasonable or cost efficient. Because there were renters and families living in the houses of others (known as *allegados*), the total number of families who required housing units was not 1950 but 2900. A development of that size, with 55-m^2 units, would not fit on the site. However, families in three buildings decided they wanted to stay in place and negotiated repairs for those buildings, with the results shown in Figure 3.3 (b). Others chose to move to one of three new developments (with 400 units each) nearby, shown in Figure 2.2 (b). The remaining families will return to a newly designed, smaller project, with larger units, on the original site.

In Coronel, at the Mártires del Carbon project, another experiment with improving social condominiums was underway. While the earthquake did not severely damage this project, the redesign of the buildings was a pilot for other earthquake repairs of social housing. Here, the social leaders organized families in 3 buildings where the redesign converted 3 units into 2 units, enlarging each unit from 42 m^2 to 64 m^2. In the case of these three buildings, shown in Figure 3.3 (c), one-third of the families chose to move to other developments nearby, and the remainder stayed in one building during the renovation of the other two buildings. Once other residents of the complex saw the new units, they were eager to organize and participate in future renovations. The second phase of construction will start in 2013.

Overall, the social condominiums have strong citizen participation in organizing for the selection of housing unit types and family groups for buildings or projects. How this translates into other aspects of managing the community is less clear. As with many developments that concentrate low-income populations, there is also a concentration of social problems and a lack of services such as banks supermarkets, and police and fire stations. The Ministry has developed a "second chance" program called Blocks: Segunda oportunidad, to improve the lives of families living in extreme social vulnerability and overcrowded condominiums. The program will renovate or rebuild units to reduce density and improve conditions in older, problematic developments. Participation by families will be voluntary. This is clearly an important step—where general housing policy is learning from the earthquake recovery policy. However, as discussed in the next section, housing needs to be coupled with better urban and site planning to address public space, security, and other issues.

(a) Elevated social housing, Dichato.

(b) Repaired building in Villa Cordillera, Rancagua.

(c) Existing and renovated units under construction, Mártires del Carbon, Coronel.

Figure 3.3 Post-earthquake social-condominium housing. (Photos courtesy of Mary Comerio)

3.3 URBAN PLANNING

While Chile has a long tradition in the provision of social housing, its urban planning system is weak. According to Minister Rodrigo Pérez [2012, personal communication], there is no fully articulated policy, many actors, and little or no cooperation between government, municipalities, and the private sector. There are no metropolitan systems (Santiago, for instance, has 32 different municipalities), and it can take years to approve local plans. It is within this context that the Ministry approached post-earthquake planning and attempted to build a degree of coordination into the institutional framework.

As discussed in the above Section 2.4 on integration of urban planning with housing reconstruction, the post-earthquake planning efforts introduced the concepts of resilience and hazards mitigation, as well as master planning to cities and towns that had previously used only zoning as a planning instrument. While zoning designates what types of uses can be located in a particular area, the master planning was both proactive (in terms of hazard mitigation) and coordinated (in terms of targeting and encouraging specific types of short- and long-term development).

3.3.1 The Dichato Case

There were 18 coastal cities and towns in the Biobío Region that suffered extensive tsunami damage and the planning efforts brought new thinking on land use as part of the housing and community recovery [MINVU 2010, 2011]. In Dichato, with a population of about 4000, some 600 families (and 200 renters) were displaced by the earthquake and tsunami, which destroyed over 1300 homes. The town was particularly hard hit because of its geographic position and wave direction. The planning effort involved detailed risk analysis and the design of numerous mitigation elements, including a tsunami wall on the beachfront backed by a mitigation park with hills and trees. The park's size and layout were designed to reduce tsunami energy (from an event equivalent to the one of February 2010) by 35%. This meant that the original coastline was moved 20 m inland and 113 properties along the waterfront would be expropriated for the park, new roads, and other significant infrastructure. Housing could not be built until other infrastructure was completed, including the reinforcement of the river channel. These projects required funding from the Ministry of Public Works. Other ministries funded corollary projects. For example, Ministry of Education funding was used to move a school out of the hazard zone.

