Case 5

The *Taishin* Triangular Initiative in Central America: Co-creating Quake-Resistant Construction Methods for Popular Low-Cost Housing

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1. Introduction

The Project *Taishin* (a Japanese word meaning “quake resistant”), or the project for “Enhancement of Technology for the Construction of Popular Earthquake-resistant Housing,” aims at alleviating the disaster risk for residents in the popular low-cost housing in El Salvador.

Started in 2003, the project is a collaborative response by Mexico and Japan to help El Salvador to recover and reconstruct the country from the aftermath of two successive tragic earthquakes in 2001, which resulted in the casualties of over 1,000 people with extensive damage on buildings, especially on popular housing of low-income group. El Salvador was fortunate to have a sub-regional center of excellence on disaster prevention, the National Center for Disaster Prevention (CENAPRED) established in 1990 in Mexico with Japanese assistance. Through the triangular partnership, main local counterparts including two universities and a local non-governmental foundation, El Salvador Foundation for Development and Dissemination of Housing (FUNDASAL), have jointly developed and piloted quake-resistant construction methods for popular housing with the compilation of manuals and guidelines. The currently -ongoing phase 2 of the project is working towards the further scaling-up of the tested methods.

In the following Section 1, we first outline the background and the pathways of project development. Section 2 will then examine what factors have contributed to the project’s achievement as well as how different actors have contributed to it. Section 3 concludes with some thoughts on the case analysis.

2. Co-creating Quake-resistant Construction Methods: The Project *Taishin*

2-1 El Salvador, Recovering and Rebuilding from the Aftermath of the Earthquake

Diagram 1: Map for the Country in Scope of the Project

Source: Prepared by the author

The Republic of El Salvador in Central America was devastated by two huge successive earthquakes, the first on January 2001 and the second the following month. Their magnitudes measured 7.6 and 6.6 respectively.

The damage was tremendous, especially in the worst-hit provinces in the eastern part of the country. It was estimated that these earthquakes took the lives of more than 1,000 people and inflicted the total damage of 16 billion dollars (that accounts for 12 percent of the GDP of this country)[1]. Approximately 8 percent of the houses in the country were half destroyed or partially destroyed, and approximately 10 percent of these houses were completely destroyed[2]. Public buildings were also affected including half of the hospitals, one third of the schools and even the Office of the President. The aftermath of earthquake revealed the fact that those particularly hit were the poor and the vulnerable group in the country with 60 percent of the half or partially destroyed houses resided in by the low income group[3]. The incidents also exposed the insufficient state of social protection accorded to them.

[1] Country Assistance Strategy 2001
[2] Country Assistance Strategy 2001
[3] Early assessment chart for JICA Project

In tackling the tragic disaster, an emergency Consultative Group (CG) meeting was held in March inviting donors including Japan, which resulted in pledges totaling 13 billion dollars of emergency assistance to the country. During the meeting, donors led by IDB announced their priority areas of assistance, which included the provision of temporary housing, special housing subsidy and loan facilities for low-income people.

2-2 Pathways leading to Project, *Taishin*

(1) Mexico as the emerging sub-regional knowledge source for disaster prevention

One of the hallmarks of this triangular initiative was the proactive engagement of Mexico as the pivotal country. It was largely possible because of the expertise and preparedness which Mexico had already accumulated through its own tragic experience of large earthquake in 1985 which killed about 10,000 people[4]. Another factor was the emergence of Mexico as a newly proactive "emerging" donor at the time.

Following the Mexican earthquake, Mexico decided to establish CENAPRED with the financial and technical assistance (92 experts in total during the period from 1990 to 1994[5]) from the Japanese Government. Since its foundation, CENAPRED has gradually developed its capacity in knowledge and approach in disaster prevention and has particularly built a regional reputation in the scientific assessment technique of seismic capacity of building and houses, which was then started to be called *Taishin*, the Japanese expression for quake resistance.

