

Support Measures for Reconstruction of Condominiums Damaged by Earthquakes Comparative Study on the Hanshin-Awaji Earthquake of 1995 in Japan and the 921 Chi-Chi Earthquake of 1999 in Taiwan —

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Abstract

The aim of this study was to compare the characteristics of reconstruction of condominium buildings and the associated support measures for the Hanshin-Awaji Earthquake of 1995 in Japan and the 921 Chi-Chi Earthquake of 1999 in Taiwan. We found that the system and structure of support after both earthquakes were similar: the basic measures included subsidies, interest subsidies, deregulation for rebuilding, and participation of semi-public organizations. After the 921 Chi-Chi earthquake, the objectives were both rebuilding and repair, and these were supported by an extensive and multiple system involving both government and a semi-public fund, whereas after the Hanshin-Awaji earthquake, the principal objective was rebuilding, and this was expedited by rapid modifications to existing systems. Despite the presence of powerful supporting mechanisms, progress in rebuilding following the 921 Chi-Chi earthquake was slower than that following the Hanshin-Awaji earthquake because of the relocation of owners and delays in the establishment of support measures. In the case of the Hanshin-Awaji earthquake, the immediate arrangement of supporting measures and the time limit on demolition of damaged buildings at public expense expedited rebuilding not only of heavily damaged buildings, but also those with medium damage.

Keywords: condominium, reconstruction, rebuilding, repair, support measure, earthquake

1. Introduction

The Hanshin-Awaji earthquake in Japan and the 921 Chi-Chi earthquake in Taiwan both hit city areas and caused considerable damage to many apartment buildings. Because most of these apartment buildings were condominiums (multi-owned residential buildings), their various owners had to arrive at agreements regarding the rebuilding or repair of the damaged buildings¹. Attaining such an agreement among the many owners of the units was very difficult because of the high costs of construction, differences in demand for housing, and other factors. To solve these problems and to realize reconstruction projects for the damaged condominiums, some support measures, which were generally instated by the relevant public sectors, were necessary.

Previous studies on the reconstruction of condominiums following the Hanshin-Awaji earthquake have concentrated on the actual situation and problems¹, consensus among unit owners², and roles of consultants³; only a few academic studies have concentrated on support measures. For the 921

Chi-Chi earthquake, research studies have been published on success factors for reconstruction projects⁴, consensus among condominium owners⁵, and reconstruction policies⁶. No study has attempted to compare reconstruction policies following the two earthquakes, with a focus on condominiums².

Our aim in this study is to compare differences in policy regarding the reconstruction of condominiums between the two earthquakes, and to describe the characteristics in each case. We investigated support measures for rebuilding and repair of damaged condominiums following both earthquakes, and we examined the effectiveness of these measures. The data used in the analysis were collected from reports published by national and local governments, articles written by researchers, and interviews of officers, specialists, and leaders of condominium residents.

2. General Conditions for Condominium Reconstruction (1) The Hanshin-Awaji Earthquake

The numbers of condominium buildings that were damaged in the Hanshin-Awaji earthquake are listed in Table 1. Surveys by different groups give differing numbers of buildings, but it is safe to say that the number of buildings where damage was categorized as “heavy” or “medium”, and which therefore required rebuilding, was roughly 180. These buildings are assumed to consist of approximately 12,000 units,

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corresponding to about 2.6% of the housing stock where damage was categorized as “heavy” or “medium” (460,357 households).

With respect to plans for reconstruction, owners of about 50–60% of the condominiums where damage was heavy or medium intended to rebuild their properties. Repairs were performed on about 30–40% of the buildings. In the case of six buildings (3.5%), the owners planned to sell the site and dissolve the common ownership. Although eight years have passed since the earthquake, owners have not decided on plans for reconstruction in the case of three buildings (1.7%). Data from Tokyo Kantei (an estate investigation company), reported in Table 1, show that the intention was to rebuild most of the heavily damaged buildings; it should also be noted that there were plans to rebuild nearly 30% of buildings where damage was classified as medium and where repairs would otherwise be possible.

(2) The 921 Chi-Chi Earthquake

The numbers of condominium buildings damaged in the 921 Chi-Chi Earthquake are listed in Table 2. Data are taken from figures supplied by the 921 Earthquake Post-Disaster Recover Commission. Data for June 2005 show that 163 condominiums were heavily damaged and needed to be demolished and rebuilt, and 145 condominiums sustained medium levels of damage for which the estimated repair cost was more than half the cost of rebuilding. These damaged condominium houses comprise a total of 29,204 units; these are assumed to be equivalent to 34.7% of the housing stock where damage was categorized as “heavy” or “medium” (84,255 units).

With regard to plans for reconstruction, plans were made to rebuild 87.7% of the heavily damaged condominiums, and only one building was scheduled for repair. Almost all the buildings with medium damage were scheduled for repair. Owners of five heavily damaged buildings (1.6% of the total) opted to reconstruct houses at new sites instead of rebuilding on the original site. There are 14 buildings with heavy or medium damage where the owners have not been able to decide on a course of action although six years have passed since the earthquake.