Only commercial activities would be allowed in the first zone behind the park; a second zone would allow elevated housing; and regular housing would only be permitted behind the elevated housing (see Figure 2.2). While these restrictions are currently in place for all subsidized (i.e., government-built) housing, they will become mandatory when the zoning plan is updated. However, given the public investment in infrastructure, the plan is effectively in place. These are dramatic changes to introduce to a community traumatized by their losses. Needless to say, people were not uniformly supportive of the changes. Those with homes or second homes in the expropriation zone did not want to lose their beachfront property. Fishermen and tourist-serving businesses were concerned about losing waterfront access and income. Families were divided over whether they wanted to return to living in town or move to higher ground.

Some of the community concerns and fears were alleviated by an experiment known as the Dichato festival. At one tense community meeting, where every issue appeared to be characterized by winners and losers in a zero-sum game, a local person, Claudia Gonzalez, raised her hand and said, "”Forget the other issues, what we need is jobs." Felipe Kast took inspiration from that discussion and asked a popular singer Miriam Hernández to do a concert to bring people into Dichato and create jobs, but her husband Jorge Saint-Jean suggested a one-month music and arts festival. Tickets were free and available by lottery on the Monday before the

Saturday performance, creating a buzz before each weekend. In all, 35,000 people came to Dichato in February 2012, and the concerts were broadcast live on television. The event was so successful that it will be replicated in February 2013.

Community anxiety has also been alleviated as citizens now see the housing construction underway. New waterfront infrastructure has given a new look to the city, and local businesses, some of which have operated for the past two years in an emergency mall, can now look forward to more permanent sites and anticipate a summer business cycle, as the goal for the infrastructure completion is February 2013 (Figure 3.4). Still, many citizens are deeply opposed to the tsunami park. They believe it is too big, and they are concerned about the lack of maintenance in the future. This type of public space is not in the Chilean culture. With the exception of traditional town plazas, little public open space exists in urban settings.

Although the government intends to create a maintenance entity located in the park, modeled after a park management organization for a large Santiago park, the local community is skeptical. The only open spaces they have experienced are the troublesome open spaces in large social housing developments. They cannot imagine that the park will be free of vandals or crime. These are legitimate concerns, which could be addressed through increased concessions and public uses (boat clubs for example) to give local merchants and civic groups a sense of ownership and control in the public spaces. The government-led planning effort is based on sound design principals, but additional steps are needed to bring local governments and community groups into long-term relationships that support the planning intentions.

(a) Tsunami wall and infrastructure. **(b) Fenced zone for mitigation park with new elevated single family housing behind.**

Figure 3.4 New waterfront infrastructure in Dichato is scheduled for completion in February 2013. (Photos courtesy of Mary Comerio)

3.3.2 The Talca case

Talca is a mid-sized city of 220,000 people and capital of the Maule region. Thirty percent of the city was severely damaged, because the center-city neighborhoods were filled with old adobe structures. The rubble was cleared in approximately one month and on-site emergency houses were used, just as in rural areas. Because many of the adobe houses were large, it was common for the owners to rent portions of the house. Thus, the vulnerable population in Talca was large, but they did not need emergency villages because other family members with undamaged homes took in displaced families. If Dichato had the worst damage, Talca was the second in terms of overall earthquake impacts.[16]

As discussed above, Talca had more than double the number of families in need because of the high number of renters in central neighborhoods. In some areas, it did not seem logical to simply rebuild 50-m^2 single-family homes on high-value land. In addition, given the need by displaced renters, new developments on the periphery of the city were inevitable. To counteract this trend, the Ministry created a program to add density to the city, by providing a subsidy to builders to develop infill center city sites with proximity to shopping, health care, and other services.[17] Earthquake victims in the registry would have first priority to purchase the condominiums (equivalent to a single family home voucher), but the builder would receive an additional loan of US$4800 per unit to cover the costs of urban construction. After a certain period, unsold condos would be made available on the market for people who qualify for regular subsidy programs.

One of these projects is under development in the Las Heras neighborhood (Figure 3.5). The goal of projects such as this is to keep families in the neighborhood and encourage higher density development in central neighborhoods. While the intention is laudable, it is not clear that the builder subsidies and complementary zoning is enough to regenerate central neighborhoods. The program will certainly add some multistory condominium buildings on larger sites, but greater public intervention may be needed to really transform the areas. Unlike Dichato, where the mitigation park and new infrastructure (necessitated by hazard reduction) reshaped the commercial core of the town, the Talca neighborhoods will not be reshaped by higher density housing on scattered sites. These neighborhoods will need sites to be grouped for high-density development, and more invested in public amenities as well as economic development to revitalize the communities; and that will require more planning tools than are presently available in Chile.

