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International Cooperation in a Post-disaster Scenario: A Case Study from Gujarat, India

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ABSTRACT

In the aftermath of the Gujarat Earthquake, January 26, 2001, several Indian and Japanese organizations joined together in a rehabilitation initiative to produce a model village, with specific focus on upgrading community's living conditions and emphasis on livelihood issues. The initiative was based on the needs and priorities of the community. The cooperation scheme involved different stakeholders from government, non-government, and academic institutions. A mechanism for turning knowledge into practice has been developed, which is regarded as an example of implementation technology. The lessons learned from the implementation of this initiative are applicable to other parts of the world and other types of disasters.

1. INTRODUCTION

The earthquake of January 26, 2001 (magnitude 7.7, USGS) devastated the entire state of Gujarat in Western India, causing extensive loss of life and property. The impact was particularly severe in the Kuchchh district and neighboring areas and 13,000 lives are estimated to have been lost. More than 300,000 buildings collapsed and more than twice that number were severely damaged (Earthquake in Gujarat, 2001). This was a tragic blow to the region which had suffered from draught and the aftermath of two cyclones within the past three years. The devastation affected the area socially, economically and physically. As part of the long-term rehabilitation process, a joint initiative was undertaken that incorporated various organizations in India and Japan. It was aimed at the rehabilitation and reconstruction of a village, as a model of earthquake-safer houses and emphasized the upgrading livelihoods in the community. The importance of this initiative is that it provides a model of rehabilitation and tries to establish a framework of mutual cooperation among different stakeholders and organizations in the post-disaster scenario.

2. PROBLEM OF DISASTER ASSISTANCE

Disaster assistance is a complex issue with several dimensions. Government, non-government, international organizations have their own stakes in disaster assistance programs, and links must be established among them, as well as with the community. In other words, a post-disaster rehabilitation program should be seen as an opportunity to work with communities and serve local needs. The relationship between natural disasters and development is a far-reaching issue. On one hand, development is regarded as deterministic and a major cause of vulnerability. On the other, it is regarded as a vehicle necessary for vulnerability reduction (Lewis, 1999). Relief and development often lead to burdens on the recipient government, but also may often fail to serve the actual purpose and to reach the people in needs. The linkage between the disaster, aid, development, and relief is controversial, as discussed by Middleton and O'Keefe (1998). They argued that in many cases, humanitarian aid is linked to political factors, and needy communities become victims of political battles.

Past disasters in India show that in the post-disaster scenario there have been many role players that included national, international and local non-government organizations (Reddy et al., 2000). Whereas all the role players had commitments for development work, lack of available skills, strategic planning, and cooperation among similar organizations often have led to disorganized relief and rehabilitation programs (Jigyasu, 2000). The situation

KEY WORDS: Cooperation, Community, Livelihood, Rehabilitation, Earthquake

regarding rehabilitation is the more alarming due to the inability to regain sustainable livelihoods, as well as stakeholders not to sharing the responsibilities (Parasuram and Unnikrishnan, 2000). The traditional approach to post-disaster rehabilitation (MERDP, 1998) and the findings of a recent field survey made in Latur, Maharashtra, India by the senior author (Latur was hit by a strong earthquake in 1993, had more than 8,000 human casualties) pose important questions related to rehabilitation. These are community need, community ownership and participation, inter-disciplinary and multi-stakeholder cooperation, and livelihood and the sustainability issues.

In contrast to the traditional approach, a people-driven approach has been incorporated in the current initiative. Table 1 contrasts the traditional approach and the one incorporated in the current initiative as related to the above-mentioned issues. We here describe a scheme of cooperation among various stakeholders for the development of a village community. International cooperation is shown to be able to reach the grass-root level, provided there is strategic planning and that different stakeholders can work together to achieve a single goal.