The growth of CENAPRED as the regional center of excellence in the *Taishin* technique and other disaster prevention technology and approaches also coincided with the gradual emergence of Mexico as an "emerging donor" in the sub-region. At the time of this triangular initiative, Mexican government had just established Mexican Agency for International Development Corporation (AMEXCID[6]), which was the clear indication of the commitment for extending international cooperation by the Mexican Government. In support of the newly

[4] 4 The Series 3 introducing the project to provide technological cooperation to developing countries in building and housing area - Earthquake disaster prevention project in Mexico, P49

[5] The Series 3 introducing the project to provide technological cooperation to developing countries in building and housing area - Earthquake disaster prevention project in Mexico, P50

[6] Then, it was called IMEXCI (Instituto Mexicano de Cooperación Internacional). AMEXCID was newly established in 2011. (http://amexcid.gob.mx/index.php/es/acerca-de-la-amexcid/ique-es-la-amexcid)

established AMEXCID, the Japanese government dispatched Japanese experts to the organization for its capacity development. Advisers also helped the organization to identify and formulate pilot triangular cooperation initiatives, which had the intention of providing assistance to seven Central American countries including El Salvador.

It was when the preparation of the pilot triangular cooperation was under way that the great earthquake hit El Salvador. In the immediate aftermath of earthquake, the Mexican and Japanese governments quickly dispatched a joint survey mission to El Salvador, and had consultations with the central government in discussing the details of the assistance. As a result of the joint survey, the three parties — Mexico, Japan and El Salvador — identified strong needs in the improvement of earthquake resistance performance (seismic performance) for low-cost state housing as well as self-help housing by low income groups (popular housing). These houses, inhabited by low income groups, were severely destroyed by earthquake.

(2) The formation and implementation of *Taishin* triangular cooperation

Against this backdrop, the three parties agreed on a triangular initiative to develop the capacity of El Salvadorian organizations to effectively undertake the scientific seismic capacity assessment (*Taishin* technique) of popular low-cost housing. The Japanese Government also agreed to provide the necessary facilities and equipment for the *Taishin* experiments. The period of project formulation also coincided with the official visit by then Mexican President Vicente Fox Quesada to Japan in 2003, during which the Japanese and Mexican governments concluded the agreement on the Japan-Mexico Partnership Program (JMPP). This agreement laid the official overall partnership framework between the Japanese and Mexican governments for triangular cooperation. Thus, *Taishin* became one of the earliest triangular cooperation projects undertaken in the framework of the newly launched JMPP.

Due to the relatively long period taken for formulation and preparation of this triangular initiative, the main activities actually started in late 2003. Nevertheless, its launch was timely as the government introduced the “Safe Country: Plan of Government of El Salvador 2004-2009” (País Seguro: Plan de Gobierno 2004-2009) in the following year, which advocated for the adequate provision of housing with the clear

government roles in tackling the challenge such as the formulation of a new housing policy, strengthening of housing standards and regulations, a new loan scheme for informal sector and the land entitlement, especially for the poor. The arrival of the five-year plan document of “Safe Country”, which emphasized the housing issues, further enhanced the policy relevance of the *Taishin* initiative.

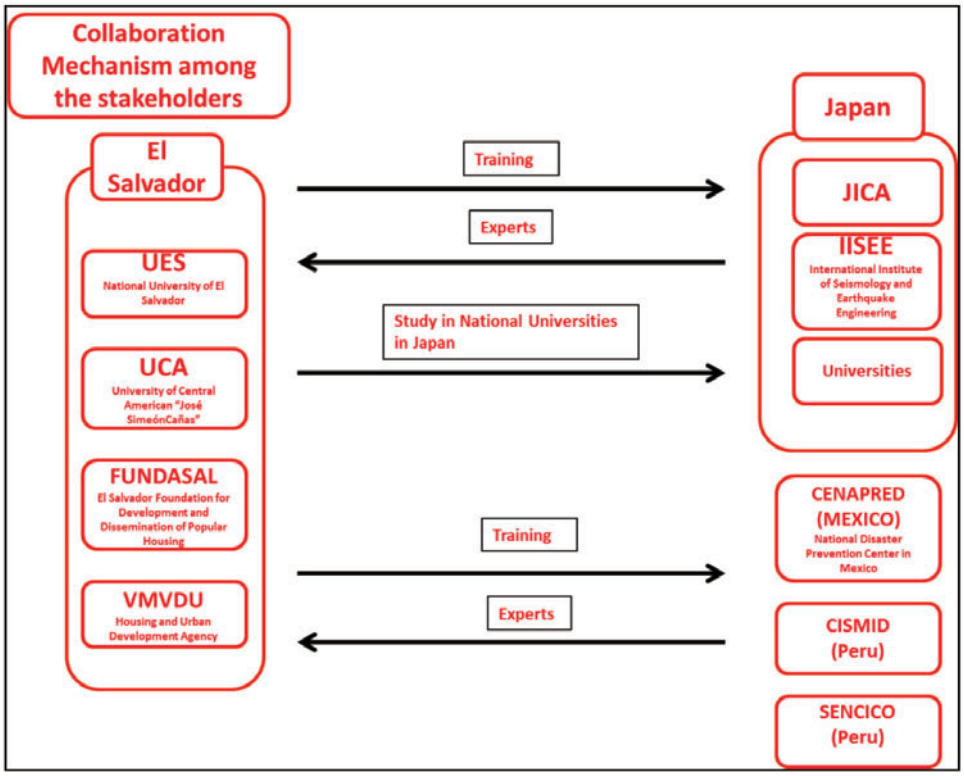
Diagram 2: Photo showing the experimenting on the seismic capacity of a brick