(3) Comparison of the Two Earthquakes

It is roughly twice as many buildings suffered heavy or medium damage in the 921 Chi-Chi

earthquake than in the Hanshin-Awaji earthquake, and there are big differences in the ratios of damaged condominiums to the damaged housing stock as a whole: in the case of the Hanshin-Awaji earthquake, this was about 2.6%, whereas in the 921 Chi-Chi it was about 35%. From these numbers, one can say that more condominiums were damaged in the 921 Chi-Chi earthquake than in the Hanshin-Awaji earthquake, and support for damaged condominiums was therefore a more important issue in terms of housing-reconstruction policy following the 921 Chi-Chi earthquake.

One feature of the Hanshin-Awaji earthquake is the comparatively high rate of rebuilding of condominium buildings with medium levels of damage. On the other hand, no plans were made to rebuild any buildings that sustained medium levels of damage in the 921 Chi-Chi earthquake. Because the announced numbers of buildings with various levels of damage have varied as time has passed since the 921 Chi-Chi, it appears that judgments regarding levels of damage have been modified to correspond with the chosen method of reconstruction.

Rebuilding at new sites is a unique characteristic of the 921 Chi-Chi earthquake. According to interviews with some leaders of the owners of reconstructed condominiums, the reason for moving to new sites is that many of owner-occupiers were afraid of living at the same site where the former building collapsed and the family had died. The high rate of buildings where plans remain undecided is also an important characteristic of the 921 Chi-Chi earthquake: the percentage for heavily damaged buildings is 8.6%, a much higher figure than in the case of the Hanshin-Awaji earthquake (1.7%).

3. Support Measures for Reconstruction

The main measures for supporting rebuilding and repair and their start times are shown in Tables 3 and 4. In these tables, the listed measures are those that apply to condominiums in particular; these do not apply to detached houses or rented apartment housing³. The support measures may be divided into seven categories: 1) simplification of legal procedures; 2) deregulation for rebuilding; 3) subsidies for reconstruction costs; 4) loan and interest subsidies; 5) participation in reconstruction projects by the public sector; 6) support for planning and consensus; and 7) relief for unreconstructed cases.

Table 1. Numbers of condominium buildings damaged in the Hanshin-Awaji Earthquake

Source	Hyogo Prefecture (Mar. 2003)			Tokyo Kantei (Estate Investigation Company) (Dec. 1999)							
	Heavy & Medium		Heavy	Medium	Total						
Total	172	100%	11626	100%	83	100%	108	100%	191	100%	
Plan	Rebuilding	108	62.8%	7193	61.9%	65	78.3%	31	28.7%	96	50.3%
	Repair	55	32.0%	4210	36.2%	12	14.5%	75	69.4%	87	45.5%
	Sale of Site	6	3.5%	119	1.0%	5	6.0%	1	0.9%	6	3.1%
	Undecided	3	1.7%	104	0.9%	1	1.2%	1	0.9%	2	1.0%
		Buildings	Units		Buildings		Buildings		Buildings	Units	

Table 2: Numbers of condominium buildings damaged in the 921 Chi-Chi Earthquake

Source	921 Earthquake Post-Disaster Recovery Commission (Jun. 2005)										
	Heavy			Medium			Total				
Total	163	100%	11543	145	100%	17661	308	100%	29204	100%	
Plan	Rebuilding	143	87.7%	9218	0	0.0%	0	143	46.4%	9218	31.6%
	Repair	1	0.6%	801	144	99.3%	17645	145	47.1%	18446	63.2%
	Rebuilding at New Site	5	3.1%	872	0	0.0%	0	5	1.6%	872	3.0%
	Undecided	14	8.6%	652	1	0.7%	16	15	4.9%	668	2.3%
		Buildings	Units		Buildings	Units		Buildings	Units		

3.1 Support Measures for Rebuilding

(1) The Hanshin-Awaji Earthquake

Support measures for rebuilding in the case of the Hanshin-Awaji earthquake are shown on the left-hand side of Table 3. In category 1), a special law regarding the rebuilding of completely collapsed condominiums was enacted: this law provided procedures for rebuilding in the case where the agreement is difficult.

In category 2), the Comprehensive Design System was specially modified for the case of earthquake restoration. A degree of deregulation was extended, and some conditions that normally apply to this system were relaxed. In addition, some building regulations were applied with increased flexibility.

Category 3) includes various types of subsidy handled by different sectors. The subsidy system for building-improvement projects, established by the national government, was expanded for the case of earthquake restoration, conditions regarding when subsidies were applicable were relaxed, and the subsidy rate was increased by two-thirds to four-fifths. A subsidy for activities relating to rebuilding damaged condominiums was established by the local government, and subsidies for joint housing projects were established by the Hanshin-Awaji Earthquake

Disaster Restoration Fund (hereafter referred to as the "EDR Fund"). These two subsidies applied to small buildings for which the subsidy system for building-improvement projects did not apply.