3. MISSION AND GOAL: EMPHASIS ON SAFETY AND SUSTAINABILITY

Experiences for past earthquakes in India (Latur, 1993, Jabalpur, 1997, Chamoli, 1999) show that rehabilitation programs usually focus on the reconstruction of houses with the assistance of national and international resources. The massive reconstruction program undertaken after the Latur earthquake, funded by the World Bank, was able to improve the living conditions of the people by the construction of houses through the use of formal construction sectors (Salzar, 1998). There was a serious problem however in that local communities were not involved in the process, and livelihood issues were not incorporated. In long-term perspective, therefore lessons learned from disasters often are forgotten, and opportunities available following a disaster are not properly utilized for sustainable development. This problem is specific not only to India, but to other disaster-prone developing countries as well. While developing strategic planning for the current initiative, the key issues listed in Table 1 therefore were emphasized. Two particular aspects were highlighted; how to have successful practice at the local level and how to establish a model of cooperation applicable to different parts of the world and different types of disasters. The current initiative was planned for rehabilitation to make a model village, in which the focus is on different livelihood elements as well as the reconstruction of houses and infrastructures. The mission of this initiative was to achieve safer and sustainable livelihoods through community self-help, cooperation and education. The goal was to develop a standard model for a disaster-resilient community, which would serve its particular development needs and be a model for others.

The current initiative is taking place in two villages, Patanka and Datrana, in the district of Patan, about 280 km northwest of Ahmedabad, in the state of Gujarat, India (Figure 1). The distance between the two villages is approximately 10 km. These villages were chosen because of the location and accessibility (having a critical location has impact on surrounding villages), the interest and motivation of the village leaders and community members, the involvement and networking of local non-government organizations, and the interest of diverse stakeholders in working together in the same target area. Table 2 gives statistics for the two villages. Both are of moderate size, and suffered considerable damage. The collapse rate of buildings was higher in Patanka, than in Datrana.

4. ROLE PLAYERS: DIVERSE STAKEHOLDERS

Various organizations from the government and non-govern-

Table 1. Comparsion of the traditional and suggested approaches in post-disaster rehabilitation program.

Criteria	Traditional Approach	Suggested Approach
Community Need	This factor has been ignored being most disaster assistance based on the priorities of the assisting agencies	Community needs and priorities are first to be considered.
Community Ownership and participation	In most cases, houses are reconstructed by formal construction sectors, without community involvement.	Community members build their own houses, thus they owning the technology.
Inter-disciplinary and multi-stakeholder cooperation	Programs often are formulated and executed by a single group of stakeholders and reflect their priorities.	Tasks are formulated based on multi-stakeholder cooperation, and an inter-disciplinary approach is incorporated.
Livelihood issues	Reconstruction often gives attention only to the physical reconstruction of houses.	Livelihood issues are part of the reconstruction programs, emphasis being placed on enhancing skills in the local communities.
Sustainability Issues	Community provides future efforts. In most cases, sustainability issues are neglected.	Through institutionalization of efforts and community involvement, sustainability issues are taken into consideration