It is hard to criticize MINVU for a creative program that uses the subsidy tools available through the Ministry and adapts them to improve housing conditions in an urban setting. However, the situation in the Las Heras neighborhood, and in Talca in general, is complicated. Despite the fact that 60% of the damaged homes were adobe, there were no heritage zones in Talca, perhaps because the adobe homes were scattered among wood frame and masonry houses. While there is a mix of incomes in the neighborhood, almost half the residents were in the lowest income category. According to a study by the Public Policy Center at Catholic University,

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[16] Constitución was the third most impacted city. While not discussed in detail here, many of the planning issues were similar to those in Dichato.

[17] The urban densification program works differently than other Ministry housing subsidies. To qualify for subsidies, the project has to meet design guides established by the Ministry to preserve the urban image (e.g., height restrictions, façade details, first floor apartments, and public space). The subsidy varies according to the price of the units. Typically the subsidy ranges between US$14,500 and US$24,000 per unit, decreasing as unit prices rise. To ensure access to units for earthquake victims, the Ministry required that 20% of the units are limited to a price of $38,400. When the subsidy is deducted, the family would get a loan to pay US$14,400 for the unit [MINVU 2012b].

families in Las Heras and Abate Molina neighborhoods would stay in the neighborhood with or without the added density. The study also concluded that better coordination between housing and urban policy was needed, as well as better information and participatory processes [Mora and Polanco 2012, personal communication].

Figure 3.5 **Two views of an urban infill condominium project in Las Heras neighborhood, Talca. (Photos courtesy of Mary Comerio)**

A community leader in Las Heras echoed these views. She lived with two families in her damaged home, could not resolve the land tenancy problems, and missed the deadline for the registry. She is living in an emergency house on her home site. She does not believe the neighborhood is improved by the big condominium building. She is more concerned about the number of empty sites scattered throughout the neighborhood, and the extra distance her children must walk to school. It is understandable that she is wary of change. At the same time, her sentiments reflect deeper economic and social problems in the community.

Economic difficulties exist for families who have lost rental incomes from their old homes as well as social problems for families who may have depended on sharing arrangements for help with child or elder care. For these urban families, the provision of a basic house or condominium is not a full solution to their loss—especially if their old house was a source of income.

For the neighborhood, increased density on a few sites will not solve the loss of cohesion in the urban fabric. Ultimately, more urban planning tools are needed, such as a local redevelopment authority or enterprise zone. These and other contemporary planning instruments could create a variety of opportunities to:

- Acquire land for concentrations of commerce or mid-rise housing.
- Develop community services and amenities that will lead to neighborhood revitalization.
- Encourage community involvement in providing for a greater diversity of housing choice (including owners, renters and sharing arrangements).

This applies not only to Talca, but also to Curicó, Chillán, Constitución, and other mid-sized cities that have urban problems requiring urban-scale solutions. In these settings, housing is not necessarily the only tool needed to reconstruct the community.

4 Comparison With Other Housing Recovery Programs

Comparing the disaster losses and recovery programs of different countries is extremely difficult when local conditions make each situation unique. However, some generalizations can be made. The greatest loss of life tends to be concentrated in developing countries, whereas high property losses typically are a result of urban disasters in developed countries. The scale of housing loss is a combination of the earthquake intensity, soil conditions, tsunami generation, the level of building code enforcement, and the quality of construction. Housing recovery (and recovery in general) is often a combination of a proactive government role in the reconstruction process, opportunities for individual households community participation and available funding.

To measure the success of recovery, it is important to look at different scales of intervention over different time frames. Success in recovery will first depend on the scale at which that recovery is measured: at the level of the individual or household, at the level of the neighborhood or community, and at the level of the city or region. Success in recovery will also depend on the time frame in which recovery is measured: in years or in decades. Finally, the degree of success in recovery will depend on the perspective of the evaluator: a family, a community, a government, an outside funder, or an independent evaluator [Comerio 2005].

