DISASTER PREPAREDNESS, LDC VOLUNTEER DEVELOPMENT PROGRAM MANAGEMENT AND TECHNOLOGY TRANSFER IN EARTHQUAKE ZONES

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ABSTRACT Volunteer development programs in LDC often deal with technology transfer; the management of these programs following a major earthquake so that they can disseminate techniques of earthquake resistant construction requires astute programming in the various post earthquake phases, identification of an appropiate technology and transfer media, and accomodation of existing disaster preparedness plans as exercised by the host country and volunteer institution.

* The views expressed in this paper are these of the author and do not necessarily reflect those held by the Organization of American States.

1. Introduction

In many of the earthquake prone areas of Lesser Developed Countries (LDC), building construction with earthen materials is prevalent; many of these areas are also the site of volunteer development programs. When a major earthquake affects one of these areas such as the case of Peru, Nicaragua and Guatemala during the decade of the 70's, these volunteer programs are often requested to assist in building reconstruction programs. This paper will focus on three general aspects of such participation - disaster preparedness, program management and technology transfer. Discussion of aspects of teaching development volunteers not directly involved in building construction programs will also be included.

No exhaustive and up to date survey or inventory is available which throughly documents the proceedures and capacities of the multitude of volunteer programs presently operating in earthquake prone areas but past seismic ocurrences such as those mentioned help to define for future reference the breadth and depth of resources these programs represent. To this end, the experience of the U S Peace Corps in earthquake prone areas will serve as a basic point of reference.* While generalizations can be made concerning the participation of volunteer programs based on the Peace Corps experience, invariably circumstances specific to the country, the occurrence of an earthquake, and the happenings that follow a disaster of this nature indicate that even for the same institution, each situation is unique.

2. Volunteer Program Disaster Preparedness

A disaster preparedness proceedure which includes provision for an institution's participation in post earthquake activities in an affected area is often evolved during a long period of time, spurred on by involvement in such disasters and the problems and opportunities that such occurrences bring with them. Be it formalized to the level of a written plan promulgated throughout the institution or otherwise considered in its operations, these are a few characteristics which premise the disaster preparedness process:

a. The first responsibility of the institution is to account for the safety and well being of its members and to plan and execute the proceedures necessary to that end. This activity includes personnel status reporting, establishment of the necessary communication network, evacuation and personal document requirements and contingency plans, disaster information reporting and dealing with news media and information inquiries by third parties, and personal preparedness. Above and beyond those proceedures directly related to the safety and well being of the institution's personnel, a disaster preparedness plan may include applicable skill identification, disaster causation, prediction and hazard location assessment, and precautionary measure analysis particularly for those volunteers in areas of significant seismic activity. Neither a disaster preparedness plan nor volunteer training programs in general deal with techniques of

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earthen building design and construction at any level beyond a basic orientation as to analysis of the structural integrity of prospective housing to be inhabited by the volunteer and the provision of written material concerning the basics of earthquake resistant construction.

b. The participation of an institution with an on-going assistance program in an affected country in post earthquake activities is normally at the discretion of the host country government. Once a request for such participation has been formulated it is usually the responsibility of the institution's international (or regional) staff to assess the situation and respond to the request. This situation reflects the protocol requirements under which the program operates in the host country through the auspices of the institution's own national government and the internal decision making structure of the institution.

c. On going volunteer development programs in LDC offer a wide range of technical assistance projects, usually organized on a sectoral and, as a function thereof, geographical basis. Although the evolution of such programs during the decades of the 1960's and 1970's has spawned more highly technical and management by objective projects than in earlier years, there are few such programs that specifically deal with construction of earthen buildings in earthquake prone areas. On the other hand, knowledge of the basic concepts of earthen building design and construction may be possessed by volunteers working in programs related to basic infrastructure development (roads and water resources for example) and in equipment and services installation projects (schools, hospitals, agricultural industries, etc.). The institution sponsoring such programs may have the ability to quickly identify personnel both inside and outside its own organization on a national, regional or worldwide basis who have knowledge of earthen building design and construction techniques and, perhaps, previous post earthquake experience. In general, however, most volunteer technical assistance programs, unless specialized in this area, are faced in the immediate post earthquake period with the task of resource indentification and operations formulation. Most volunteers are not usually involved in design and construction activities, particularly those related to housing construction at one significant scale. Nor are the volunteers often in a position to shape, influence or change generally held practices in earthen building construction unless intervening circumstances such as an earthquake modify or amplify the subject area of the volunteers' program.