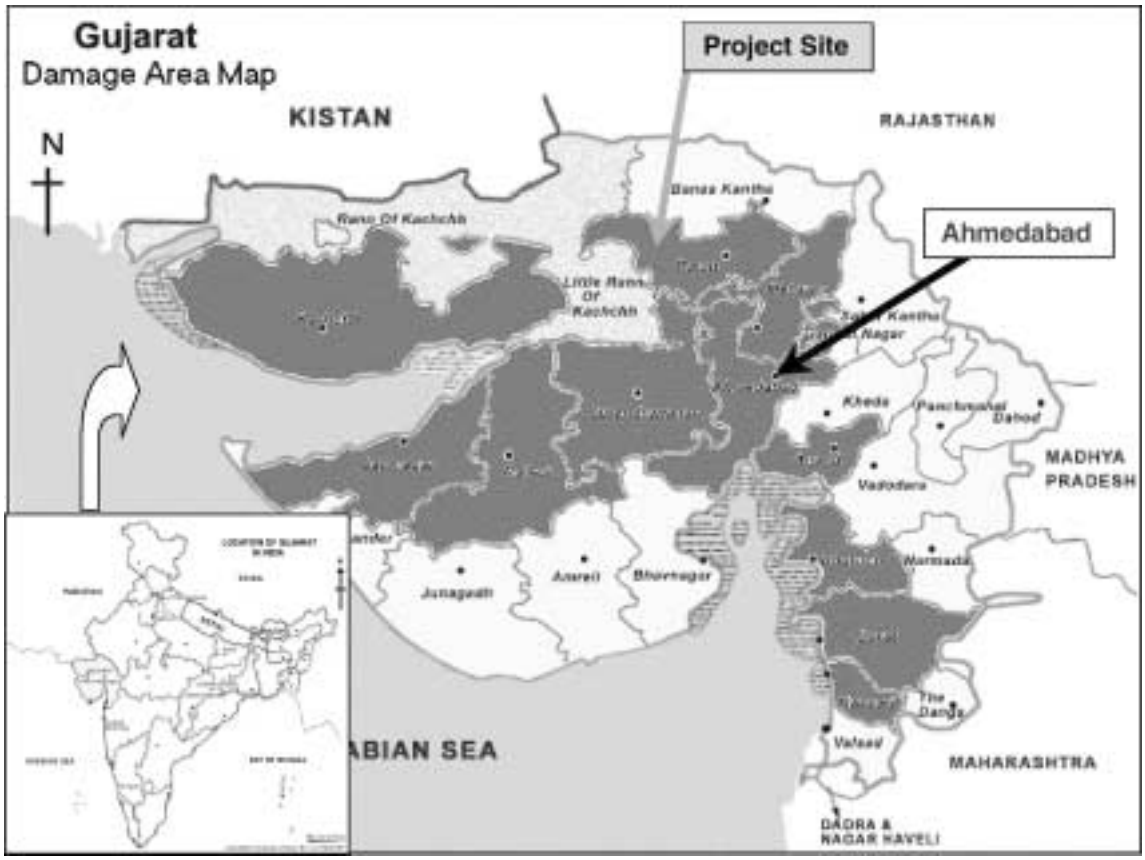

Fig. 1 Location of the most severerly affected areas and the project site in Gujarat Insert：Map of India showing the location of Gujarat. Hevily shaded areas show the maximum damage zones.

Table 2. Statistical Data for the two affected villages in the study.

Item	Patanka Village	Datrana Village
Population	1071	2002
Number of Houses and Families	276	403
Collapsed Houses	220	125
Damaged Houses	45	205
% of Rehabilitated Houses	80%	60% (with internal funding)

ment sectors, and academic and research institutions in India and Japan cooperated and contributed to this initiative. The United Nations Centre for Regional Development (UNCRD) was responsible for overall coordination and for formulating strategies to be discussed with its counterpart, a non-government organization the Sustainable Environment and Ecological Development Society (SEEDS). Liaison with the governments of both India and Japan was the prime role of the UNCRD, whereas SEEDS took the leading role in field implementation. The Earthquake Disaster Mitigation Research Center (EDM) was keen to study the technical aspect of rural non-engineered construction, and the process by which safer construction practices are adopted. This was done through a confidence building program in association with a local non-government organization, the National Center for People's-Action for Disaster Preparedness (NCPDP). A consortium of Japanese NGOs, called NGOs Kobe, provided their experiences of community development after the Great Hanshin-Awaji Earthquake of 1995. NGOs Kobe also funded a significant part of the current initiative. Funding also was received from the Ministry of Foreign Affairs of Japan through its Grass-root Assistance Program, and additional funding on livelihood issues were sought from the Japan International Cooperation Agency (JICA). The Gujarat State Disaster Management Authority (GSDMA) took a leading role in disseminating the experience to other parts of Gujarat, as did the National Center for Disaster Management (NCDM) to other parts of India. Thus, a team of various organizations with different mandates and objectives was assembled to work for the local communities. The initiative had following different components:

- Reconstruction of housing and infrastructures,
- Upgrading of livelihoods,
- Training of masons and engineers,
- Confidence building program for earthquake safer rural housing, and
- Dissemination of experiences.

Different activities were planned to obtain these components, which are discussed in the next section. Table 3 shows the responsibilities of the various stakeholders, and Figure 2 is a schematic diagram of those responsibilities.

Table 3. Task-Stakeholders relationship.