In Category 4), there were many types of loans and subsidies, such as loans from the Governmental Housing Loan Corporation and an interest subsidy for this loan. These measures were available to owners of damaged houses: owners of condominiums could also make use of them. An additional interest subsidy by the EDR Fund was made available as a special measure for rebuilding of condominiums.

Activities in Category 5) are operated by the Local Housing Supply Corporation. This organization participated in rebuilding projects by purchasing properties from owners who opposed rebuilding and did not wish to join the project. In some projects, they purchased all the ownerships, built a new building with a fixed-term land lease, and sold tenancy rights back to the original owners. The EDR Fund supported these projects by subsidies for planning costs and land rents.

In Category 6), the local and municipal government sent advisers to help the activities of the owners. Fees for advisers were subsidized by the EDR Fund.

Table 3. The Main Support Measures Specially Designed for the Rebuilding of Condominiums

The Hanshin-Awaji Earthquake, Japan 1995.1.17		Category	The 921 Chi-Chi Earthquake, Taiwan 1999.9.21	
Name and Outline of Support Measures	Start		Name and Outline of Support Measures	Start
Law on Special Measures for Rebuilding Damaged Condominiums - Collapsed building can be rebuilt by mutual consent of more than 80% of owners. - Owners must deal with the legal procedures for rebuilding within one year.	1995.3	1) Simplification of legal procedure	921 Temporary Act for Post-Earthquake Reconstruction - Simplification of procedure on rebuilding by Urban Regeneration. - Damaged building can be rebuilt or repaired by mutual consent of more than 50% of owners.	2000.2 2000.11
Earthquake Restoration Comprehensive Design System - Deregulation of floor area ratio within the area of the former building. - Reduction of minimum size of applicable buildings in comparison with the ordinary system. - Deregulation of some conditions to apply this system.	1995.3	2) Deregulation for rebuilding	921 Temporary Act for Post-Earthquake Reconstruction - Addition of extra bulk within the limits of 0.3 times the bulk determined by the building regulations in the case of Urban Regeneration. - Deregulation of height restrictions.	2000.2 2000.11
Flexible Apply of Building Regulation - Deregulation of height restrictions and shadow restrictions.	1995.3			
Expansion of Subsidy System for Building-Improvement Projects - Reduction of the minimum size of applicable buildings. - Deregulation of some conditions to permit the application of this system. - Increase in the subsidy rate for planning and construction of common facilities.	1995	3) Subsidy for reconstruction cost	Subsidy for Removal Cost of Basement Subsidy for Sewage-Treatment Facilities Support Program for Rebuilding of Damaged Condominiums (921) - Subsidy for activities of owners' association in case of Urban Regeneration. - Subsidy for planning cost to planners who cooperate with owners' association.	1999 1999 2000.9
Subsidy for Activities of Rebuilding on Damaged Condominiums - Subsidy for costs of planning and agreement among owners and neighborhood.	1995		Subsidy for Planning Cost - To subsidize whole costs of planning in case of Urban Regeneration.	2001
Subsidy for Joint Housing Project (EDR Fund) - To Subsidize 2/3 of costs for planning and construction of common facilities.	1997			
		3) & 4)	"Touchdown" Program (921 Fund) - Subsidy for construction of common facilities and interest subsidy for a loans in case of reconstruction project jointly operated by owners and developers.	2004.2
Interest Subsidy for Rebuilding of Damaged Condominiums (EDR Fund) - Interest subsidy for a rebuilding loan from the Government Housing Loan Corporation.	1995.3	4) Loan and interest subsidy	Interest Subsidy for Purchase of Ownership - For a loan to purchase ownership from owners who do not join the rebuilding project. Loan for Structural Improvement Projects - Loan to owners when they use a steel frame for earthquake proofing of rebuilt buildings in the case of Urban Regeneration.	2000.11 2000.11
			"Crossing the Threshold" Program (921 Fund) - Loan to owners who cannot pay expense of rebuilding temporarily. - Interest-free loan for owners who do not have security in the case of Urban Regeneration.	2001.4 2002.1
Support Project for Rebuilding of Damaged Condominiums (Local Housing Supply Corporation) - Participation of the Local Housing Supply Corporation in rebuilding projects. - Purchase of nonparticipants' ownerships and sale of rebuilt new houses. - Purchase of all ownerships of site and rebuilding with fixed-term land lease.	1995.4 1996.4	5) Participation in reconstruction project by public sector	"Crossing the Threshold" Program (921 Fund) - Short-term loan to owners' association for purchase nonparticipants' ownerships in case of Urban Regeneration. - Ownerships of unsold houses are transferred to the 921 Fund at the end of the process.	2001.4
Subsidy for Rebuilding using Fixed-Term Land Lease (EDR Fund) - Subsidies for planning costs and land rents in projects by Local Housing Supply Corporation.	1996.4			
Support Program for Community Development - Dispatch of advisers for support of planning and agreement and subsidy for advice fees by EDR Fund.	1995	6) Support for planning and consensus	Support Group for Condominium Rebuilding - Organization of architect groups and dispatch to each condominium for support. Working Manual of Condominium Rebuilding	1999 1999
		7) Relief to unreconstructed cases	921 Temporary Act for Post-Earthquake Reconstruction - If owners cannot rebuild building after demolition, government will acquire ownerships and make compensation for these rights.	2000.11