Source: JICA El Salvador Office

In El Salvador, several low-cost housing construction methods were already available on the ground through the work of FUNDASAL, a local foundation working for low-income settlements, an international NGO and other organizations. In spite of the low-cost nature of those methods, which made them accessible to the poor, there was the important remaining issue that the level of quake-resistance capacity on these methods had not been scientifically tested. The main objective of the triangular initiative was thus to test and refine these low-cost construction methods so as to make them more earthquake-resistant.

As shown in the diagram 3 the technical cooperation experts were dispatched from both Mexico and Japan in the program. Additionally, it was decided that some experts that specialized in adobe (sun-dried)

Diagram 3: Structure for Project Implementation



Source: Prepared by the author

brick methods were also sent to El Salvador from a Peruvian organization, which had developed its capacity through bilateral technical cooperation with JICA in the past.

The following are the additional details of the assistance and the role of key actors in this initiative.

(1) El Salvador (The beneficiary country):

- Universities: National University of El Salvador (UES), the premier national comprehensive university and Central American University "José Simeón Cañas" (UCA), the highly-regarded top-ranked private university strong in the engineering field. Both of these universities were to conduct the experiments on the earthquake resistance strength (seismic performance) of the houses which were constructed based on the four construction methods (soil cement, block panel, adobe, and concrete block).
- Local NGO: El Salvador Foundation for Development and Dissemination of Housing (FUNDASAL). FUNDASAL, a local NGO working for low-income settlements, was tasked to build the model

housing through which the results of the experiments were further fed back into the project for further actions.

- The Bureau of Housing in the Ministry of Housing and Urban Development (Vice Ministerio de Vivienda y Desarrollo Urbano/ VMVDU): The ministry bureau in charge of housing policy was given the supervisory and advisory role in the project. It also took responsibility for the policy actions such as the formulation of the pilot project.
- The joint dissemination task team: The task team, consisted of the representatives from all the counterpart organizations, was established as the institutional mechanism for nationally disseminating and sharing the knowledge related to the construction methods for earthquake resistant houses.

(2) Mexico as the main pivotal country with Peru as the second pivotal nation

- CENAPRED (National Center for Disaster Prevention): CENAPRED, as the regional center of excellence in disaster prevention techniques, provides capacity development assistance to El Salvadorian counterpart organizations in the *Taishin* technique, the pilot model housing project and the advisory service for the institutional mechanism for disseminating *Taishin* methods.
- AMEXCID (Mexican Agency for International Development Corporation): AMEXCID oversees the support from Mexico to El Salvador at a policy level.
- Japan-Peru Earthquake Disaster Prevention Center (Centro Peruano-Japonés de Investigaciones Sísmicas y Mitigación de Desastres): CISMID of Peru is noted for its expertise in quake-resistant adobe house construction techniques. As many Peruvians still reside in adobe houses unlike Mexico, Peru with its CISMID is better positioned for sharing knowledge on the improved technique for adobe houses. It was also opportune to engage CISMID as there was an ongoing JICA technical cooperation project in the Peruvian organization at the time, which also aims to disseminate the appropriate construction methods for quake resistant houses[7].