Task	Responsible Stakeholders
Reconstruction of houses and infrastructures	- SEEDS, and NGOs Kobe - Village and District governments - UNCRD
Upgrading livelihoods	- SEEDS, and NGOs Kobe - JICA - MOFA
Training of masons and engineers	- NCPDP, SEEDS and UNCRD - District and Gujarat State Governments
Confidence building programs for earthquake safer rural housing	- EDM - UNCRD - NCPDP and SEEDS
Dissemination	- UNCRD, Gujarat and Indian governments

EDM: Earthquake Disaster Mitigation Research Center
JICA: Japan International Cooperation Agency
MOFA: Ministry of Foreign Affairs, Japan
NCPDP: National Center for People's-Action for Disaster Preparedness
SEEDS: Sustainable Environment and Ecological Development Society
UNCRD: United Nations Centre for Regional Development

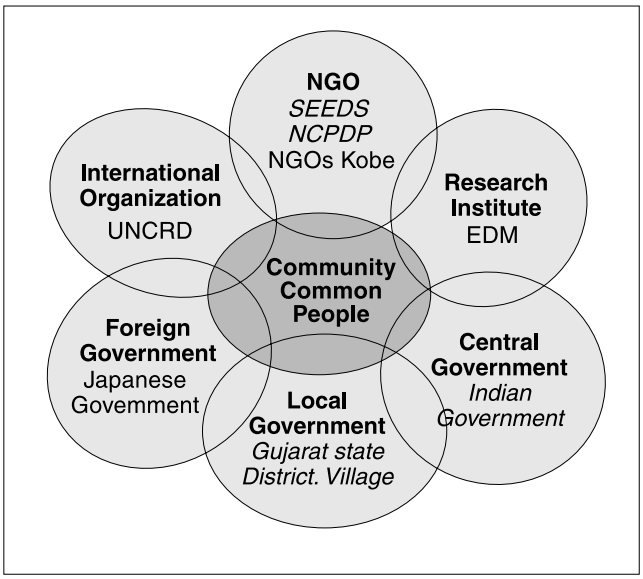

Fig. 2 Scheme for cooperation by various stakeholdes in the rehabilitation program. Organizations in italics are the Indian counterparts, the others Japanese organizations. For abbreviations, please refer to Table 2.

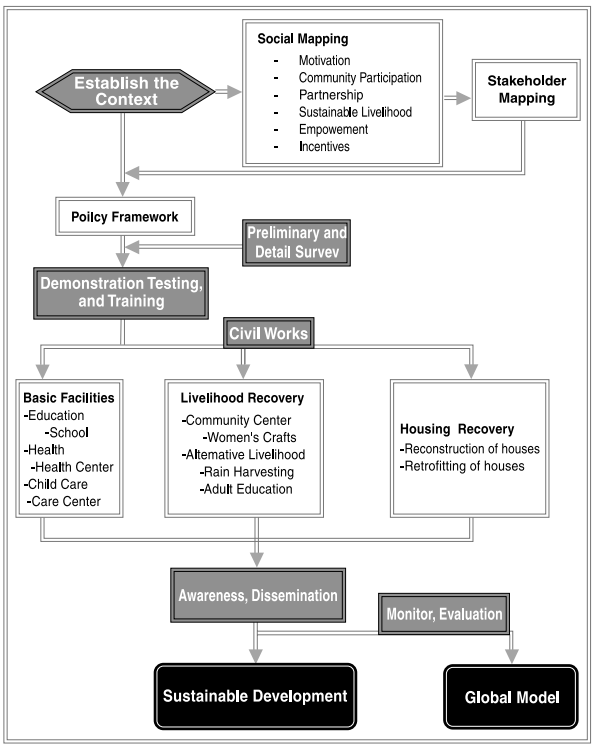

Fig. 3 Flow chart of the activities of the current initiative as part of sustainable development program.

5. PROJECT ACTIVITIES: FOCUS ON LIVELIHOOD AND COOPERATION

As stated, while obtaining earthquake safer construction, the focus should be on upgrading living conditions, and making people more self-sufficient, thereby creating a disaster-resilient community. Major project activities are shown in flow-chart in Figure 3. Timeframes for the major activities and milestones are provided in Figure 4. Work started with the relief activities of SEEDS immediately after the earthquake. Considerable time elapsed between the first community meeting in the village and the start of actual construction work.