Disaster preparedness for volunteer development programs, then, does not necessarily ensure or include preparation of the volunteers in techniques of earthquake resistant construction. Moreover, it is probable that few volunteers are instructed in those techniques as part of their program or project training unless their activities in the host country specifically include the design and construction aspects of earthen buildings. The volunteer institution is not likely to divert training and operations resources to this end above and beyond those elements needed for the volunteers' personal safety and well being or in the absence of a formal request from the host country government for assistance in this area.

At this point a note should be made concerning the disaster preparedness of the LDC. As in the case of the volunteer institution, the country's approach to disaster preparedness, has no doubt evolved over an extended period of time and is marked by major or minor seismic occurrences which have spawned further elaboration and modification to a formal plan. Behind the plan are existing codes, regulations, programs and projects which affect earthen building construction in

earthquake prone areas. The intent of these may be to discourage (if not prohibit) the construction of earthen buildings or to ensure the technical competence of their design and construction. While earthen buildings as a housing solution is the most general application of this material, public sector regulation and participation in the construction sector is most often observed in other areas - institutional, commercial and industreal buildings - where earthen buildings are scrutinized, impractical or prohibited. A major earthquake may be seized upon, then, as an opportunity to instigate a prepared plan to control or regulate the use of earthen buildings in these non-residential applications as well as in housing.

But their use in rural areas and among the urban poor is particularly difficult to subjugate to control and regulation. Most earthen buildings in these areas are owner-designed, owner-contracted or owner-built. This generally means that the ensueing design and construction processes are not intervened upon by established public safety or design professionals. Nor are the structures financed (or insured) through conventional means. Again the non-residential use of earthen buildings in these geographical and economic areas is more easily influenced by general public construction policies and post earthquake programs and projects. Housing, however, as the most numerous and critical use of earthen buildings in these two areas is a far more difficult segment of construction to foster technical competency.

Another aspect of LDC disaster preparedness is the relationship between the overall development plan for the country with its corresponding regional programs and the probable impact of a major earthquake. Such regional programs often contain a set of integrated projects covering the production and physical infrastructure sectors and volunteer programs may contribute to the execution of the integrated projects. The occurrence of an earthquake, however, may necessitate substantial modification of the regional program. This is due to the possibility that the geographical area affected by the earthquake may not coincide with the defined boundories of the development region.

Other elements which could thwart a close correlation between the existing planning process and the impact of a major earthquake are the substitution of the normal national or regional planning authority for some form of emergency direction, the distribution of centralized planning functions into separate (and autonomous) sectoral actions, and the destruction of or damage to the prime resources upon which the development plan was based. The degree to which a national disaster preparedness plan incorporates the normal development processes predicates the alterations which on going projects, including those of volunteer development institutions, will face both in their objectives as well as in their operational characteristics. Finite national resources may have to be shifted to newly established priority areas, thus limiting the support to below anticipated levels to many existing programs and projects.

3. Program Management

Once all personnel in the earthquake area are accounted for and a formal request has been made and approved for participation of volunteers in post earthquake activities, the institution will begin to amplify the indentification process of resources available, and on the basis of need assessment, program the activities of

of its personnel. Volunteer participation can be broken down into three distinct phases, one following another with a varying degree of overlap between one and another phase.

1. Emergency Relief Phase

The type of activities most often requested for volunteer participation are:

a. Distribution of relief supplies, (food, medicine, provisional shelter materials, etc.) and giving comfort to disaster victims.

b. Administration of relief supply distribution programs.

c. Damage assessment, identification of assistance needs, and assignment of relief resources.

d. Provision of scarce skills needed in relief operations (medical, construction, and communications personnel).

Distribution of relief supplies and administration of corresponding programs are set up in individual communities. These are activities in which volunteers at their project sites most quickly become involved following stabilization of their personal situation, reporting of their status and initial life-saving and debris clearing actions. Local entities, public and private in nature, organize these activities and most generally depend on national or international agencies for supplies. Volunteers program themselves into a variety of tasks and are urged to cooperate with local officials.

As comprehensive assessment of damage is undertaken and needed resources are identified, including scarce skills, volunteers may be asked to survey damaged areas and channel immediately available resources to needed locations. At this time volunteers may begin to make note of the characteristics of unaffected, damaged and destroyed earthen buildings, including siting, structural design, construction techniques employed and types of failures incurred.

The emergency relief period may last from one to four weeks depending on the type and scale of the disaster. Volunteers in the affected area will be making day to day decisions during that period concerning the kind and extent of their involvement and will communicate as often as possible with the institution's staff as to their present and anticipated activities and the need for assistance.