With the caveat that comparisons are difficult and tempered by differing perspectives and time frames, it can be useful to compare Chile's housing recovery to that in other countries with a strong central government role in recovery management and to those where recovery is characterized by a more limited government role. Table 4.1 provides a comparison of losses in six recent disasters, three (in blue) with strong national government leadership in recovery and three with more limited government roles.

4.1 STRONG GOVERNMENT RECOVERY MANAGEMENT

In the Chile case, there were extensive housing losses over a large geographic area in a country with excellent building codes but little insurance. The government took a proactive stance in raising taxes to fund recovery and to expand existing housing programs for low- and middle-income families. The government also ran parallel rebuilding programs for schools, hospitals and other infrastructure. Families were able to stay on their home sites and were allowed to chose among model homes. Plans for hazard abatement were integrated into coastal redevelopment and efforts were made to rebuild with greater density to counteract exurban development. The four-year goal for completing housing provided adequate time to adjust the programs to address unique local conditions, although larger urban settings may require more extensive planning interventions than housing subsidies can provide.

Table 4.1 Comparison of Losses in Selected Recent Disasters. (Blue indicates strong national government roles in recovery. (All amounts are in US Dollars.)

	U.S. H. Katrina 2005	**China 2008**	**Haiti 2010**	**Chile 2010**	**New Zealand 2010–11**	**Japan 2011**
Damage Value	$80B–150B	$30B–50B	$12B	$30B	$40B est.	$300B est.
Housing Units Lost	500,000	5 M	300,000+	370,000	10,000–15,000 est.	113,000 est. +evacuation
Deaths	1970	90,000	316,000	526	184	19,000

4.1.1 China

By comparison, the M 7.9 Sichuan earthquake of May 12, 2008, in western China, had extensive damage in a large and remote region. Good building codes exist in China, but regulations in the region were less vigorously enforced, resulting in a high death toll. The central government took a proactive role, requiring wealthier eastern provinces to contribute 1% of their GDP to the recovery, in a program where damaged cities were twinned with contributors. As was common in China, planning and central management was used to develop new towns and large-scale housing construction. The goal of moving families out of temporary housing after two winters meant there was little time to review building codes, little time to consult impacted residents about their desires or needs, and little environmental review of site selection. There was also no real choice of housing type or location available to families. China’s strong emphasis on expediency may have compromised overall construction quality and limited integration with jobs and social services. Thus, while the central government of China focused on a massive and speedy rebuilding program, they lost opportunities for sustainable development and hazards mitigation, as well as opportunities to reduce social vulnerability through coordinated efforts in jobs, health care, and other services. Further, victims had little choice in their housing options and many families were separated because new housing was not near jobs.

4.1.2 New Zealand

In Christchurch, New Zealand, the February 22, 2011, M.6.3 earthquake was one of a series of earthquakes that impacted the city, but this one—with an epicenter near the downtown—severely damaged the central business district. Widespread liquefaction also caused extensive damage to utilities and housing across the city. Here, losses were covered by government required earthquake insurance, provided by a national Earthquake Commission (EQC). Approximately 87% of the homes in greater Christchurch were damaged. Of those, 30% had major damage and 70% had minor damage [Markum 2012]. There have been approximately 459,000 claims and some NZ$3 billion (US$2.5 billion) paid out as of May 2012 [EQC 2012]. For residents, the wait for payment from the insurance claims and the government decision to zone land areas where rebuilding will and will not be allowed are sources of considerable stress.

Land was zoned red (no rebuilding allowed), orange (further study needed) and green (rebuilding allowed) based on geotechnical studies and assessments of where utilities could be replaced. More than 7000 homes in the red zones were offered a buy-out package to leave their unsalvageable houses. The government will buy their land (more than 700 hectares), which is now subject to an increased threat of river and ocean flooding. Another 2500 homes are on-hold in the orange zone pending further study. The green zone has been complicated by a subdivision into three subzones by the Department of Building and Housing. In these subzones, some 10,000–15,000 homes in Technical Category 3 may require substantial foundation work to be considered habitable. The homeowners in green TC3 are afraid that they will never be able to afford the complex structural foundation repairs or sell the homes in the future. Homeowners in TC 3 would rather be zoned red [Markum 2012]. These engineering standards are critical to the city's long-term redevelopment. Yet, the effect, when combined with uncertain job prospects due to downtown losses, could push many residents to leave the city, despite the insurance coverage intended to support home repair.