(2) The 921 Chi-Chi Earthquake

Measures for supporting rebuilding following the 921 Chi-Chi earthquake are shown in the right-hand side of Table 3. In category 1), the 921 Temporary Act for Post-Earthquake Reconstruction was enacted. It included a wide range of provisions on reconstruction, and it provided some rules, such as the required ratio of owners opting to rebuild or repair (over 50% of all owners).

Category 2) support is provided by the same act. In the case of Urban Regeneration, extra volume was added to condominiums that were rebuilt. The Urban Regeneration system is a national system for renewal of urban areas, and the government recommended it for rebuilding of damaged condominiums.

Category 3) consists of two types of support: one is applicable to every condominium and covers the removal or construction of common facilities; the other is applied to rebuilding under the Urban Regeneration system and covers planning and consensus costs. The latter subsidies were given by the government and the 921 Earthquake Reconstruction Fund (hereafter referred to as the “921 Fund”). The 921 Fund is a semi-public foundation based on contributions from citizens, and the fund supported reconstruction from a different standpoint to that of the government.

Measures in category 4) are also provided by the government and the 921 Fund. To support the creation of a consensus, interest subsidies from the government were supplied to people who wished to use loans to purchase ownership from nonparticipating owners. The government provided special loans for earthquake proofing using a steel frame. The 921 Fund developed a unique program named “Crossing the Threshold” for support in the final stages. In this program, the 921 Fund loaned rebuilding payments to owners who did not have enough money or could not borrow it from a bank because of a lack of security. This program was a short-term loan that applied only in the case of Urban Regeneration. There was a measure that combined subsidies with interest subsidies: the “Touchdown” program was established by the 921 fund to support projects that did not meet the requirements of the “Crossing the Threshold” program.

Category 5) support is supplied by the 921 Fund. The “Crossing the Threshold” program included several items in which the 921 Fund was concerned with ownership. Owners’ associations purchased ownership from nonparticipants with a loan from the 921 Fund, and the association sold the newly rebuilt houses. When houses were sold, the association returned the loan with the income; when houses remained unsold, the ownership of unsold houses were transferred to the 921 Fund. By this process, the 921 Fund effectively purchased ownership and participated in rebuilding project as an owner.

In category 6), the government organized groups of architects and sent them to each condominium for support. An operations manual for these architects and the owners of damaged condominiums was also established.

Category 7) was provided in the 921 Temporary Act for Post-Earthquake Reconstruction. There were some provisions regarding the tasks of the government when condominiums proved impossible to rebuild.

3.2 Support Measures for Repair

Support measures for repair following the Hanshin-Awaji Earthquake are shown on the left-hand side of Table 4. Interest subsidy for repair of common facilities with loans from the Government Housing Loan Corporation was the only measure that was designed especially for condominiums.

Measures in the 921 Chi-Chi Earthquake are shown on the right-hand side of Table 4. Subsidies for repair of common facilities were provided by the government and the 921 Fund. As a result of these subsidies, 70% of the cost of repairing common facilities was supplied. Subsidies and support for planning and consensus were also available. The government established an organization to evaluate the safety of buildings, and a commission system for checking the quality of repairs for the purpose of reducing the number of disputes.

3.3 The System of Support Measures

The systems of support measures for rebuilding following the Hanshin-Awaji earthquake and the 921 Chi-Chi earthquake are illustrated in Figures 1 and

Table 4. The Main Support Measures Specially Designed for the Repair of Condominiums

The Hanshin-Awaji Earthquake, Japan 1995.1.17		Category	The 921 Chi-Chi Earthquake, Taiwan 1999.9.21	
Name and Outline of Support Measures	Start		Name and Outline of Support Measures	Start
		3) Subsidy for repair cost	Support Program for Making Repair Plan (921 Fund) - Subsidy for negotiation activities by owners' association. - Subsidy for cost of making repair plan by architects.	2000.9
			Subsidy for Repair of Common Facilities - Subsidy for repair cost of common facilities (49% of total cost)	2001.8
			Support Program for Repair of Damaged Condominiums (921 Fund) - Subsidy for repair cost of common facilities (21% of total cost) - Subsidy for fees of architects who deal with repair plan.	2001.12
Interest Subsidy for Repair of Common Facilities (EDR Fund) - For a loan of repair costs from the Government Housing Loan Corporation.	1995.11	4) Interest subsidy		
		6) Support for planning and consensus	Establishment of Organization to Solve Disputes - Evaluate safety of buildings and solve disputes about buildings.	2000.11
			Commission to Check Qualities of Repair Works - Commission for checking the quality of repairs by organization of experts.	2001.12
			Support Group for Condominium Repair - Organization of architect groups and dispatch to each condominium for support.	2002.5

2, respectively. These figures show support measures, the organizations that executed these measures, and the objects of the measures.