Activities which include decisions pertaining to the distribution of relief supplies should be monitored closely. Institution staff and volunteers may be asked to make such decisions. Responsibility for such decisions should be accepted with care, and institution personnel should strive to implement proceedures which place decisions as to distribution of supplies with host country nationals (individuals or organizations) or duly designated international relief agencies.

Use of volunteers brought in from other countries is extremely limited during the initial emergency relief period and may be limited to qualified medical people. Other scarce skill areas are of limited use during this time due to the need for equipment and transportation in order to mount effective programs.

2. Rehabilitation Phase

Following emergency relief efforts, which will be accomplished to varying degrees

in different locations, rehabilitation activities will be initiated. These activities will be concentrated in the areas of infrastructure, community facilities, communications, and housing. The rehabilitation phase typically occurs one to four months following the initial crisis and many of its activities will be funded into the reconstruction phase.

Specific activities which will be carried out include some or all the following projects:

a. Housing

1. Provision of temporary family shelters,
2. Distribution of building materials, and
3. Provision of shelter for orphans and child day-care centers.

b. Infrastructure

1. Opening of roads and repair or replacement of bridges,
2. Opening of rail lines and stations,
3. Restoration of electrical power,
4. Repair or potable water systems, and
5. Repair of sewerage systems, including tratment plants.

c. Community Facilities

The repair or provision of temporary structures for:

1. Hospitals and clinics,
2. Government administration and service facilities,
3. Educational facilities,
4. Markets, and
5. Transportation terminals.

d. Communications

1. Restoration of telephone service,
2. Restoration of telegraph service,
3. Restoration of postal service, and
4. Restoration of radio and television broadcasts.

At this time, the institution's staff takes the lead in programming volunteers into these activities. Abbreviated yet comprehensive programming proccedures are sought which will ensure appropriate use of volunteers, particularly in those instances where personnel from outside the affected country are to be brought in for rehabilitation programs. The following programming issues would be discussed with requesting agencies and formal agreements reached between the institution and the participating agency before volunteers are assigned to programs. Particular emphasis should be placed on items a, b, f, and h.

a. Program structure with identification of the volunteer's immediate supervisor;

b. Job description outlining tasks and responsibilities;

c. Needed skills and skill levels;

d. Personal equipment and supply needs;

e. Food and lodging accommodations;

f. Transportation and use of vehicles;

g. Travel requirements;

h. Reimbursement for travel and supplies; and

i. Per diem expenses.

Most requests for volunteer support will be generated from international disaster relief, technical assistance and development agencies who will be working idependently or in close coordination with a particular host country entity at the local, regional or national level. These agencies have gained valuable experience through dealing with past disasters and most likely will be carrying out previously developed programs. The requests may include jobs for administration personnel to hire, fire and manage host country national staff as well as make critical decisions on the disbursement of building materials and supplies at the local level. The degree to which they will promote or allow host country nationals to participate in decision making in the areas of program management and distribution of goods varies greatly.

Rehabilitation assitance is competitive among international agencies as well as national entities, as evidenced in media reports on specific program policies and operations following past major disasters. This situation is often intensified by assignment of specific geographical areas or communities to assistance agencies by de host country government, which obviates the competitive atmosphere. It must be remembered that most international agencies depend on donations and grants to support their relief programs and they must ensure the success of their activities to encourage funding. The institution will examine with particular care the role the volunteer is to carry out, discuss programming issues with the volunteer and apply existing programming criteria to ensure that the institution's goals are met, especially in the area of host country institution building and support. Volunteers should be placed with the understanding that changes in site or job description must have prior concurrence of the institution.

3. Reconstruction Phase

This phase usually lasts from one to five years and many of its programs are extensions or modifications of rehabilitation programs. Reconstruction programs are specifically designed to address any readjustment in post-disaster priorities as envisioned by the national government.

Assessment of participation in reconstruction should begin during the rehabilitation phase and follow established programming procedures. Both national agencies and the institution will revise and reset their priorities to include reconstruction assistance. For the institution this may mean the cancellation of planned programs, the mounting of specialized programs to meet specific reconstruction needs and/or an emphasis in programming special placement volunteers with unusual skills.

Care must be taken in assessing reconstruction needs in order that proposed programs will have adequate host country personnel and resources. Agency budgets and responsibilities can be inflated in the short term through infusion of post-

disaster loan and grant funds, only to be cut back, depending on the level of continued international reconstruction support and host country budget constraints and priorities, and national availability of resources.

