Community Based Flood Hazard Mitigation in Squatter Settlements: Experiences in the Rimac Valley, Peru

Andrew C. Maskrey
Director Adjunto,
Centro de Estudios Y Prevencion de Desastres (Predes)
Apartado 11832, Jesus Maria,
Lima, Peru.

Introduction

The concept that the disasters which occur every year in developing countries, due to floods, hurricanes, earthquakes and droughts are natural, has been losing ground in recent years. It is increasingly clear, that the majority of disasters occur as a result of a development model, which concentrates wealth and resources amongst a wealthy elite at the expense of an impoverished majority, who lack even the minimum resources necessary to satisfy their basic needs and who consequently are permanently vulnerable to suffer a series of disasters : hunger ; illness, unemployment; violation of human rights, etc. The disasters, which we call "natural" or in other words which are provoked by natural hazards only serve to aggravate the daily disaster faced by the majority of the population.

Nonetheless, many agencies and researchers still dedicate the greater part of their efforts towards persuading national governments to "do something about the disasters". Of a recent AID package to Peru, for the reconstruction of affected areas, 90% of the funds were destined to government organisations, for example. Although in the best of cases there may be a discussion of how to persuade the population to participate in state organised programmes, very few attempts have been made to turn the question on its head—how to persuade government agencies to participate in peoples own hazard mitigation programmes. Up to now, researchers and agencies have allowed themselves to be distracted by a series of entertainments, while failing to face up to the fundamental issue—is it really possible that government agencies in developing countries can take the initiative in disaster prevention or is this one more universal myth. This paper puts forward the hypothesis that the population affected by the disasters is the only agent capable of reducing risks and of persuading national governments to carry out useful actions In the following pages, this hypothesis will be backed up by the concrete experiences of a disaster prevention programme carried out in the Rimac Valley, Peru during 1983 and 1984.

The Rimac Valley

The Rimac Valley is located on the western slopes of the Andes in the Department of Lima. Including its principal tributaries : the Santa Eulalia, Canchacalla and Blanco rivers, it has a total area of 3517 km^2 which represents 0.24% of the total area of Peru. The Rimac has its source at 5000 m in the Andes and reaches the Pacific at Callao after a course of only 120 km.

Given the immense variations in altitude

the river basin has markedly different ecological zones, ranging from the coastal desert, through the semi-arid agricultural zone between 1500 and 3000m, to the high Andean "puna" above 3500m. Annual rainfall rarely exceeds 50mm in the coastal area but usually passes 1000mm in the upper valley.

The basin has a high population density, due to the location in the coastal plain of Lima and Callao, with a population of more than 6 million and 70% of Peru's industrial establishments. Other important towns are Chaclacayo, Chosica, Surco, Matucana and San Mateo, with numerous small rural communities.

The Rimac Valley is the principal route between Lima and the Central Sierra and the Amazon. Both the Central Railway and Central Highway follow it, both being essential for Peru's exports and for Lima's food supplies. The Rimac also generates electricity for Lima and supplies it with drinking water.

The disasters and their consequences

Every year during the rainy season "huaicos" (alluvions or flash floods) and river floods cause fast-impact disasters in both rural and urban areas in the Rimac Valley. These have direct consequences for the local population :—destruction of housing, land ; crops and infrastructure ; loss of life etc. as well as very serious regional implications :—paralisation of economic activities ; food shortages contamination of Lima's water supply ; blockage of communications etc. To give some examples of the magnitude of the damage :—

(a) In 1984, the Central Highway was completely cut for 15 days and the Central Railway for 60 days. For each day the economic losses have been calculated as :

— Central Highway - $ 3,867,838

— Central Railway - $ 620,139

Also, for example, the cost of reconstruction of the railway in 1983 was $ 3,365,634.

(b) In 1983, 437 Has. of farmland was affected (in only 2 tributary valleys) and the total loss of agricultural production ascended to $ 5,465,000.

(c) In 1983 more than 100 people were killed by huaicos, 96 houses were totally destroyed and 622 families were made homeless.

The causes of the disasters

The Rimac Valley presents geological, topographical and climatic conditions which are highly favourable for the formation of geodynamic processes such as huaicos. The steep gradients, the type of rock, the absence of vegetation and the concentration of the rainfall in only three months of the year make the huaicos which occur in the Rimac's tributary valleys bigger and more violent than similar events which occur in other regions of the world.

On reaching the valley bottom, the huaicos lose velocity, depositing a thick layer of mud and rocks on everything which they find in their path, as well as adding their material to the Rimac's current, which itself becomes a gigantic huaico. All this solid material is transported to the lower valley, where it is sedimented, causing the river to change course, raise its level and flood.