5.1 Establishing the Context:

This was the first step of the initiative, in which all the different organizations identified their objectives and roles in the project. There were two aims to achieve; to understand needs at the local level, and to establish coordination among the various stakeholders. Social mapping was used for the first purpose, and stakeholder mapping for the second. As part of the social mapping, several community workshops were organized, in which local people

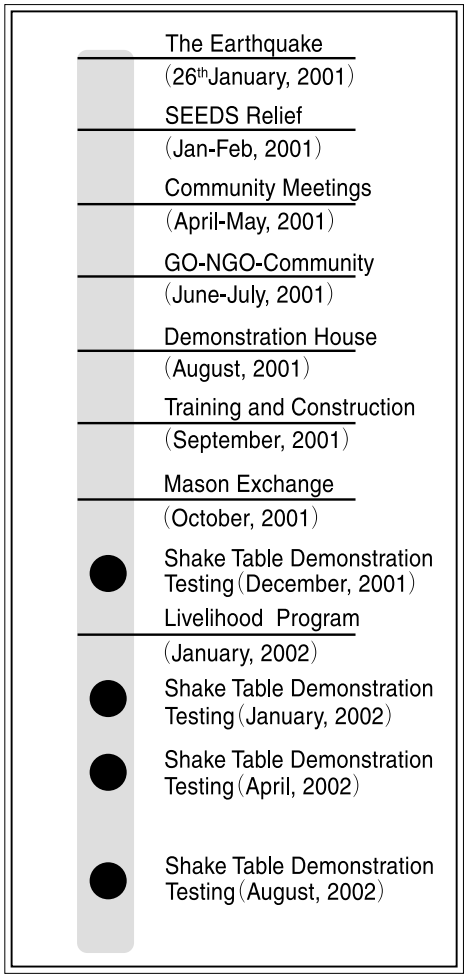

Fig. 4 Project activities time frame and milestones.

interacted with the team in an exchange of views and ideas (Figure 5). Moreover, several team meetings were arranged to discuss the scope of work and responsibility of each stakeholder. The overall framework of the initiative was formulated based on identification of the concept, philosophy, and basic methodology. A three-level committee was formed to run the project effectively, and the policy framework and coordination mechanism were established (Table 4). As shown in the table, the steering committee, which made policy and provided the overall direction of the project, was chaired by the local NGO. The working group, which implemented work in the field, was composed of representatives from local government, and local NGOs and chaired by the local government head. This ensured involvement of the government sectors and sharing of financial and human resources. The third committee

Fig. 5 A village community workshop provided the opportunity to understand the needs and priorities of the local pepole.

Table 4. Tri-level committee for effective project implementation.

Committee	Members	Responsibilities
Steering Committee (Meets once every two months)	- Local NGO (Chair) - Japanese NGO - Research Organization - International Organization	- Guide the project - Advocacy for the project - Dissemination Plans - Fund Raising
Working Group (Meets once a week)	- Local Govt. representatives (Chair) - Local NGOs having field offices	- Coordination of Implementation - Setting Design Standards - Construction Technologies - Research on related issues - Event Planning
Village Committee (Meets twice a week)	- Village government (Chair) - Local NGO - Local government engineer	- Organizing village meetings - Supervision of Construction - Technical Guidance - Construction Management at the Village Level. - Organizing Field Events

was chaired by the village government representative. This ensured implementation at the target level and that the initiative would comply with the expectations and needs of the villagers. A proper reporting system that ensured the flow of information both ways was established. The current area of study is located in Zone 5 on the Earthquake Hazard Map of India (the highest hazard zone), in which future earthquakes are anticipated to occur (Vulnerability Atlas of India, 1997), therefore, establishing the context was considered as one of the most important step for avoiding devastating damage in future earthquakes.

5.2 Preliminary and Detail Surveys:

The basic survey had two different aspects, physical and social. A preliminary survey was made of each house to obtain the initial damage scenario. During this survey, information on social structure and livelihood also were collected. Caste system is a characteristic feature of the affected area for many centuries. Most livelihoods are based on this caste system (SEEDS 2001). Each caste has a specific role to play in the society. During the social survey, while gathering information on economic status and livelihood, it also was necessary to categorize the village in terms of the caste system. This was followed by a detailed house-to-house survey, the measurement of houses, and the classification of damage.

5.3 Demonstration Testing and Training:

In spite of visual observations of the damage, construction practices have remained the same, and vulnerable constructions still being built even after the earthquake (Shaw and Sinha, 2001). This was attributed to several reasons: lack of confidence in traditional construction methods, lack of available low cost and affordable technology, and lack of trained, skilled masons. The important aspects of rural non-engineered constructions therefore needed to be identified by demonstration and training that involved the local community in order to provide them with confidence in existing building materials (Shaw et al., in press). The main message of this demonstration and training program was that damage was done to rural constructions mainly due to the lack of proper use of technology, not to poor construction materials. The important steps were to build awareness, confidence, and capacity among the people of the local communities, masons and local engineers. A preliminary training program was conducted in the village so that people would understand the importance of earthquake-resistant construction at little additional cost.