(1) The Hanshin-Awaji Earthquake

Figure 1 illustrates the system of support that was instituted following the Hanshin-Awaji earthquake. The objects of the measures can be divided into three types: the building itself, the group of owners (generally referred to as the “owners’ association”), and individual owners.

Laws have been amended to support a full range of objectives by amending procedures for rebuilding. Building regulations have been relaxed to permit buildings to be rebuilt on the same scale as the ones that they are replacing. For owners’ association, there are three types of support available from different organizations. Central and local governments give subsidies for the construction of common facilities and for the costs of planning them through a system of subsidies for building-improvement projects. The Local Housing Supply Corporation participates in rebuilding projects and it coordinates plans and assists in achieving an agreement among owners. The EDR Fund supports owners with subsidies for planning costs, such as consultation fees for advice. For owner, the Government Housing Loan Corporation provides loans for a reconstruction at a low rate of interest (this loan applies generally, not just for condominiums), and the EDR Fund gives an interest subsidy on this loan. If some owners oppose a rebuilding plan and do not participate in that project, the Local Housing Supply Corporation will purchase their properties and will then participate in the project as an owner.

(2) The 921 Chi-Chi Earthquake

Figure 2 describes the system of support instituted following the 921 Chi-Chi earthquake. The objects of the measures are the same as those in the Hanshin-Awaji earthquake.

A law, named the *921 Temporary Act for Post-Earthquake Reconstruction* contains almost all the measures for reconstruction: it includes not only adjustments of procedures, but also provision of deregulation, subsidies, and interest subsidies, etc. For

building, deregulation, such as permission for extra building bulk, is applied only in the case of Urban Regeneration. For owners’ association, subsidies from the central and local government for the construction of common facilities and for the costs of planning and support for coordination of projects by organized groups of architects are provided to all the damaged condominiums. A loan from the central bank and subsidies for planning from the 921 Fund are supplied for use of steel frames on rebuilding: this also applies only in the case of Urban Regeneration. The 921 Fund provides additional loans for the purchase of nonparticipants’ ownership; this loan means that the 921 Fund participates indirectly in rebuilding projects. For owners, the central bank supplies loans at a low rate of interest (this loan is generally available and is not particular to condominiums), and the central government gives interest subsidies for loans to purchase the rights of owners who do not participate in rebuilding. In the case of Urban Regeneration, the 921 Fund provides original loans to owners who do not have sufficient security.

3.4 Comparison of the Two Earthquakes

If we consider the support measures as a whole, it is clear that less support was provided for repair of buildings in the case of the Hanshin-Awaji earthquake than in the 921 Chi-Chi earthquake. In both earthquakes, the measures supporting for rebuilding were more substantial than those supporting for repair; in particular, the measures instituted following the Hanshin-Awaji earthquake were much more focused on rebuilding and necessary support for repair was not available. This shortage of support measures for repair may explain why some condominiums that suffered only medium levels of damage were rebuilt following the Hanshin-Awaji earthquake.

A comparison of the support systems for each earthquake suggests that the basic structures were similar in each case, but the measures following the 921 Chi-Chi earthquake were more numerous and detailed. The existence of the 921 Fund as a semi-public organization may account for this characteristic. Since the 921 Fund was more independent from government than was the EDR Fund