(3) Japan as the facilitating donor country:

- Japanese Government through JICA, the executing organ: The Japanese government through JICA has facilitated the triangular

[7] The project for technical training and disseminating low cost earthquake resistant housing (2005~2007)

initiative through the process of formulation, execution and progress monitoring. It assisted partners in both managerial and financial aspects of the initiative including the provision of necessary equipment and facilities for *Taishin* experiments, the dispatch of experts from Mexico, Peru and Japan and the acceptance of El Salvadorians for short-term training as well as long-term fellowships.

- Partner institutions in Japan: A number of Japanese institutions including the Building Research Institute, the International Institute of Seismology and the Earthquake Engineering (IISEE) and some National Universities have been engaged in the program with the provision of training opportunities in Japan as well as the fellowship opportunities in partnership with JICA.

2-3 The Progress, Achievements and Challenges

Progress

All the project activities for the first phase of this initiative have been completed as planned. As a triangular cooperation, it is particularly noteworthy that Mexican experts have played a central and effective role in the planning and execution of this program from the onset in close collaboration with El Salvadorian a resident coordinator and Japanese experts.

Nonetheless, this initiative has not been without challenges in its implementation process. For instance, the initial consensus on the project building design such as coordination mechanisms and the procedural details among stakeholders took a quite long time due to the different policies and institutional settings of the three countries. However, such initial lengthy dialogues among partner countries eventually turned out to be positive for the subsequent smooth execution of the project.

There were also certain difficulties in information sharing and the team building among organizations within El Salvador due partly to the competition among universities. However, such initial challenges were gradually overcome through their collaborative work through the initiative as well as the frequent dialogues at the monthly “technical committee” meetings in which representatives from all the counterpart organizations participated. In the committee, the participants shared the information and had intense discussions regarding the progress of actions set for each member. In this regard, the committee effectively

provided a space and opportunity, or "Ba" for mutual learning and actions among members[8].

Major accomplishments

Although the triangular collaboration towards the further national scale-up of *Taishin* housing is continuing, the initiative has already recorded several notable accomplishments.

First of all, the initiative has undertaken all the planned activities for the transfer and adaption of *Taishin* assessment techniques to two major national institutions including the National University of El Salvador and the UCA. Now, these two universities are capable of undertaking the scientific seismic capacity assessments using the equipment and facilities provided by Japan. Through the *Taishin* experiment, the laboratory of two universities in collaboration with FUNDASAL has already finished testing four low-cost housing construction methods. It is also noteworthy that in 2012, both of these universities newly established a Master's Program for Earthquake Engineering, which takes advantage of the capacity and expertise the universities have built up through this *Taishin* initiative. Though the start of these programs are not solely explained by the *Taishin*, it, nevertheless, indicates that two universities are now in a position of offering such postgraduate programs in the closely related field to which *Taishin* has made contributions.

Secondly and closely related to the first achievement, the project succeeded in refining four low-cost housing construction techniques to make them more earthquake resistant. In collaboration with FUNDASAL, the project undertook the experimental housing construction pilot, based on the refined quake-resistance methods. With regard to the soil cement method, one of the four appropriate technologies for low-cost housing, the project improved the soil cement by adding the locally available volcanic ash to soils. Furthermore, in collaboration with El Salvador's "Chagas' disease[9] project" with JICA assistance, the *Taishin* project also introduced cement plaster for adobes, which is effective in preventing the vector insect of Chagas'

[8] SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation P15

[9] It is the tropical disease the second serious disease after malaria. In Republic of El Salvador, it is considered that approximately 32,000 people that represent about 4.3% of the population have been infected with Chagas disease. The assassin bug transmitting Chagas disease resides in the walls and floors of adobe houses (http://knowledge.jica.go.jp/km/ProjectView.nsf/SearchResultView/9552C05F6418FF90492575D100359127?OpenDocument")

disease (kissing bugs) from encroaching into the walls and floors of the adobe houses. The introduction of such improved technique of low-cost adobe methods, which is more quake-resistant and repellent to insects, would be particularly beneficial for low-income groups. Following the satisfactory results of the pilots, manuals and training materials on the quake-resistant construction methods were developed and distributed widely. Several training events for its dissemination have also been organized.

Thirdly, thanks to the successes in the capacity development of partner institutions, El Salvador has now started to play the role of a sub-regional pivotal country in the field of the *Taishin* technique through this triangular initiative. The following are some examples.

