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Journal of Administration Overseas

INDEX

VOLUME XVI NUMBERS 1–4

1977

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The Human and Social Implications of Earthquake Risk for Developing Countries*

K. N. WESTGATE & P. O'KEEFE**

TOWARDS AN INTEGRATED MITIGATION STRATEGY

The human and social implications of earthquake risk are many. In basic terms an earthquake can result in lives being lost, property damaged or destroyed and economies disrupted. The implications for the individual are the potential loss of family and friends, injury and the destruction of dwelling and workplace. The sum total of these effects gives an impression of the community burden. However, despite some mitigative measures, there appears to be no apparent decrease in the recurrent death toll and destruction of property. Indeed, available figures reveal an alarming upward trend in the number of deaths from such geophysical hazards as earthquakes, especially in developing countries.[1] Each time an earthquake disaster occurs the donations of emergency relief arrive from international sources, although local self-help has often already met the requirements for immediate aid. Concern is expressed through the media which promotes a short-term, armchair involvement for audiences far removed from the actual scenes of destruction.

In six weeks the events are often forgotten. Two questions remain pertinent: firstly, what should be considered as the real implications of earthquake risk for a population; and, secondly, having identified these implications, what then must be our priorities?

Much research has been undertaken in recent years in the United States which attempts to lay down certain strategies for the mitigation of earthquake risk. These strategies are based on the knowledge that certain features of the earthquake hazard

*This article is based on a paper submitted by the Disaster Research Unit at Bradford, to the 1976 Unesco Conference on the Assessment and Mitigation of Earthquake Risk.

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[1]See statistical analysis of disaster occurrence in Dworkin, J. (1974): 'Global Trends in Natural Disasters, 1947–73'. *Natural Hazard Research Working Paper No 26, Institute of Behavioural Science, University of Colorado*; Baird, A.; O'Keefe, P.; Westgate, K.; Wisner, B. (1975): 'Towards an Explanation and Reduction of Disaster Proneness, Disaster Research Unit, Occasional Paper No 11, University of Bradford.

imply potentially grave losses to inhabitants of seismic regions in the USA. Some of these research findings and their implications can be listed as:

1 The destruction of buildings caused by energy transmitted through vibrations of the ground.
2 The effects of tsunamis, especially on coastal communities, involving destruction by water and inundation.
3 The compound nature of many earthquake disasters involving not just the quake itself, but also fire from the shorting of electricity cables or the fracturing of gas pipes.
4 Earthquake activity in the region of major dams which could result in flash flooding, or the failure of sloping land producing massive landslips and avalanches.[1]

The strategies undertaken in the United States to counteract such potential effects include: '(i) Attempts at reduction/prevention of earthquakes *per se*; (ii) Earthquake and tsunami-resistant construction; (iii) Land use management; (iv) Attempts to forecast and disseminate earthquake and tsunami warnings; (v) Insuring structures against earthquake and tsunami damage; (vi) Efforts to prevent or minimize associated hazards such as fire and landslide; and (vii) Efforts to prepare the community to respond promptly and adequately when disaster does strike'.[2]

These strategies, it is assumed, given adequate concentration of time and effort, could lead to successful disaster mitigation in the United States and, equally, other more developed countries. The problem for developed countries is essentially an urban one and increasing urban growth and massive collections of people in large, sophisticated, industrial centres create special problems in seismic zones and require equally sophisticated and highly-technological answers.

The problems are different for developing countries which lack the organised urban centres prevalent in the West. Where urban centres occur, they are physically often of a different character containing as they do a large proportion of migrant or semi-migrant labour from the rural areas who hope to implement their meagre rural incomes with paid urban employment. Developing countries also lack much of the technological expertise, sophistication, wealth and resources of industrialised countries. Indeed, the problems of developing countries are often not answerable by the super-imposition of Western technology and methods on to a political, social and economic system of an entirely different nature.[3] What is required is a successful strategy for countries struggling to maintain economic viability – *disaster mitigation must take place within the context of development as a whole.*

[1]See White, G. F.; Haas, J. E. (1975): *Assessment of Research on Natural Hazards. MIT Press, Cambridge, Mass.*

[2]*Ibid.*

[3]Westgate, K. (1975). 'The Human Response to Disaster: an Analysis of Individual and Community Response to Natural Hazards'. Unpublished M.Sc. thesis, Postgraduate School of Planning, University of Bradford, pp 211–214.