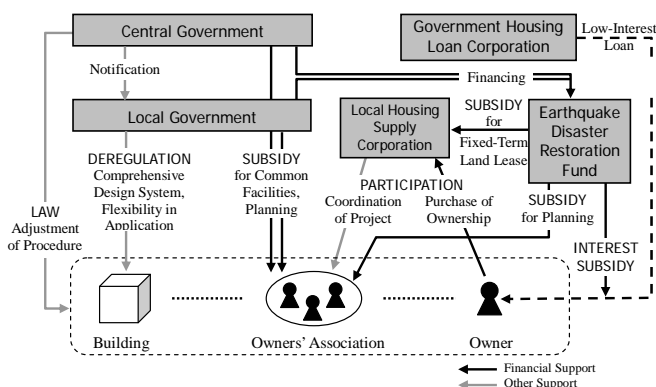


Figure 1. The Supporting System in the Hanshin-Awaji Earthquake

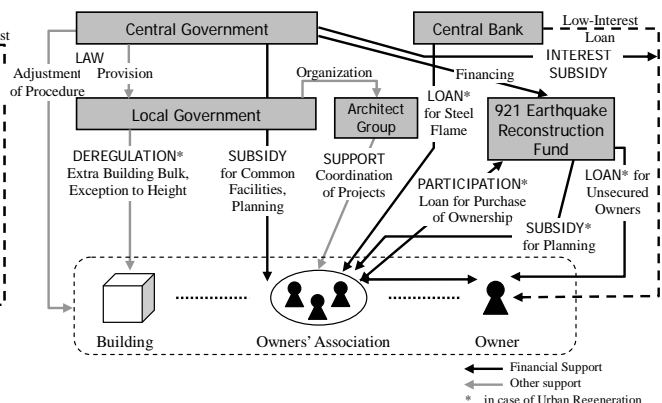


Figure 2. The Supporting System in the 921 Chi-Chi Earthquake

in the case of the Hanshin-Awaji earthquake, the 921 Fund was able to provide unique and necessary support from an original viewpoint. With this characteristic of the 921 Fund, two parallel support systems, one involving the government and the other the 921 Fund, coexisted and interacted in the case of the 921 Chi-Chi earthquake.

Turning now to the start times for each of the measures (as shown in Tables 3 and 4), the main support measures were instituted almost immediately after the earthquake in the case of the Hanshin-Awaji earthquake, and the support system as a whole was in place soon after the earthquake. Compared with this, support measures following the 921 Chi-Chi earthquake were established more slowly and in a stepwise manner. Important measures, such as loan and interest subsidies, began in November 2000, about one year after the earthquake, and effective measures by the 921 fund were instituted and modified during the succeeding several years.

In the case of the Hanshin-Awaji earthquake, many of measures were taken by modifying existing mechanisms, such as the Subsidy System for Building Improvement Projects. The government adapted existing mechanisms to provide for earthquake reconstruction, with some changes in conditions and rates; the process was, therefore, quite rapid. On the other hand, the main measures instituted following the 921 Chi-Chi earthquake were established anew. Urban Regeneration had been already established in 1998, but this system was adjusted for rebuilding of condominiums, because there was no case applying this system before the earthquake. Each of the measures adopted by the 921 Fund was created in stages to correspond with the existing situation and the needs of damaged condominiums. It therefore took time to initiate the support measures, but it was nevertheless possible to develop the necessary supporting mechanisms.

4. Effects of Support Measures

To clarify the effects of the support measures described in the previous section, we discuss the application of each measure and the enforcement of reconstruction efforts supported by some of the measures. The support measures discussed in this section are restricted to the case of rebuilding.

Table 5. Application of Support Measures Following the Hanshin-Awaji Earthquake

Category	Support Measure	Result	Ratio of Application
2) Deregulation	Earthquake Restoration Comprehensive Design System	52 bldgs	48.1%
		4137 units	57.5%
3) Subsidy for Rebuilding Cost	Subsidy System for Building Improvement Project	93 bldgs	86.1%
		6586 units	91.6%
4) Loan and Interest	Subsidy for Activities of Rebuilding on Damaged Condominiums	17 bldgs	15.7%
		Interest Subsidy for Rebuilding of Damaged Condominiums	6287 person
5) Participation by Public Sector	Support Project for Rebuilding of Damaged Condominiums	40 bldgs	37.0%
		3707 units	51.5%
		2 bldgs	1.9%
	Subsidy for Rebuilding Project using Fixed-Term Land Lease	108 units	1.5%

Ratio means percentage of measure applied buildings/units to rebuilt buildings/units (108bldgs, 7193units)

4.1. Application of Support Measures for Rebuilding (1) The Hanshin-Awaji Earthquake

The numbers of applications of various support measures instituted following the Hanshin-Awaji earthquake are listed in Table 5. Deregulation of the Earthquake Restoration Comprehensive Design System was applied in approximately 50% of rebuilt buildings and units. The Subsidy System for Building Improvement Projects was used in roughly 90% of rebuilding projects. The total amount of subsidy was estimated at approximately 34 billion yen, equivalent to 368 million yen per building or 5 million yen per unit. Subsidies for activities involving rebuilding were seldom used. The rate of uptake of Interest Subsidies for Rebuilding of Damaged Condominiums was also high: the amount of interest subsidy paid up to 1999 was approximately 1.1 billion yen.

The Support Project for Rebuilding of Damaged Condominiums by the Local Housing Supply Corporation was used for 3707 units in 40 buildings. As part of this project, the Local Housing Supply Corporation also purchased at least 350 ownerships in cases where the owner could not raise a loan for reconstruction. Rebuilding with a fixed-term land lease, where all ownership was purchased by the corporation, was used only in the case of two buildings.

(2) The 921 Chi-Chi Earthquake

The numbers of applications of the various support measures instituted following the 921 Chi-Chi earthquake are listed in Table 6. Urban Regeneration, which deals with many measures, applied in the case of 60.7% of the heavily damaged buildings. This proportion corresponds to the proportion of Regeneration Associations that were established based on the procedure stipulated for Urban Regeneration; therefore, support mechanisms, such as the addition of building bulk and subsidies for the planning cost, were not used in all cases, but it appears that these support mechanisms were adopted in many cases.