- Assistance to Nicaragua: From 2010, the UCA and other El Salvadorian counterpart organizations started to jointly host specialist training programs for the Nicaraguan counterparts on the *Taishin* technique as part of the ongoing project in Nicaragua for the improvement of the earthquake-resistant housing construction technologies.
- Assistant to the Dominican Republic and Haiti: A special seminar was organized in the Dominican Republic in March 2011 with the aim of disseminating the El Salvadorian experience to counterparts of the Dominican Republic as well as Haiti, which were affected by earthquake in January 2010. The staff from two universities in El Salvador and those from the El Salvador Building Association participated in this seminar as instructors. El Salvadorian experts also organized a training program in El Salvador for the officials of the Haitian Public Works, Transport and Communication Ministry in response to the official request from the Haitian government.

Other notable actions

In addition to the above, there were other notable achievements, which were not fully envisaged at the beginning of the project. One such achievement is the organizational change in the management of the housing sector. Partly inspired by this triangular program, the Bureau of Housing in the Ministry of Housing and Urban Development (VMVDU), the national policy maker in the housing area, voluntarily took the initiative in establishing the Department of Standard Formulation and Investigation (UNICONS) in itself and created the El Salvador Construction Institute (ISC) to modernize the construction industry in El

Salvador. As part of the currently ongoing phase two of this project, the UNICONS are revising relevant regulations and drafting out technical standards pertaining to four construction methods.

Another notable self-help action by El Salvador, inspired by this initiative, was the closer academic exchanges between the two universities. Before this project started, the collaboration between two universities had been very limited partly due to the competition between the two institutions. Through the joint activities of this initiative, they have been able to build mutual trust and a closer partnership. They are now undertaking various joint activities in the field of quake resistant construction engineering to support other Central American countries without much external intervention.

Ongoing project for further national dissemination

The follow-up phase of this triangular initiative is currently underway. The ongoing project is currently making an effort to mainstream the proven quake-resistant low-cost housing methods into national technical standards for further scaling-up. Considering the fact that the country had not even had a national official standard for housing construction, the ongoing project is now playing a critical role in the preparation of policy and standards for safe and quake-resistant popular low-cost housing, building on the refined technology and methods developed during the first phase, which this case study has illustrated.

3. Case Analysis

3-1 Key Factors of Achievement

The key factors of notable achievements so far in this *Taishin* initiative include the following;

- ✓ Strong knowledge demand matched by the provision of appropriate knowledge by the pivotal country
- ✓ Engagement of major key stakeholders committed to the cause
- ✓ Institutional innovations for effective knowledge transfer and mutual learning

The knowledge demand matched by the timely and adequate opportunity provisions for knowledge exchange

This is a triangular knowledge exchange triggered by two tragic large earthquakes in El Salvador. The desire to acquire “knowledge” for safe

quake-resistant housing in the post-earthquake period in the country was matched by the supply of *Taishin* methods by Mexico. Prior to the El Salvadorian earthquakes, Mexico had acquired and localized the knowledge from Japan over the years following their tragic experiences of huge earthquakes in the mid-1980s. In other words, the fact that all the three countries in this initiative share recent tragic experiences of large earthquakes became an underlying driving force to connect three countries towards this triangular program.

In El Salvador, the devastation after the earthquakes provided a basic country context for increasing recognition on the need for the "knowledge" of earthquake resistant housing construction standards and methods, virtually non-existent in the country prior to the disaster. The aftermath of earthquakes also brought to light the national reality that low-income groups residing in popular and self-constructed housing were the most affected due to the inadequate construction methods used.

Such potential ground for demand on the *Taishin* knowledge was then underpinned by the high level emergency Consultative Group meeting for reconstruction as well as by the formulation and launch of a national development plan after the meeting. At the CG meeting, donors including the IDB made commitments for support, which included policy actions on housing issues with the provision of temporary housing and other related schemes such as special housing loans. This CG meeting effectively provided the initial impetus for policy actions on housing including *Taishin*. The policy environment surrounding this initiative was further consolidated by the formulation and launch of a coherent national development plan entitled "Safe Country (2004-2009) Plan of Government of El Salvador 2004-2009" (País Seguro: Plan de Gobierno)" in 2004, soon after the start of *Taishin*. The plan clearly stated the importance of the role of the state in ensuring adequate access to houses by the people in low income brackets. The demand and the commitment for the acquisition of *Taishin* knowledge were also evident among implementing organizations. One such indication was the construction of a building by the UCA, which could accommodate the facilities for the experiments under their own financing.