The question is one of scale. An earthquake in a developing country can seriously disrupt the whole economy of the country and has grave repercussions for development programmes. A successful disaster mitigation strategy acts as an insurance of this development.[1]

A first step in an approach to successful disaster mitigation in the developing countries is to remember that disasters are about people: *without people there can be no disaster*.[2] It is imperative therefore that disaster strategies be orientated towards the vulnerability of the population.

Secondly, the concentration of effort and resources into the period immediately following an earthquake occurrence is often an exaggeration of the actual needs and requirements of a stricken population during that period. Massive inputs of relief aid often lead to dependence by the people on such relief. Dependency of this kind can lead to distortions of the existing socio-economic condition and an increase in the vulnerability of a population to further disaster and further dependency.[3] For example, Davis cites the problems of temporary housing in Managua after the 1972 earthquake:

> Although the US government AID housing is built with a 2 year life expectation, it is more than likely that they will last, in modified form, for up to 20 years. In a city like Managua with its predisaster deficit of 8,000 houses it is unthinkable that the authorities will have the finance to re-house the 60–90,000 occupants of these houses. This would therefore indicate the need for upgrading the standard of houses. This would include internal sanitation, more permanent construction, other buildings on the site – for shopping, social needs etc.[4]

Davis refers to these temporary houses as instant slums; in other words, the 'temporary' housing becomes permanent and because the construction is temporary it is liable to rapid deterioration.

Emergency aid immediately following an earthquake is vital but these immediate requirements, in the first instance, can often be adequately accommodated by self-help supplied by the population itself and by the various voluntary agencies whose appeal for public support requires prompt and visible results. Consideration should be given to diverting resources away from the disaster event itself towards the identification of disaster potential and the mitigation of *future* disaster occurrence by the promotion of *appropriate* measures.

Thirdly, the re-orientation of resources towards the mitigation of future disaster occurrence implies encouraging developing countries towards a greater self-reliance

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[1]Baird *et al* (1975) *op cit*, pp 44–48.

[2]*Ibid* p 1.

[3]*Ibid* p 34.

[4]Davis, I. (1974). 'Managua, December 23rd 1972: the Provision of Shelter in the Aftermath of Natural Disasters – Report on Housing Strategy, December 1972–September 1973'. Research Project Report No 2, School of Environmental Studies, University College, University of London, p 136.

in coping with disaster. It does not imply that catering for the immediate needs of a disaster-stricken population is not a necessary direction for resources but that these needs are but one aspect of a continuing programme of disaster mitigation measures integrated into development plans. Action of this kind will tend not only to decrease a population's vulnerability to disaster occurrence but also act as *an insurance of the development plans themselves*. Disasters interrupt development programmes to a great degree and appropriate mitigative measures can decrease the possible losses.

With the promotion of self-reliance at its core, a disaster mitigation policy for the developing countries should bear in mind four vital points:

1) Disasters are not just isolated events but are recurring phenomena.[1] For example, Managua was damaged by earthquakes in 1885, 1931, 1968 and 1972. An earthquake can therefore be expected to occur again in the future. This fact tends to be reflected in the lives of the population to a greater or lesser degree, depending on the frequency of occurrence. Populations of earthquake areas tend not to reveal this trait so much as, say, those living within known hurricane paths, but it is surprising how much knowledge is passed from generation to generation. The population, consciously or unconsciously, respond in their lives by action or attitude, to the future earthquake threat. Disaster is, thus, a continuing process. *Just as this fact is often reflected in local attitudes, so equally it should be reflected in disaster aid.* Trainer talking of the 1972 Managua earthquake recognises this problem:

> Each time there is a major disaster, those who face the issues and make the decisions tend to start anew, treating the situation in their city as a unique case.[2]

2) Efforts at the provision of adequate defences against disaster should concentrate on the promotion of self-reliance. This implies the use of local resources and technologies wherever possible.[3] Local communities have much to teach us in the realm of mitigative strategies which are effective in their own particular environment although they may lack the resources and education to observe the full range of probable strategies. Selective foreign technology; methods and ideas should only be utilised where they are appropriate to the culture and resource utilisation of the local population.

3) In developing countries, it is essential that attempts at disaster mitigation be incorporated into development planning as an insurance of development.[4] It has already been stated that disaster should be seen as a continuing process. Development planning is also a continuing process and disaster mitigation strategies should quite properly find their place within this development strategy and not be considered as an isolated exercise. With the heavy concentration of effort in the emer-

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[1]Westgate (1975), *op cit* p 1; Baird *et al* (1975), *op cit* pp 1–2.