In demonstration training programs, two identical half-size models of rural houses were constructed on a locally built shaking table in the field and tested to underscore the importance of earthquake safety elements. The experiment and training programs were carried out in the presence of the local masons and people in order to reinforce confidence in the earthquake-resistant construction techniques to be used. Figure 6 shows the first of the test series, in which two models were constructed from stones and mud mortar, after which one was retrofitted with locally available materials. At the end of testing, the retrofitted building had minor cracks, whereas the other building had collapsed. This visual experiment, with explanations, inspection, and measurements gave immense confidence to the community. Four such testings were conducted on houses built with different construction materials and construction techniques.

Another important aspect of the training program was mason training, in which trained masons from Kathmandu, Nepal provided training for local masons from the affected village of Patanka. Through that program, the Patanka masons had the chance to visit Nepal and see the work of the Nepalese masons. This also gave great confidence and experience to the local masons.

5.4 Civil Works:

Both villages suffered significant damage, and most buildings needed reconstruction (SEEDS 2001). Civil work on actual house construction started after the initial preparation, survey, and initial training workshop and is currently carried out as a participatory approach through community involvement, by which the local people are able to contribute to the process and learn. Certain expenses were shared by the local people in terms of their labor; and outside contributions involved construction materials and cost effective earthquake safer building technology. Civil works consisted of three components: upgrading basic facilities (education, health and child care), livelihood recovery, and housing recovery. Upgrading basic facilities consisted of the planned retrofitting of schools, constructing health centers and a new child care center. Livelihood recovery focused on the construction of a community

Fig. 6 Shake table demonstration tests. Normal construction（model right）, impproved constrution with retrofitting （model left）, Photo：left before testing, right：after testing.

Fig. 7 Damage to a rural house built of stone and timber. Collapse of the roof and failure of the walls produced the major damages to such structures.

center for women and a rain harvesting system for various uses of rainwater. The major rehabilitation component was housing recovery, which included the retrofitting and reconstruction of homes. The first milestone of the civil works was a demonstration house that was erected for the most needy family in the village. This markedly helped to build trust with the local communities and to demonstrate the earthquake safer construction practices.

Most of the houses in the area were traditional structures, built of locally available materials. It is of utmost importance that local traditions and culture should be taken into account during house reconstruction (Shaw, 2001). Traditional housing has two basic characteristics; its spatial planning and building system (Shaw et al., 2001). At any given time both aspect are the products of evolution over hundreds of years. As a result both were optimized in terms of the prevailing local context. Spatial planning took into account the lifestyle of the people, and the building system's protection of the house from climatic elements. The most common building materials were stone, earth and local timber. These materials were used in a way that allows future total recycling, rendering the houses very environmental friendly. Typically the walls were of stone masonry set in mud mortar, cement being used only to seal open joints. Roofs were constructed of various kinds of tiles placed over timber understructures. Damage to the houses mainly was caused by the failure of walls and roofs (Figure 7). The heaviness of the roofs did much damage to the structure of the house. Walls were not jointed properly, and each one behaved differently during the shaking, thereby causing structure failure.

5.5 Awareness and Dissemination:

The project activities, which targeted the community and the local and national governments, significantly raised awareness. Dissemination of the experiences and outcome to different communities also was important. Dissemination was carried out through the circulation of periodic reports, presentations at various workshops and meetings, and by organizing training programs for the masons of different villages. State and central governments had important roles in the in-country dissemination, and UNCRD had a vital role in international dissemination.