In this case, Mexico with its national disaster prevention center, the CENAPRED played the role of supplying knowledge to El Salvador.

Mexico has accumulated knowledge for disaster prevention, having experienced a large earthquake. As stated in the preceding sections, the establishment of CENAPRED was one of these initiatives with the help of the Japanese Government and JICA. Over the years, Mexico has absorbed and adapted the Japanese disaster prevention technology of *Taishin* into the context of Mexico as well as the Central America sub-region. Through the process, CENAPRED has emerged as the regional center of excellence. It was therefore fortunate for El Salvador to have Mexico as a reliable sub-regional partner, capable of providing localized *Taishin* methods suited to the Central American context. The Japanese Government through JICA, its ODA implementation arm, has helped facilitate both countries to link up for knowledge exchange such as through the dispatch of joint fact finding and dialogue missions by Mexico and Japan to El Salvador to explore the potential area for collaboration.

Against these backdrops, El Salvador thus requested Mexico, the pivotal country, and Japan, to provide the country with the opportunity for learning the *Taishin* technique.

Engagement of major key stakeholders committed to the cause

The initiative strategically engaged a broad range of El Salvadorian stakeholders on housing issues in the country, from policy to research and dissemination. As mentioned in the previous section, the key actors involved include VMVDU, two universities; the National University of El Salvador (UES) and Central American University “José Simeón Cañas” (UCA), and FUNDASAL, a non-government foundation working for popular housing.

As envisaged, their engagement in the initiative became an asset for the progress of the initiative. VMVDU, mandated for national planning and implementation of urban development[10] and housing issues, has demonstrated its leadership and commitment throughout the initiative including the proactive contribution to the formulation process of this project. Two universities of UES and UCA, the main executing organization of the project, have played the central role in the initiative. During the initiative, they made an effort to build their staff capacity to be able to undertake the experiment with support from Mexico and Japan. Last, but not the least, the country was also fortunate to have the well-

[10] VMVDU website http://www.vivienda.gob.sv/

known non-governmental agency, FUNDASAL, actively working in the very area of popular housing. The engagement of the foundation, equipped with rich practical experience in the field, has certainly helped the initiative in the pilot construction project as well as its dissemination process in the country, which is still ongoing. Active engagement of counterpart organizations in El Salvador equipped with the basic capacity to plan and execute the activities has been one of the key factors for the good progress in knowledge exchange.

Institutional innovations for effective knowledge transfer and mutual learning

In addition to further development of capacities for the execution and scaling-up of quake-resistant housing policy and practice, another challenge for the initiative was how to ensure the closer collaboration, continuous exchange and mutual learning among diverse actors for the adaptation, institutionalization and operational scaling-up of *Taishin*. In spite of the relatively sound capacity of the counterpart organizations involved, one of the bottlenecks was the insufficient collaboration among these organizations. Therefore, as an integral part of the program, the *Taishin* initiative consciously designed “Ba” and institutional mechanism so as to ensure the closer partnership and continuous mutual learning among them. One such institutional set-up was the monthly Technical Committee.

Besides the routine meeting agenda such as the monitoring of progress and performance, the interactions at the meeting helped facilitate the members to know each other well and resulted in the stronger mutual trust within the group. The start of closer academic exchanges by the two universities in earthquake engineering, for example, is a clear indication of the enhanced partnership that has grown out of the *Taishin* initiative. The Committee has thus provided precious opportunities and spaces among the stakeholders for information exchange, trust building and mutual learning with the common vision and objective of localizing and scaling-up *Taishin* methods.

It is also worth noting that an El Salvadorian coordinator assigned to the project played a key role in consolidating and coordinating stakeholders of this project. In the case of triangular cooperation in which large numbers of diverse stakeholders are involved, the presence of capable coordinator is often indispensable to smooth the process of trust

building and mutual learning among the stakeholders.

3-2 Roles and Effective Assistance Approaches by Pivotal Country and the Donors

In this initiative, external actors have played an effective role not only as the knowledge source but also as facilitator of knowledge acquisition by El Salvador counterparts.