4.1.3 Italy, Turkey, and India

The M 6.3 earthquake in the Abruzzo region of Italy on April 6, 2009, devastated many small towns as well as the central city of L'Aquila and left more than 60,000 homeless. Within six months, the national government quickly built base-isolated housing for 15,000 people, on a variety of sites in the region. Intended as long-term temporary housing, the units would be repurposed as student housing after 20 years [Calvi 2010]. Although the effort was critical for many families with no housing options, larger recovery efforts have stalled for lack of funding. Families who did not receive the new housing lived in hotels and coastal towns (two hours away) for two to three years and many have relocated permanently. University students commute two hours from Avenzano. It is unclear how the university, the tourist industry, or local business will support their own recovery without greater housing stability.

Other examples of strong central government recovery management come from recovery efforts after earthquakes in Turkey (for example after the 1999 Kocaeli and Düzce earthquakes) and in India (after the 1993 Maharashtra and 2001 Gujarat earthquakes). In these cases, World Bank funding was channeled through national and state governments to support rebuilding programs [Mukherji 2010, 2011]. Although the finance mechanisms were different, the approaches were similar to those undertaken in China and Italy with heavy investment in replacement units in new developments. Some limited efforts by NGOs engaged small subsets of the affected population in self-building and repair programs.

There is no single approach to housing recovery. In all these cases, governments used existing agencies and programs to deliver housing after disasters. Some, as in China and L'Aquila, Italy, were highly centralized with little opportunities for housing choice or participation in planning by the citizenry, while others provided varying degrees of flexibility and housing choice to earthquake victims (although in many cases constrained by the limits of available funding and engineering requirements). For the more recent events, it will be valuable to re-examine the relationship between post-earthquake housing construction and community economic and social stability ten years post-event to see how the impacted populations have fared.

4.2 LIMITED GOVERNMENT MANAGEMENT WITH PRIVATE INVESTMENT

The U.S. and Japan are similar in their approach to a more limited role for government in disaster recovery, with a focus on public funding primarily for infrastructure, limited government support for housing (and all private sector recovery), and a general lack of disaster insurance for homes.

4.2.1 Hurricane Katrina, U.S.

The largest U.S. disaster in recent years was Hurricane Katrina, which devastated New Orleans and the Gulf coast in August 2005. The damage was distributed over a large geographic area but included one major city, New Orleans. With 100,000 New Orleans units (50% of city households) and 400,000 units lost across the Gulf Coast region, there was not enough capacity to provide temporary housing (such as mobile homes and trailers). Many families were evacuated to other cities and states.

Government flood insurance[18] did not cover all of the storm damage for homeowners, and all government assistance programs were hampered by politics at all levels of government. Housing repairs and reconstruction required substantial private investment and relatively little low-income and multi-family housing was rebuilt. New Orleans now has about 25% fewer habitable housing units than before the storm. Similar issues will arise with the most recent hurricane, Sandy, which hit New York and New Jersey in October 2012, where public investment in infrastructure will encourage private investment in high-income areas but leave lower income regions with few options for recovery finance.

4.2.2 Tohoku, Japan

Japan's March 11, 2011, Great Eastern Japan earthquake and tsunami devastated a large coastal region, similar in scale to the region affected in the Chile earthquake. Because of the additional complexity created by the nuclear power plant damage, housing recovery will go beyond the replacement of disaster losses to include long-term evacuation from undamaged communities affected by fallout. With limited insurance for homes, declining economies as well as an aging population in coastal fishing villages, and complex social adjustments for nuclear-displaced families, there will be a prolonged recovery which will require a combination of public and private investment. Studies estimate that rubble removal alone will take three years. Coastal

[18] There is no equivalent government insurance for other disasters such as tornados or earthquakes.

planning similar to that undertaken in Chile to mitigate tsunami hazards has been completed, however decision making, distribution of funding and plan implementation are taking place at central government, prefecture, and the local municipality level without good coordination [Maki 2012].

Past events in the U.S. and Japan—the 1989 M 7.1 Loma Prieta earthquake in the San Francisco Bay Area, the 1994 M 6.8 Northridge (Los Angeles) earthquake, and the 1995 M 7.2 Hanshin-Awaji (Kobe, Japan) earthquake—discussed below, demonstrate the outcomes from a limited government approach to housing recovery.