The Support Program for Rebuilding of Damaged Condominiums, provided by the 921 Fund, was used in about 60% of cases of heavily damaged buildings. In this program, the 921 Fund provided about 8 million NT\$ in subsidies for the activities of the owners' associations and about 70 million NT\$ in planning fees for architects.

Table 6. Application of Support Measures Following the 921 Chi-Chi Earthquake

Category	Support Measure	Result	Ratio* of Application
2) Deregulation	Urban Regeneration (Addition to Building Bulk, Subsidy for Planning Cost, etc.)	99 bldgs	60.7%
3) Subsidy etc.	Support Program for Rebuilding of Damaged Condominiums	8562 units	74.2%
3) Subsidy for Rebuilding	Support Program for Rebuilding of Damaged Condominiums	102 bldgs	62.6%
		8772 units	76.0%
4) Loan and Interest Subsidy	Crossing the Threshold Program	Loan without interest for owners lacking security	62 bldgs 38.0%
		Loan for owners who cannot pay temporary expenses	2480 units 21.5%
		Loan for owners' association to purchase ownership	62 bldgs 38.0%
5) Participation by Public	Loan for owners' association to purchase ownership	2404 units 20.8%	
		53 bldgs 32.5%	
		688 units 6.0%	

Ratio means percentage of measure applied buildings/units to heavy-damaged buildings/units (163bldgs, 11543units)

The number of instances of applications of the Crossing the Threshold Program was provided by the 921 Fund. There were 2480 instances of interest-free loans by owners who did not have sufficient security and 2403 instances of loans to owners who could not meet expenses temporarily. There was a tendency for these two items to be used at the same time; uptake of these loans was about 20% in the case of heavily damaged units and about 29% for units where Urban Regeneration applied. There were 688 instances of short-term loans to owners' association to purchase the ownership of nonparticipant owners (about 6% of heavily damaged units). In addition, there were nine cases in which the lot size for rebuilding was reduced from that of the original site. In these cases there were too few participants in the rebuilding project to rebuild new condominium of the same size as the former building, so an area of the site equal to the rights that the 921 Fund purchased from nonparticipants was left as vacant land.

(3) Comparison of the Two Earthquakes

Subsidies for rebuilding costs were taken up in most projects following both the Hanshin-Awaji and the 921 Chi-Chi earthquakes. Interest subsidies were also widely used in the Hanshin-Awaji earthquake, so it can be said that support measures for money matters are both basic and general. The rate of application of the Earthquake Restoration Comprehensive Design System in the Hanshin-Awaji earthquake is relatively close to that of Urban Regeneration in the 921 Chi-Chi earthquake, so it is likely that deregulation for rebuilding was used similarly following both earthquakes. In Category 5), the ratio of application of Support Project for Rebuilding of Damaged Condominiums by the Local Housing Supply Corporation is nearly equal to that of Crossing the Threshold Program by the 921 Fund. Therefore the results achieved by these two organizations are similar from the viewpoint of supportive participation.

4.2. Progression of Rebuilding Projects

(1) The Hanshin-Awaji Earthquake

Figure 3 shows the situation regarding rebuilding following the Hanshin-Awaji earthquake. The graph

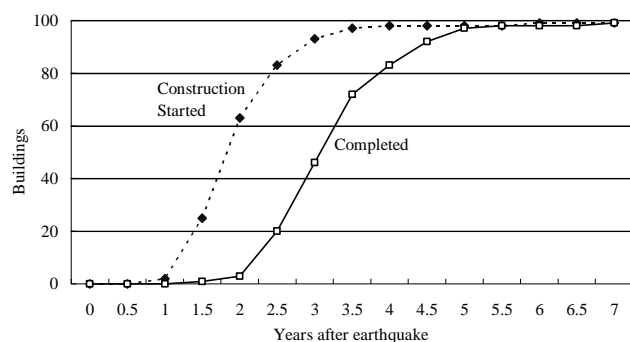


Figure 3. Progress of Rebuilding Projects for Condominiums Following the Hanshin-Awaji Earthquake

shows the progress of projects at 99 buildings, equal to 91.7% of buildings where rebuilding was planned. Construction work generally started within about two years of the earthquake and was generally complete within about three-and-a-half years of the earthquake. Most rebuilding projects were completed within five years of the earthquake. The earliest date of completion was one-and-a-half years after the earthquake; the latest project was started six years after the earthquake and completed one year later.

(2) The 921 Chi-Chi Earthquake

Figure 4 shows the situation regarding reconstruction following the 921 Chi-Chi Earthquake. This graphs show the progress of projects at 96 buildings that used the Support Program for Rebuilding of Damaged Condominiums, provided by the 921 Fund: these correspond to 67.1% of the buildings where rebuilding was planned.

Since this support program was applied in the case of Urban Regeneration, regular rebuilding projects managed outside the Urban Regeneration system are not included. Regular rebuilding was performed for 44 building (656 units), and 39 buildings were completed by June 2005 (about six years after the earthquake).