Monitoring the development of the host country governmental reconstruction structure and its policies is essential. One of three general models is usually developed in dealing with reconstruction.

a. A new national agency and/or ministry is created to carry out reconstruction with policy and execution responsibility.

b. An existing national agency and/or ministry is charged with creating a national reconstruction policy and designating all reconstruction activities to take place. This entity may also execute reconstruction programs in any or all sectors.

c. A decentralized reconstruction policy is adopted with existing agencies and ministries carrying out reconstruction programs in their respective sectors. These entities may or may not create policy, depending on the existence or absence of a coordinating, policy making group.

In consultation with national government officials, the institution will undoubtedly want to revise program projections. This may take the form of new or expanded programs to include such skills as carpenters, and other construction trades, architects, engineers, physical and occupational therapists, demographers, cartographers, agronomists, environmental scientists, and soil conservationists for the following types of projects:

a. Housing construction,

b. Public building,

c. Irrigation systems,

d. Road systems,

e. Potable water and sewerage systems,

f. Rural electrification,

g. Public health, and

h. Food production.

Technical assistance in earthen biulding design and construction may be a formal, specific part of a reconstruction program for items a. and b. above, or it may be included as supplemental material for these and the other types of projects mentioned according to their use of earthen buildings. It is rare that a special technical assistance program in this area is requested in the absence of a major earthquake. Such a request may be for a few highly qualified professionals to participate in the preparation of building codes, zoning regulations, rural or low income housing development programs, or disaster preparedness plans. Otherwise programming technical assistance in earthen buildings faces the issues and variables mentioned earlier.

4. Technology Transfer

The panorama of volunteer participation in the transfer of earthen building technology through development programs in LDC is multifaceted and conditioned to the uniqueness of each country and each post earthquake situation. Aspects of that panorama to be considered include the following:

a. Development programs for LDC earthquake prone areas do not normally demand that participating volunteers have prior knowledge nor mandatory training in earthquake resistant construction of earthen buildings. Elementary acquaintance with this technology may be presented to facilitate the choosing of structurally sound housing for the individual volunteer.

b. Technical assistance programs could include earthen building technology if design and construction issues related to specific building use types, geographical areas or income classes so deemed necessary, but such technology generally receives high priority only following a major earthquake, in the formulation of disaster preparedness plans, or more commonly, in the preparation of technical segments of codes, regulations, and construction-related programs and projects.

c. Apart from the few instances where volunteer participation is centered on earthen building technology dissemination or where design and/or construction specialists must deal with the issue as part of a building development program, volunteers do not normally deal with the subject neither in its technical nor in its economic and social terms.

d. Following a major earthquake, volunteers in the affected area quickly program themselves into disaster relief, the first of the post earthquake phases. The succeeding phase of rehabilitation draws quickly on volunteer skill or specialty areas at hand and the reconstruction phase will consider earthen building technology as a possible project component according to program objectives and priorities.

Volunteers teaching and employing techniques of earthquake resistant construction of earthen buildings is quite feasible as part of reconstruction programs or as part non-earthquake instigated development activities. On a short term basis following a major earthquake it is probable that volunteers will neither have the knowledge nor will relief activities place a high priority on this particular area of technology transfer. Volunteers themselves may be victims of the disaster and share sentiments and doubts similar to their host country neighbours concerning earthen buildings, their design and construction. In any event, it is during the rehabilitation phase that the need for knowledge of earthquake resistant construction becomes quite apparent and volunteer participation in the dissemination of such technology becomes a special issue.

The context in which this participation may take place is shaped by a variety of forces. The need for technology transfer in the area in question is relative to the absence or lack of utilization of a presently available appropriate technology. It is not suprising to find within a relatively small geographical area affected by an earthquake (within, say, a 10 kilometer radius or less) widely varying degrees of damage to earthen buildings. Upon examination it is probable that the most important variable in explaining the absence or presence of extensive structural

damage to the buildings, is the proper design and construction of the buildings according to known earthquake resistant techniques as evident in the construction of some earthen buildings. Further investigation may identify a construction craftsman or family of craftsmen who erected each set of buildings grouped by degree of damage.

It occurs also that earthquake resistant techniques may have been known and practiced in past generations but for economic reasons (usually cost) or technical appraisals (no need for the technology because of belief that there is a low probability of a seismic occurrence, or the need for the application of old construction ways are antiquated and they are no longer necessary nor expedient) they are discarded, not accepted or not passed on to succeeding generations. Local unsupervised reconstruction activities in areas affected by an earthquake often show a resurgence of seismic resistant construction techniques which were lost or forgotten as exemplified by contemporary earthen structures built in the 20 years preceding the earthquake.