Nontheless, one cannot put all the blame on the geology and climate for the annual disasters in the Rimac Valley. It is necessary to examine the influence of man's activities. In the Inca and pre-Inca periods, it is unlikely that disasters occurred in the area. On the one hand, the Andean cultures had on excellent grasp of the geodynamic processes and by means of their social organisation were able to put into action enormous terracing works, which completely controlled soil erosion avoiding the formation of huaicos. Up to the present day, large areas of pre-Inca terraces are in use in the upper valley and there are tributaries, where the erosion is completely controlled-huaicos being unknown. On the other hand the human

settlements were all located on the hillsides in stable areas and not in the valley bottom.

With the arrival of the Spaniards in the 16th Century, all that started to change. New imported agricultural practices failed to take into account the local ecological conditions, contributing to the acceleration of the geodynamic activity. New urban settlements (including Lima) appeared in the valley bottom in areas extremely vulnerable to the effects of both huaicos and floods. Man and his activities and settlements began to adopt increasingly vulnerable forms in the face of increasingly violent and frequent natural hazards.

The vulnerability increased dramatically with the penetration of capitalist production relations into the area, beginning with the construction of the railway (in 1983) and the highway (in 1930). This led to a process of urban expansion in the valley bottom and the abandoning of agriculture as the principle activity in the upper valley, in favour of mining and commerce. However, all these changes were almost insignificant compared with the consequences of the process of industrialisation and urbanisation which has taken place in Lima since the 1950's. The total neglect of the rural areas has created new problems such as overgrazing, deforestation, destruction of terraces etc. which in turn have increased the frequency and magnitude of the huaicos and floods. The vertiginous growth of Lima has led to the appearance of enormous squatter settlements of low income families in the Rimac Valley usually, located in the most vulnerable areas with respect to natural hazards, and particularly in the area between Lima and Chosica.

In other words, the disasters which occur every year in the Rimac Valley are a direct consequence of the development model (capitalist dependent) which Peru has adopted. Only in the last forty years, the population living in areas with direct risk to suffer disasters has risen from 5000 to approximately 50,000 at the same time as the natural hazards themselves have become considerably more dangerous and frequent. The present situation is the consequence of a focal point of urban and industrial capitalist development taking place in an area which presents an extremely high level of geodynamic activity.

THE ROLE OF THE STATE

As a Cause of the Disasters

Like it or not, Government policy over the last 30 or 40 years has been an important factor in the development of the vulnerability of the population and their settlements in the Rimac Valley. Economic policy, through different regimes has consistently favoured the form of capitalist urban-industrial development which, has taken place. Housing and settlement policy has constantly failed to take into account the real needs of urban low-income families and thus has had no option but to accept (with differing levels of support or repression) the invasion of marginal land on a large scale as the only way out of the housing problem. Agricultural policy has failed to make Andean farming on low quality land an attractive alternative for the rural population and has been a factor which has contributed to the progressive abandoning of the rural areas.

There are also very specific instances where Government programmes have magnified existing risks, provoking disasters. For example, the construction of the new Central Highway in 1983 and 1984 has greatly increased the sedimentation of the Rimac far more effectively than the huaicos have been able to do and has been responsible for several floods in 1984, which produced very serious consequences in the lower valley.

In Hazard Mitigation and Reconstruction

Various Government organisations (Defensa Civil, Cooperacion Popular, Corporacion de Desarollo de Lima-CORLIMA) have different responsibilities, with respect to the Rimac Valley disasters, Defensa Civil to disaster victims. Both Cooperacion Popular and CORLIMA carry out defense works (river defenses, dyke repairs etc.) on a fairly continuous basis throughout the valley. However, it is important to underline some of the characteristics of these last two organisations and the way in which they work :

— they work preferentially with communities who support the ruling political party

— they carry out neither technical nor social studies. The works are not based on an interpretation of the causes of the disasters but rather are aimed only at mitigating the immediate effects.

— the works are not carried out by qualified technical personnel and frequently do not stand up to the huaicos and floods. Faulty design and implementation has led to unnecessary disasters in several cases.

— the work of CORLIMA is carried out with private contractors. where the profit motive is more important than the effectiveness of the work.

In other cases (for example, the annual repairs carried out to the Central Highway) a highly profitable disaster industry has emerged. Each year private contractors carry out short term repairs, which do not last the rainy season, creating the neccesity to repeat the works the following year. Powerful interests are thus created against a definitive solution to the disaster problem.