5.6 Impact Analysis, Monitor, and Review:

It was important to analyze and learn lessons from the current initiative, in order to make the process applicable to other disaster-affected communities in India and the world. To this end, understanding of the real impact on the community, ascertaining the rate of adoption of earthquake safer building practices, and assessing the possible transferability of the initiative to other locations were needed. Impact analysis was made through a set of questionnaires and interviews over regular intervals of time. Two questionnaires for local masons and engineers were designed, one to be given before the demonstration testing, the other after it. Questionnaires were repeated for four testings. The results are currently being analyzed. Some highlights of the impact analysis findings are: 1) the increased belief and confidence of people in retrofitting at minimum additional cost, 2) enhanced confidence in the use of stone masonry with proper construction, 3) understanding of the greater importance of construction technology than the building materials used, and 4) the need for testing to be done at different locations with different groups of people.

6. LESSONS LEARNED FROM THE CASE STUDY

The lessons can be summarized with reference to five issues as stated earlier : community need, community ownership and participation, inter-disciplinary and multi-stakeholder cooperation, livelihood issues, and sustainability. All are considered interrelated and inter-dependent.

6.1 Community Need:

This was the first lesson. In both villages, many day-to-day issues required attention and focus. This was made clear at the very first meeting with the community members. They did not want just to rebuild their houses but to use the rehabilitation program as an opportunity for village development. Water was a serious long-term problem in the area, because most of Gujarat was undergoing severe draught that had lasted three years. As a few days of rain during the monsoon was the only source of water, rainwater harvesting was needed. Most of the village peoples' livelihoods were dependent on livestock, therefore food-grains for livestock was another priority area. Community members also wanted to learn safer construction practices, to give them status as trained masons, which could be linked to their livelihoods. They were eager to learn such different elements of construction practices as iron-work and wood-work. Need for these practices had increased in the post-earthquake period. Needless to say, such lessons cannot be learnt in a single day. A rehabilitation program therefore must be flexible enough to accommodate the needs of the local community in the process.

6.2 Community ownership and participation:

Chairmanship of the village level committee was given to the head of the village, which was very significant in showing that ownership belonged to the people and community. Regular meetings at the village level, and the local decision-making process helped to implement this. The participation of local masons and home-owners in the construction process gave actual ownership of the technology to the local people.

6.3 Inter-disciplinary and multi-stakeholder cooperation:

This was another significant lesson. Rehabilitation is a very complex problem and should be approached from various different disciplines, with the participation of various stakeholders. This is definitely a challenge because all organizations and stakeholders have their own mandates and missions. The current project team consisted of civil engineers (structural engineers), planners, architects, social scientists, administrators, and policy makers. The initial meetings among these stakeholders were very important. The clear-cut vision of each organization's involvement was very useful during the early stage of the primary planning process. Centralized coordination of different organizations was essential for facilitation of the total program.

6.4 Livelihood issues:

As discussed earlier, both case study villages are relatively economically backward. Therefore, livelihood issue was one priority area. The major livelihoods are farming, livestock herding, masons (and related construction workers) and laborers. Of these, agriculture and livestock are the most seriously affected by climatic conditions. Another important livelihood alternative was small-scale handicraft industries for the women, which included gum collection, embroidery, folk-art, and painting. This was specifically important in Datrana village where a community center is currently being made for the women's livelihood programs.

6.5 Sustainability issues:

Sustainability is the most challenging issue, and provides the greatest learning experience. This should be kept in mind from the very beginning of any rehabilitation program. The exit-policies of NGOs and/or other role players are very important. Institutionalization of efforts is the key factor. At the village level, small scale CBOs (community based organizations), which would be responsible for the sustainability effort in each village, were formed. Networking among these organizations and linking with the local NGO also were important factors. The actual impact of the project in the long term has yet to be seen, but, appropriate measures are being undertaken on the sustainability issue.

7. MODEL OF COOPERATION AND IMPLEMENTATION TECHNOLOGY

Shaw and Sinha (in press) argue that to provide safer and sustainable livelihoods in a community, it is necessary to establish linkages among the various stakeholders: the communities, governments at different levels, academics and non-government organizations. A post-disaster reconstruction program must be a dynamic, flexible process, that reflects people's priorities and aspirations, and it should seek a balance between affordability, technical feasibility, and the quality of life (Vatsa, 2001). In many cases, such projects are donor-driven rather than community-driven, project activities being decided by donor agencies or governments, rather than the communities themselves. Ownership of such projects therefore belongs to governments or donor agencies. Another issue is the involvement of different stakeholders. In most cases, the government, non-government, and academic sectors work separately with little or no interaction and have separate goals and objectives (Eade, 2000).