4.2.3 San Francisco Bay Area, U.S.

Some 15 years after Loma Prieta, major investments in public infrastructure brought about the transformation of the San Francisco waterfront (resulting from the demolition of the Embarcadero freeway), and the rebuilding of museums, cultural, and civic buildings. The Hayes Valley neighborhood was also revitalized, with the replacement of the damaged Central freeway with a boulevard design. By contrast, only 75% of the total housing destroyed by the earthquake was replaced ten years after the event. While high-income areas recovered quickly, many residents of low-income, single-room occupancy hotels and apartments were left homeless after the Loma Prieta earthquake. The time-consuming repair and replacement of these units was largely carried out by nonprofit housing groups, which meant that no additional units of affordable housing were added in the decade after the earthquake [Comerio 1998, ABAG 2000].

4.2.4 Los Angeles, U.S.

After the Northridge earthquake, almost 300,000 owners of damaged single-family homes made claims on their earthquake insurance; repairs required two to five years to complete. Rebuilding multifamily housing was more difficult. Two-thirds of the 59,000 multifamily units declared uninhabitable required 5 years for repairs, while the remaining one-third were abandoned or torn down [Comerio 1996, 1998]. High rental vacancies in the San Fernando Valley at the time of the earthquake provided families with relocation options so people were not displaced. The rebuilt apartments typically served newcomers to the area.

4.2.5 Kobe, Japan

In Kobe, some 400,000 housing units were damaged or destroyed. The government provided 48,300 temporary units, which were occupied for 6 to 8 years after the event. A complex planning process involved a variety of land-use and zoning adjustments to aid the rebuilding process, which were effective but time-consuming. The government set a target of 125,000 replacement-housing units, of which 38,600 were designated for low-income people. The Phoenix plan stated that two-thirds of the new units were to be built by the public sector and one-third by the private sector. Five years after the event, private sector housing was being built much faster than public sector housing, particularly in outlying areas [Preuss 1998; Olshansky, Johnson, and Topping 2005]. Although the overall housing replacement goal was ultimately met, many of the earthquake victims were displaced and new housing in Kobe served a gentrified population. Some 10% of Kobe population left the city and it took 10 years for the population to return to pre-earthquake levels [Maki 2012].

Both the U.S. and Japan are developed nations, willing to accept a higher reliance on the private sector for disaster recovery, even if that recovery is uneven across income groups. In developing countries, a limited government role in disaster recovery can extend the hardships for disaster victims.

4.2.6 Port-au-Prince, Haiti

The devastating recent losses in Port-au-Prince from the January 12, 2010, M 7.0 earthquake—in terms of the number of deaths as well as the physical losses in housing, schools, hospitals and public buildings—extend to the capacity to manage the country. Haiti lost a significant portion of its weak national government in the earthquake and was already dependent on the NGOs for many social services [Farmer 2011]. For any developing country, the losses incurred in natural disasters are in part products of their predisaster conditions—poverty and lack of jobs, education, and training. Post-disaster, the problems are often compounded by the unintended consequences of international aid. In Haiti, less than 1% of the aid went to the public sector, and yet, long-term recovery requires a functioning public sector. An NGO can build a school or a clinic, but the building is of limited use without a public mechanism to pay teachers or nurses.

Here again, it is too early to know the outcome of the recovery and reconstruction efforts in Haiti. There are hopeful signs that the Ministry of Public Works is involved in the development of building standards and the coordination of NGOs. A new Ministry of Housing has been created and many people have left the emergency camps, although their living circumstances remain uncertain. As of December 2012, there are still 357,000 Haitians in 496 tent camps [Sontag 2012], and much remains to be done in the resolution of land ownership, the development of public services (water, sanitation, education and health care), job training, and economic development along with the provision of housing.

4.3 COMPARISON OF PROGRAMS

When the housing recovery in Chile is compared to other countries, two metrics stand out: (1) a strong or weak role of government in management and coordination, and (2) more or less individual choice in housing combined with citizen participation in larger planning processes [Comerio 2012]. A more limited government role will undoubtedly lead to a more uneven recovery, while a more holistic, human-centered, participatory approach will promote the capacity for affected populations to make decisions on their own behalf and encourage local institutions (both governmental and non-governmental) to develop fair and coordinated redevelopment plans.