Can the State Play a Useful Role in Hazard Mitigation

It can be argued that given the State's role in causing the disasters, it is impossible that it can adopt a function as the actor responsible for hazard mitigation When the development model is capitalist and dependent, the state will only invest the minimum possible in social reproduction to guarantee the continued reproduction and accumulation of capital. Government organisations only intervene in the disasters to carry out short term assistance or emergency measures which permit them to obtain immediate political benefits, without having to alter the structural causes of the disasters. Hazard mitigation, therefore, is an activity which can only be taken up by the population directly affected by the disasters. Risk reduction is a social demand of low-income sectors. in the same way as drinking water, health services, education, housing etc And in the same way that it is necessary to organise and demand that the state accepts the very real responsibilities which it has with respect to hazard mitigation.

A Disaster Prevention Programme in the Rimac Valley

In the Rimac Valley, both urban and rural communities have a long history of social organisation as a means of satisfying basic needs which have to be resolved on a communal basis. Also, all the experience has shown that the possibility of low income groups to confront the disasters (both in terms of hazard mitigation as well as reconstruction) depends on three fundamental relationships :

(a) The level of consciousness and social organisation of the population.

(b) The access to essential resources and the knowledge and technology to be able to use and combine them.

(c) An institutional framework and legal system which allows (a) and (b).

Taking these relationships as a starting point, in 1983, PREDES began a disaster prevention programme in the Rimac Valley, in conjunction with the low income communities themselves, which consisted of the following activities :—

— Interpretation and analysis of the disasters and the development of the measures necessary to prevent them.

— Organisation, social promotion, education and training, with the local communities.

— Technical assistance and advisory service.

The object of the programme is to avoid the occurence of disasters in the area, by means of the progressive reduction of the vulnerability of the population and their settlements and to facilitate the recupera-

tion of those communities which have already suffered disasters.

Evaluation of the Experience

Consciousness of the problem and its possible solutions is essential. On the whole, communities which suffer from disasters every year are conscious of the risk which they face. Nonetheless, there is much less clarity with respect to the causes of the vulnerability and risk, with respect to the possible mitigation measures which could be implemented and with respect to the possible resources available for implementation. Generally, for example, a hazard is conceived only in terms of "effect" (destruction of houses etc.) and not in terms of "cause" (soil erosion in the upper valley). Conceptions of possible solutions are limited by conceptions of the problems. Only local, short term solutions to tackle the "effect" are imagined, rather than solutions which affect the "cause". Possible solutions are also limited by urban images—for example, heavy machinery and reinforced concrete—overlooking local, intermediate solutions which are within reach of the population. There is a tendency towards fatalism—"wait for the machinery"—while overlooking the resources which the community itself manages. In communities, where the disaster risk presents itself only after large intervals—valleys where the huaicos occur only every forty or fifty years—there may be a complete absence of consciousness that a disaster could occur. In these cases, it is necessary to create consciousness before any hazard mitigation work can be undertaken. The lack of consciousness of a given population should always be analysed within the context of the development process, and the disarticulation of traditional, social and cultural relations as the inevitable result of the penetration of capitalist production relations.

The level of social organisation necessary to carry out hazard mitigation seems to stem directly from the consciousness of the problem and from previous organisational experience. It also depends, therefore, on the insertion of the population within the urban economy; the continuation or abandoning of the traditional network of production and consumption and other factors related to the development process. Old communities, which maintain traditional forms of social organisation and new urban communities, which have successfully obtained basic services thanks to the struggles of their own collective organisation, adopt hazard mitigation as one more community responsibility. In contrast, in those communities where the traditional forms of organisation have been disarticulated and have been replaced by a paternalistic dependence on outside aid, within new urban networks of production and consumption, it is impossible for hazard mitigation work to be carried out, even in zones where disasters occur every year and in moment when these are imminent. It must also be remembered that there may be other pressing needs, which have to be on a daily basis, such as obtaining a drinking water supply, which take precedence over problems such as disasters which only occur periodically and which can be given low priority for much of the year. The vulnerability of low income populations is multifaceted and therefore hazard mitigation is only one aspect of the daily struggle faced by many families. The forms of articulation between government agencies and community organisations mean that the former help to disorganise the population and to prevent the formation of consciousness, in some instances.

Where a reasonable level of organisation and consciousness exists, the principle obstacle to carry out hazard mitigation is the lack of resources. Admittedly, in many cases excellent mitigation measures can be carried out using local resources and community labour.

However, often, little can be done without large quantities of materials, such as cement, which are beyond the means of the population. Also, there exist large scale works, such as river canalisations, which can only be carried out by government agencies, which possess the heavy plant neccesary. It is evident, therefore, that the state has a very large responsibility with respect to hazard mitigation:—guaranteeing those resources, which are controlled by the market or by central government and which are not available to low income communities. However, as has been mentioned above, due to the role

of the state with respect to the conflicting objectives of social reproduction and the accumulation of capital, government agencies do not fulfil their obligations. It is the communities own organisations which have to struggle, to force the state to provide the resources neccessary. The association of various community organisations in a single "Front" is often neccessary to be able to bring to bear the pressure required. Only when people assume control of their own hazard mitigation programmes, can the state adopt a responsible position, with respect to hazard mitigation.