[2]Trainer, P. (1975). *Research on Reconstruction Following Disaster: Working Paper No 2 – Managua*. Institute of Behavioural Science, University of Colorado, Boulder, p 1.

[3]O'Keefe, P.; Wisner, B. (1975). 'African Drought – the State of the Game', in Richards, P. (Ed) *African Environment: Problems and Perspectives*. International African Institute, London, pp 31–39.

[4]Baird *et al* (1975) *op cit* pp 44–48.

gency period after a disaster occurrence and not in the context of development, it is not surprising that the stricken population find themselves frequently worse off than before and in a situation which can only be exacerbated in the future. Self-reliance is often absent and dependence on external sources for essentials is only to be expected. However, these sources eventually cease to exist.

4) Vulnerability to disaster should not be considered as a static concept. Populations have different levels of vulnerability depending upon their biophysical conditions and socio-economic status.[1] Evidence shows that the locations of prime importance for sustained mitigative activity should be those areas where the populations' vulnerability to disaster is greatest because its socio-economic status is low. *This concentration on socio-economic status is probably a more important consideration than the intensity of the disaster agent.*[2]

These four points should act as guidelines for a successful disaster mitigation strategy for developing countries. The following examples give an indication of some elements of this strategy:

a A survey and analysis of local adjustments to the particular hazard or hazards involved. *Adjustment* refers to the response made by an individual or community in the face of potential disaster which aims to counteract the occurrence of actual disaster; for example, the movement of cattle from low land to higher land in anticipation of an annual spring flood. *These local adjustment processes should be encouraged wherever possible* and only mixed with foreign methods or technologies where the latter can aid in securing the appropriate strategies for that particular population. The superimposition of sophisticated technologies requiring specialised expertise which are prevalent in more developed countries, are often totally irrelevant for many environments in developing countries and can lead, through ignorance of these methods, to greater vulnerability than before.

b A survey and analysis of local attitudes to potential disaster. These attitudes, such as fear, resignation, etc. can have a great bearing on information and education programmes. Ignorance of these attitudes can lead to wrong decisions being taken and harmful strategies being adopted.

c A survey and analysis of the effect of potential disaster on local economies. In most cases, the industrial sectors of the economy will have some degree of protection even in developing countries. It is essential that attention be focused on the damage potential to the rural population who, in the majority of developing countries are the largest single sector of the population and whose economic contribution is often the largest single factor in national production. With an orientation towards this rural population, not only will overall vulnerability to disaster decrease, but real development will be stimulated.

These examples show some of the areas where aid can contribute to successful disaster mitigation instead of a short-term relief programme which treats the immediate symptoms and not the causes of disaster which lie in the longer-term. Kates *et al.* speaking of the 1972 Managua earthquake stated that:

[1]Westgate (1975) *op cit* Chapter 6; O'Keefe (1976) *op cit*.
[2]Baird *et al* (1975) *op cit* p 2.

> Each decade, a cumulative toll of lives and property equivalent to a city of half-a-million disappears beneath mud or ash, is reduced to rubble and splinters or shrivels in the parched ground. Managua underscores the global inequity of such loss. In comparison with the San Fernando earthquake – losses in lives were one hundred times greater, in per capita losses of material, ten times greater. These accord with our scattered findings from other developing countries.[1]

Such is the gap between the developed and developing countries. Kates *et al.* go on to say that:

> The central weakness in our understanding of how to reduce the high cost of natural disaster for human kind lies less with the needs of the disaster moment and more with the critical post-emergency policy decision for reconstruction.[2]

These policy decisions for developing countries must be taken within the context of development and reconstruction must be a continuous phase. The human and social implications of earthquake risk in developing countries, unless they are to continue to significantly increase, can be lessened by a successful disaster mitigation programme where the priorities are *self-reliance, a comprehension of local cultural attitudes and traits, acceptance of disaster mitigation strategies as an integral part of development planning, an acceptance of 'disaster' as an ongoing phenomenon and not as a series of isolated events, and a belief in decreasing vulnerability where the latter is greatest – among those people with a low socio-economic status.*

[1]Kates, R. W.; Haas, J. E.; Amaral, D. J.; Olson, R. A.; Ramas, R.; Olson, R. (1973): 'Human Impact of the Managua Earthquake Disaster'. Natural Hazard Research Working Paper No 33, Institute of Behavioural Science, University of Colorado, Boulder, p 35.
[2]*Ibid*, p 37.