Returning to the graph, Regeneration Associations were, in most cases, organized within seven years of the earthquake; at that time, construction had started at 67 buildings (69.8% of the whole), and projects had been completed at only 56 buildings (58.3%) at that time. Half the projects had completed the stage of organization of an association within two years, started construction within four years, and completed rebuilding within six years of the earthquake. The earliest project started within one year and eight months of the earthquake and was completed within three-and-a-half years.

(3) Comparison of the Two Earthquakes

Although many powerful support measures were instated following the 921 Chi-Chi Earthquake, progress in rebuilding was slower than that following the Hanshin-Awaji earthquake. The probable reason for this is that there were many vacant houses in Taiwan, and it was easy for residents of damaged

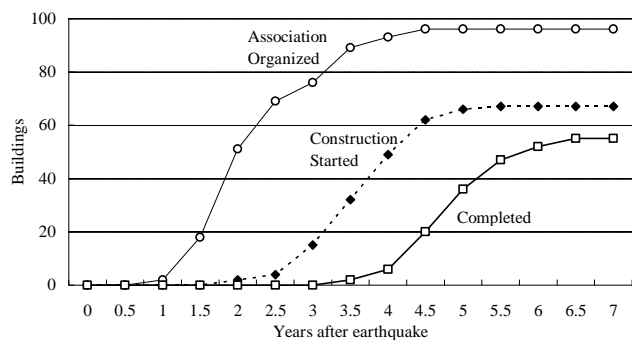


Figure 4. Progress of Rebuilding Projects for Condominiums Following the 921 Chi-Chi Earthquake

condominium to obtain a new property near to their previous property. Owners who had enough money tended to buy a new property and relocate there, after which they had no interest in the rebuilding of their former condominium. This situation made agreement among owners difficult to achieve, slowing progress in rebuilding and leaving buildings for which the owners could not decide upon a method of reconstruction. A delay in the establishment of support measures may also have influenced the progress of rebuilding. As mentioned in Section 3.4, important measures were started within about one year of the earthquake, a time when the organization of the Regeneration Association had just begun (Figure 4).

In examining why the progress of rebuilding in the Hanshin-Awaji was faster, it is clear that one reason is that support measures were available during the early stages after the earthquake. Another reason is that a time limit for demolition of damaged buildings by public expense was fixed for one year after the earthquake. Many condominium owners decided to demolish their building before this time limit, so that rebuilding had commenced within one year of the earthquake, as shown in Figure 3. It is said that this time limit also led to rebuilding of condominiums with medium levels of damage.

5. Conclusion

The discussions in Section 2, 3 and 4 are concluded as follows;

(1) The systems of support instituted following the Hanshin-Awaji earthquake and the 921 Chi-Chi earthquake were similar. There are seven kinds of support: subsidy for construction costs and interest subsidies for loans are the most basic measures. Participation in reconstruction projects by semi-public organization through purchasing the property rights of nonparticipants is a remarkable measure.

(2) Support measures following the 921 Chi-Chi earthquake were extensive and numerous. These measures are due to the setting up of a semi-public fund and the gradual establishment of new support measures; however, it took a long time to institute the whole system of support. Support following the Hanshin-Awaji earthquake consisted mainly of measures for rebuilding; there were hardly any measures supporting repair. Many of these measures only involved modifications to existing institutions, so that the support system was in place at an early stage following the earthquake.

(3) Although extensive and powerful supporting measures were instituted following the 921 Chi-Chi earthquake, progress in rebuilding was slower. The relocation of existing owners to new houses and delays in establishing support measures hampered rebuilding efforts. Progress in rebuilding was faster following the Hanshin-Awaji earthquake, because support measures led to rebuilding of many condominiums, including some of those that had

suffered only medium levels of damage.

From these conclusions, we deduce that the important points that support condominium reconstruction include extensive and well-balanced support for both rebuilding and repair; reinforcement of support measures by public and semi-public bodies; and institution of the entire support system in the early stages following the earthquake. Since there remain some condominiums whose fate is undecided or which have not been rebuilt, ways other than rebuilding or repair of the former building, such as sale of the site in the case of the Hanshin-Awaji earthquake and rebuilding on a smaller site in the 921 Chi-Chi earthquake, must be considered.

Acknowledgement

This research was supported by the Japan Society for the Promotion of Science (JSPS) for Grants-in-Aid for Scientific Research: "A Comparative Study on Disaster Management and Reconstruction Strategy among Earthquake Disasters of Hanshin (Japan), Kocaeli (Turkey) and Chi-Chi (Taiwan)" from 2001 to 2003; "A Comparative Study on Housing and City Reborn Process After Great Earthquakes in the Asian Region" from 2004 to 2006.

Notes

- 1 In this paper, the word "Reconstruction" is used in the broad sense to include both "Rebuilding" and "Repair".
- 2 The general policies for housing reconstruction, including cases of condominiums, have been compared in an earlier paper⁷⁾.
- 3 It must be noted that there are many support measures for reconstruction of ordinary housing that apply equally to condominiums.

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