Other forces which shape the demand for an appropriate earthquake resistant construction technology include social aspects which border on the imponderable: tradition, superstition, availability of suitable building materials, economic costs versus social benefits as perceived by the craftsman and the user, the social relationship between qualified craftsmen and families having need of their services, etc.

These forces when viewed in their entireity tend to define a situation where the demand for a appropriate technology for earthen building construction and the transfer of such a technology turns to an analysis of spatial location, building design and construction techniques, social organizations, and economic feasibility on a building by building basis. As such it is a starting point for the formulation of a technical assistance program faced with the same constraints and problems as assistance programs at the grass roots level in other areas of development.

Other demand forces, however, serve to order an entrance into providing technical assistance and aggregate the possibly diverse individual needs for the technology in a form more susceptable to a volunteer development program. These forces include the dependence on craftsmen as a group for the majority of earthen building construction, particularly non-residential buildings (as opposed to the often held belief that every earthen building owner is the builder of his building). Another force which allows for an efficient dissemination of an appropriate technology is the impact one example of an adequately constructed building can make, particularly if it is a structure which has survived an earthquake without loss of life to its users and with no major structural failure. And, of course, if an example does not exist, one can be built and subsequent building construction may copy the technology utilized, particularly, if doing so assures the availability of a building permit, building materials, technical assistance and manual labor.

Against this backdrop of demand for an appropriate earthquake resistant construction technology, the offering of same by volunteer development programs, particularly in the rehabilitation phase following a major earthquake, is shaped by its own set of forces. Assuming that the volunteer is personally predisposed to participate (and having overcome such possible impediments as being previously prohibited from living in earthen buildings or being an earthquake victim injured by the failure of an earthen building), preparing him or her for the task requires expenditure of resources - time and money - of the volunteer institution and perhaps of other international and national agencies as well. Familiarization

with the basic concepts of earthqake resistant building design and construction techniques is not difficult in itself. Such knowledge can be assimilated rapidly by the volunteer.

The difficulty to overcome in the rehabilitation phase is to program such an actiity in advance, make available the resources, identify the participants, develop the training program and execute. All this must be done during an extremely difficult period when volunteers, their staff and persons skilled in the necessary technology must exhibit a high degree of flexibility, utilize their time in the most efficient manner possible and respond to the demand, often rigidly self-imposed, that their efforts provide the greatest assistance possible. Under such circumstances, the volunteer generally chooses to rely on proven skills that he or she possess. These in turn must be combined into a coordinated effort to disseminate the technology. Those who understand the theory on which the technology is based direct those who can build as instructed to do so while those who can organize and communicate geographically or by spoken word, perform appropriate tasks. It is most difficult during the post earthquake emergency period to dissuade a volunteer from performing any task which he or she perceives to be a contribution irregardless of the objective, priority or skill level involved. Otherwise, they may become a victim of the earthquake aftermath. Likewise, during the development of a national development program, it is difficult to persuade a volunteer or trainer to learn skills for which they have little interest or dedication.

Volunteers are usually involved in technology transfer for which they must develop the skills and tools necessary to present and implement ideas. They most often work at the local level where interpersonal skills and command of the language make application of an appropriate technology possible. Report and a sharing of confidence provide the opportunity for assisting. These elements are built around one or another development area; they are not always transferable from one subject matter to another nor from one group of persons to another (access to an influential farmer may not privide access to an influential craftsman nor will acceptance of food processing technology presented by a volunteer allow them to have the same acceptance when explaining building technology). Moreover those means deemed expedient and employed to convince or coerce the local inhabitants to adopt a particular technology may not be acceptable to the volunteer or his institution.

None the less, good volunteers can generally adapt to new circumstances, acquire new skills and be effective agents of change. In the aftermath of a major earthquake or as part of a normal development program they can impart an earthquake resistant construction technology but they will undoubtedly be few in the face of many potential building construction projects which are worthy of close technical supervision. To that end their participation must have as great a multiplier effect as possible. In general the most effective use of volunteers has been in demonstration projects with high visibility and short term technical consultations with influencial members of the local craftsmen group who in turn control a great deal of the actual construction in the community.

Presenting earthquake resistant construction techniques must also be coupled with assistance in areas of never ending concern in the construction trade: good quality materials and proper execution of general construction techniques not necessarily directly related to earthquake resistant construction. Attention to these issues may be just as important, if not more so, to building development because of their role in the structural integrity and stability of any building.

In the end, the concern for advancing the state of the art of earthen building construction as represented by identifying seismic dangers or the occurrence of an

earthquake and the reconstruction period that follows is a relatively new phenomenon as seen from the perspective of the long history of the building material itself. If the opportunity is seized, the history yet to be written might read a bit differently than previously envisioned.