The population is perfectly capable of managing and developing the technology neccesary for hazard mitigation Training in aspects such as defense wall construction, reforestation for the prevention of huaicos and housing improvement, can have very succesful results, provided that ground conditions of organisation and consciousness are already present. The traditional technology which the population already possesses enriches the solutions proposed by outside experts. Even the introduction of new materials and technology (such as the use of geotextile) is possible. In one particular case, the population itself developed a new technique for using geotextile, which proved to be far more effective than that prososed by the manufacturer.

Hazard mitigation, based on communities, own programmes, is a slow, irregular activity, whice does not produce instant results. There is no linear development of programmed activities, given that the process has to evolve at the same rhythm as the communities, own consciousness and organisation, with all the obstacles and setbacks, which that implies. There are no spectacular large scale solutions, but rather a series of small incremental actions which progressively form a coherent whole. Perhaps the most important product of all, rather than the specific works carried out, is the development of a new popular consciousness and organisation amongst the low income population the first step towards bringing about the structural social and economic transformations necessary to eliminate the causal factors of the disasters.

Results of the Programme

In the Rimac Valley, the actions carried out since July 1933 have had the folowing results:—

- The programme now incorporates 49 urban and rural communities, with a total population of over 60,000 persons.
- It is the population, rather than PREDES, which has given the impulse both to start and to develop the programme. New requests for advice, training and support are continually received from the population.
- The programme has resulted in the appearance of new organisational forms such as the "Multisectoral Defense Front for the River Rimac", which are now playing a very decisive role in the development of hazard mitigation in the area.
- As a consequence of the programme, numerous works have been carried out, both by the population itself as well as by government agencies under pressure from the population. The programme has thus been able to mobilise an enormous quantity of both local and centrally controlled resources, producing important multiplier effects.
- Works carried out in 1983 avoided the occurrence of disasters in 1984 in several zones.

Conclusions

Supporting local communities to implement their own hazard mitigation programmes is probably the only way to reduce the occurence of disasters in a poor country such as Peru.

This task cannot be undertaken by the state, through government organisations, given the role that these play in the evolution of the critical situation of vulnerability faced by the low income population and

their vested interest in the continuation of this situation.

Nontheless, the state has an important role to play in hazard mitigation, guaranteeing those resources controlled by the market or by central government and which are not available to low-income communities.

The state can only be made to participate in and support people's own hazard mitigation programmes, when the population, through its own organisations, exerts pressure and control.

The promotion of people's own hazard mitigation programmes, based on locia communities, enables small incrementla actions to be carried out to mitigate the effects of the disasters. It also prepares the condition for the structural social and economic transformations neccesary to eliminate the root causes of the disasters. Such programmes are now a historical necessity, if large scale catastrophes are going to be avoided in the future.

Disaster problems should not be examined in isolation but always with respect to a given development model in a given context.

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STUDY OF SEISMICITY

Contd. from page **11**

A number of meetings were held between 1975 and 1978 for the proper assessment of our present knowledge of global tectonics and modern goodynamics in our country, the state of art, the various gaps to be filled in and to formulate a concerted plan of action through multi-disciplinary and inter institutional approach. The main recommendations were :

(i) Ways and means to intensify research ;

(ii) To strengthen the existing seismograph network ;

(iii) Training professional and technical staff, and

(iv) Instrument development.

Realizing the importance of promoting this type of study in the country, the Govt. fo India through the Deptt. of Science & Technology, after considering various factors, set-up an expert committee under the Chairmanship of Prof. Jai Krishna. Based on the recommendations/suggestions of this expert committee, the project was sanctioned in 1982.

The present project is primarily aimed at promoting the role of Science and Technology in the protection of the environment and people from natural hazards, particularly in such fields as earthquake prediction, assessment of seismic hazards, influence of earthquake tremors, increased rate of siltation and, finally, evolution of remedial measures/controls to minimize the consequent risks.

The project, apart from the technical aspects, lays stress on earthquake disaster mitigation and, under the heading "Seismic Zoning and Seismicity studies", the D.S.T. has been charged with inviting organisations to take up Social Awareness studies during the 7th plan.

One does hope that the aspect of translating the benefits of the Technical studies, for use by people through the 'extension work' element in each theme area and study, will soon become the order of the day.

Eighty seven participants took part in the workshop. They represented seventeen different agencies, implementing different parts of the project, including the only NGO, the Joint Assistance Centre.