Involvement of the community in a participatory way in owning both the problem and solution was undertaken at the local

Table 5. Factors necessary for an effective multi-stakeholder community initiative.

Factors	Explanation
Participation and Empowerment	Participation of the end-users is the key factor to make the initiative object-oriented and sustainable. Empowerment of the local community is another important aspect, ensuring the adoption of technology and its transferability to other areas.
Flexibility and Time-framed	An initiative should be strategically planned, but flexible enough to consider the local context. Establishing the context through community consultation is the first and most important step in this regard.
Teamwork	The initiative should be the joint cooperative work of all the different organizations and stakeholders. Together with the specific mandate of each organization, motivated teamwork makes the initiative run.
Identity and ownership	The initiative should be characterized by unique features, which enables it to make a difference. Also, ownership of the initiative should be with the end-users to ensure sustainability.
Trust	The initiative should be executed based on mutual trust among various stakeholders and the end users. Interaction with the end users in the initial stage helps to establish this trust.
Evaluation	An evaluation system should be set up which enables identification of whether targeted objectives are achieved.
Transferability	While working at the local level, transferability is an issue which needs significant attention to make the initiative a model one. Special attention should be given to the implementation process and to conversion of knowledge to practice.

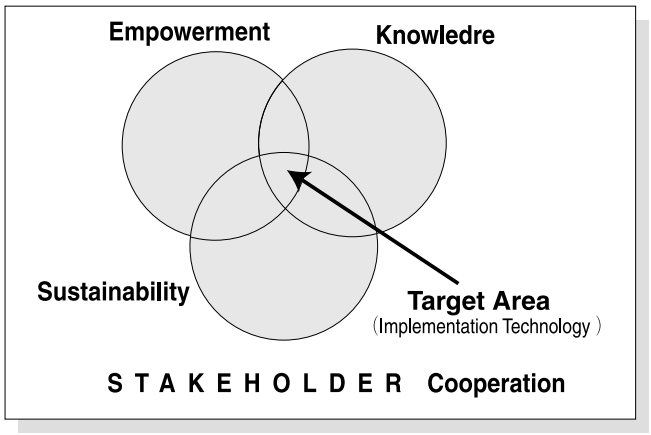

Fig. 8 Implementation technology is defined as the intersection of empowerment, knowledge, and sustainability, based on cooperation among various stakeholders.

level, by focusing on safety and the sustainability of lives and livelihoods. Involvement of different stakeholders in India and Japan in working together with the communities, under a framework based on local needs and priorities was another area of emphasis. Sensitization of the international community to those local needs and priorities was done at the international level.

In summary, the basic elements in this initiative were the community, its stakeholders, existing knowledge, confidence in technology, and people's ability to turn knowledge into practice. The goals to be achieved were: to ensure safer living and sustainable livelihoods, to empower the communities, and to motivate people through incentives. The tools used to achieve these goals were partnership, cooperation, self-help, and participation. Although the common practice for cooperation is from the central to the local government, and only then to the community, the scheme used for the current initiative is indicative of the community-centered interaction of different stakeholders. For successful rehabilitation, the important factors are participation and empowerment; flexibility and a time-frame; teamwork; identity and ownership; trust; and evaluation and transferability (Table 5).

Regardless of the developmental status of a country, existing knowledge and technology often are not converted to practice nor brought to the community level. So long as the end-users, i.e., the communities are not empowered, the sustainabilities of a safer life and livelihood are difficult to attain. The process of turning knowledge into practice has been called implementation technology (Kameda 2001). Figure 8 shows the conceptualization of implementation technology as a continued process of common standpoint on knowledge, empowerment, and sustainability, based on the cooperation of related stakeholders. This implementation technology process is exemplified by the initiative reported here.

8. CONCLUSION

Different stakeholders from India and Japan joined together in providing a post-disaster scenario for the rehabilitation of two Indian villages with specific focus on sustainable livelihoods. The initiative was formulated based on the needs and priorities of each community, and local people were involved in the decision making process. Two important features characterize this initiative: working closely with the end-users and involving them in the process and the involvement of different stakeholders in achieving a single goal. This initiative was regarded as a field experiment in implementation technology, which is the turning of knowledge into practice. The model established is universal in nature, and can be used in other parts of the world, for all types of disaster.

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