The chart in Figure 4.1 is a way of looking at the balance between government roles and citizen participation. While the placement of each country is based on the author's judgment, the aim is to represent the variety of approaches used, for better or for worse. The chart shows that Chile and New Zealand have combined both "top-down" and "bottom-up" approaches, providing government leadership and funding along with community empowerment in decision-making. It is important to recognize that these approaches are not mutually exclusive, and can be effectively combined. By contrast, China and Italy took strong government leadership roles in providing replacement housing but did not engage local communities in most aspects of the decision-making. Turkey and India had mixed programs—with some housing developed by government in large tracts and some village programs where NGOs worked with residents on self-help construction. The U.S. and Japan provide strong leadership during the emergency phase and fund some aspects of recovery such as infrastructure and public facilities, but leave most of the housing reconstruction to the private market. Haiti's weak government and high levels of poverty have limited recovery from both perspectives.

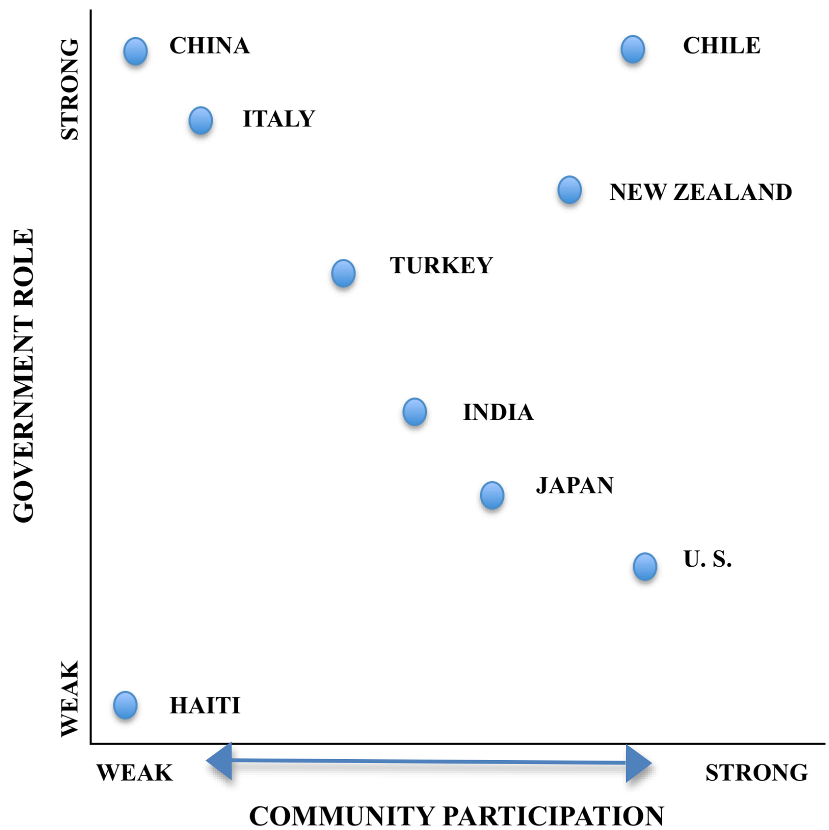

Figure 4.1 Comparison of recovery management approaches.

In the future, countries with major housing losses in a disaster can learn from the experience of others and attempt to find the "sweet spot" which provides the best of government management for expediency and flexibility and incorporates opportunities for citizens to take some control over their own recovery, with housing choice and participation in plans for the community's future. In this, Chile's performance stands out.

5 Conclusion

After a disaster, those who have lost homes and all semblance of normal life, may be confused, disorganized, and demoralized. They grieve for what was lost. Their needs go beyond physical replacements. Family-focused approaches—that is, recovery programs that engage citizens in decisions about the future—have the advantage of empowering these individuals, turning passive into active, lack of control into control, and promoting community engagement. Psychiatrist, Dr. Craig Van Dyke [2012] writes, "…the grief literature describes the endpoint of successful mourning as a point when the individual is capable of making new emotional investments in the future. It is not defined by happiness or even well-being. Rather it is an acknowledgment that one is forever changed, but it is time to get on with life and make new investments and not have one's personal development permanently arrested."