The roles of the pivotal country

Mexico, the main pivotal country of this case, played the critical role in sharing their localized *Taishin* knowledge and advising and helping to facilitate the management of the knowledge process.

As stated, Mexico has learned the technology and approaches on earthquake disaster prevention with Japanese assistance ever since the major earthquake in 1985. Building on what the country has learned from Japan, she has even undertaken a training program on *Taishin* for the counterparts from Central America and the Caribbean countries with complementary JICA support between 1997 and 2001. Through these prior efforts, CENAPRED of Mexico, the main actor of the pivotal country, has already nurtured its capacity as the regional knowledge base on *Taishin*. The movement in Mexico towards more structured and systematic assistance to neighboring countries with the establishment of AMEXCID was timely for Mexico to start activities as the pivotal nation.

More specifically, Mexican expert teams mostly from CENAPRED, particularly its committed team leader, played the critical role for the progress of the *Taishin* initiative so far. It was the team leader, who played the central role with the technical advice from Japanese experts during the formulation process of the detailed plan of this project. Following the launch of this project, the team leader coordinated the dispatch of other Mexican specialists in response to the request from El Salvador. Mexican expert teams also advised the initiative on the mobilization of Peruvian experts, who are better positioned on the specific knowledge of adobe houses than Mexican specialists. Gathering from those involved in the initiative, the contribution of Mexican experts to this initiative was not limited to the transfer of technical and management skills but the spirit to catch up. The Mexican experts, who had gone through the similar process of learning the

Taishin approach from Japanese experts, recognized what sort of capacity challenges their El Salvadorian counterparts would have to face and thus were well-positioned to provide necessary encouragement for their counterparts to further progress. All in all, the committed experts with the presence of an effective leader, who all had the direct experience of absorbing the knowledge from Japan, and are conversant with the sub-regional context were instrumental for the success of the initiative.

Japanese Government and JICA as the knowledge catalyst

As has been seen above, Mexico and Peru played the proactive role in this knowledge exchange with El Salvador. What then was the role of Japan and JICA in this endeavor?

First of all, Japan played the role of nurturing the knowledge base on *Taishin* in the sub-region, where countries frequently experience serious earthquakes. JICA helped the Mexican government with the establishment and capacity development of CENAPRED, which then extended assistance to El Salvador. Also, the Japanese government through JICA simultaneously supported the AMEXCID, newly established at the time, through Japanese advisers dispatched to the organization for its capacity development. Those advisers helped to identify and formulate the pilot triangular cooperation initiatives, through which Mexico had the intention of providing assistance to seven Central American countries including El Salvador.

JICA dispatched several Japanese experts to El Salvador to provide complementary technical and specialist advice to the counterparts in the country. This helped ensure that the El Salvadorians would practice the newly acquired knowledge on their own with periodic external advice for further actions.

The El Salvadorian counterparts of the project consolidated their knowledge through these training. Several of them went on the overseas training or fellowship program provided by the International Institute of Seismology and Earthquake Engineering (IISEE) in Japan and some National Universities. Out of the eight people, three persons obtained doctor’s degree or master’s degree. This overseas education stimulated the counterparts to be engaged in the activities of the project more energetically.

4. Conclusion

As we have seen, the project has been successful in producing a new body of knowledge by combining knowledge coming from El Salvador, Mexico, Japan, and in part from Peru. And similar processes of knowledge creation and exchange are still continuing and expanding.

There are a number of factors that have helped the development of the project, but three of these may have been the most critical: First, the beneficiary country had a strong need for the body of knowledge; indeed there was a desperate need for and commitment to obtain applicable knowledge on earthquake-resistant housing in El Salvador. Second, there was a base knowledge on which new local knowledge could be developed. Third, those who extended cooperation, both Mexican and Japanese, had been struggling with the same challenge of disaster prevention, and that shared experience among the professionals who gathered in the project, together with the interactive process of the project, might have facilitated the joint knowledge creation.

As emphasized in Chapter 2 of this volume, disaster prevention is becoming a global challenge, requiring the concerted efforts of the entire international community. The importance of knowledge creation leading to affordable disaster prevention like the ones realized in this project cannot be overemphasized; similar efforts to that end are called for.

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