In Chile, the housing recovery program has helped the great majority of earthquake victims to restart their lives in a reasonable time frame. With 121,000 families (more than 50% of the allocated subsidies) already living in repaired or rebuilt homes and condominiums just two and a half years after the earthquake, it is a testament to the design and implementation of MINVU's reconstruction plan. The plan benefited from strong leadership at the national level. The political commitment by the newly elected government was critical to funding and managing the overall process. In addition, the young professional leadership by engineers, architects, and urban planners in the Ministry and among the regional SERVIU staffs, and technical assistants was exemplary. These individuals combined best professional and technical practices with creative thinking to craft flexible and targeted programs that were manageable and accountable by government standards. They worked within existing programs and institutions, but they rewrote the plan and stretched the rules to accommodate the varied conditions they encountered among the damaged housing and family circumstances. Ultimately, the flexibility in both program development and implementation is critical to its success. Of course, a good economy and good political timing (the transition to a new administration) were helpful, providing the capacity to finance the programs and the opportunity to bring in new leaders and new thinking into existing government programs. Ten lessons emerge from the Chilean experience that can be useful to other nations coping with a large-scale disaster and extensive housing losses:

1. Accept that disasters create anxiety and opportunity. It takes government leadership—at national and local levels—to manage both.
2. Acknowledge that existing programs and institutions have the benefit of in-place staff, procedures, and budget lines.

3. Recognize that many existing programs will not fit with disaster conditions. Thus, governments and other participants must be willing to be flexible, to adapt, and to develop new programs within the existing structures.
4. Hire young and forward-thinking managers to run programs, and back them up with seasoned politicians to be the public face of the recovery efforts.
5. Recognize that national unity will last only a few weeks or months and that disasters require a vast effort to manage information and expectations.
6. Recognize that cooperation between the national and local levels of government is essential—programs need local input and cooperation to succeed.
7. Recognize that need for human "case-management"—that is, processes to help victims with all of the many problems they encounter after a disaster. This includes food and shelter, medical help, childcare, jobs, alternate jobs, and most important, their expectations.
8. Recognize that it takes time to implement a recovery effort. In the first year, it may be possible to fix basic infrastructure, but major urban redevelopment and new civic institutions can take 10-20 years.
9. Accept that large-scale housing reconstruction, the first year will produce few tangible results. While the process of developing loss data, programs, and finance is underway, keep families on their home sites, if possible, and build a large variety of model homes developments to help families living in shelters to understand the next phase. A long-term vision helps to explain the realities of construction times as well as the social and economic recovery goals.
10. Find the balance between government assistance and individual responsibility, government leadership and community involvement in all recovery efforts. Post-disaster assistance should enable citizens to recover, not create entitlements.

Beyond the direct lessons, it is also important to note that the transition from creating a recovery program to winding it down requires continued planning and creative improvements. For the families at the "end of the queue"—those who will not move into a rebuilt home until the end of the third or fourth year of the program—it might be valuable to think of ways to thank them for their patience. While the disaster research community may view the recovery as accomplished in record time, three to four years is a really long time for families coping with cramped, temporary accommodations.

Even in Chile, there are considerations that must be made for the future. For government staff (especially, for example, the staff that was added to SERVIU offices at the regional levels), the Ministry will have to think about how these jobs will evolve and change, and how to take advantage of the skills learned in the earthquake recovery program for future initiatives. One of those initiatives will be the need for planning and design tools as well as political and practical changes at the national and municipal levels as part of a national urban policy, now under discussion. Historically, the government, through the ministries, has invested in improving the physical conditions for housing, infrastructure, schools, hospitals, and other public services. Going forward, the earthquake has pushed the SERVIU to think beyond housing supply and consider the role of urban planning and citizen participation. This will require significant professional development, coordination across traditional disciplines, and political changes—all necessary next steps. Thus, to go beyond measuring the success of disaster recovery through specific rebuilding programs, it is also important to evaluate whether reconstruction will enhance community resilience and develop community engagement. In the long term, Chile's changes to urban design and development policies will continue to contribute to the formal recovery programs. The earthquake may have a legacy far beyond a successful recovery, if the recovery efforts begin a new phase in national urban policy and provide a larger planning framework at the local level where citizens can participate in the planning process.

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