Disaster prevention and management: an academic challenge for disaster prone developing countries

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Abstract

In this paper, after highlighting the concepts and types of disasters, the role of prevention and management, and of the human experts for restricting the scope of natural disasters particularly in developing countries will be discussed. Then, an attempt will be made to outline an academic MSc. course in natural disasters sciences which was developed by the author and has been implemented in Iran, a disaster-prone developing country.

1 Introduction

Many developing countries suffer from 'technological' (e.g. the case of Bhopal in India) or 'natural' disasters (e.g. earthquake in Iran, flood in Bangladesh) every year. In fact, apart from geographical and natural factors, transfer of inappropriate or non-sustainable technologies to developing countries brings about a number of crisis; e.g. Kahen & Griffiths [24], Meshkati [29], Meshkati & Robertson [31], Perrow [35]. Although some of these hazardous events cause undesirable local environmental effects in the short term (e.g. the explosion of the liquid gas tanks in Mexico city, the pesticides factory disaster in Bhopal) their negative impacts would also affect the supranational environment in the long term (e.g. the explosion of the Chernobyl nuclear power plant in the former Soviet Union).

It is evident that there is a direct relationships between the extend of destruction caused by natural disaster and the level of techno-economic and social development (e.g. technological capabilities, modernised institutions, income distribution, economic diversification and social inclusion, public health and education, choice and protection, public participation). This means that the people and activities most affected by natural disasters are bound to be those belonging to the lowest levels of society and of social sectors in developing countries; for further discussion, see e.g. Cannon [3], Cuny [6], Hewitt [14], Kreimer & Munasinghe [26], Parker [34], Torry [39]. In other words, the higher the level of development, the smaller would be the number of deaths, injured, and deprived,

and also the lower the relative material losses. It is now accepted that disasters impacts can be reduced through attempts for preparedness, mitigation and post-event humanitarian actions. Emphasis should also be put on the impact of nature which has led to the dominance of technical interventions focussed on predicting the hazard or modifying its impact. In general, the majority of people in most Third World countries are vulnerable because of two fundamental issues: firstly, the lack (or the inappropriateness) of preparedness measures (e.g. the level of protection); and secondly the lack of livelihood level and resilience. In this regard, there is a number of responsible factors such as inadequate technical and financial resources, particularly hard currency (Kahen [15], Kahen & Sayers [22]), inappropriate infrastructures, problems for transferring essential technologies (Kahen [17, 18, 19], Kahen & Sayers [21, 23]), the weak information sector (Kahen & Sayers [20]), low indigenous technological capabilities and national awareness (Kahen [18]) and unavailability of expertise and the non-institutionalised education system.

2 Disaster and Disaster Studies

In fact, it was during the 1970s that a number of social scientists, mostly anthropologists and social geographers, began to question established ways of understanding *natural disasters* (Varley [41]). As Albala-Bertrand[1] pointed out, a small portion of natural disasters has technically been recorded. Although there is a lack of organised studies on disasters historically and chronically, we can find references to floods in the Nile Valley (Moret [31], Waterbury [42]), the volcano eruption in Pompeii (Corti [5], Trevelyan [40]), the Kermanshah earthquake in Iran in the sixth century (Eslami [10]), famines and the Black Death in Europe in the fourteenth century (Gasquet [12]), the Great Lisbon earthquake in 1755 (Kendric [25]), the severe floods in Bangladesh (Choudhury [4]), the Irish famine in the nineteenth century (Edwards and Williams [9], Woodham-Smith [43]), the earthquake in Essex in the late nineteenth century (Haining [13]), San Francisco earthquake in 1906 (Thomas & Witts [37]). The systematic and scientific study of natural disasters has only been undertaken in this century mostly by geographers and sociologists. Particular studies on disasters in the Third World have mostly been carried out by social geographers; e.g. Burton et al. [2], Hewitt [14], Oliver-Smiths [33]. Apart from organised research in many academic (governmental and non-governmental organisations), postgraduate studies on disasters have now been implemented in a number of universities and research institutions around the world (see, for example, Thompson [38], Schramm [36], Leopold [27], Noji [32], ECHO [8]).

Disasters have been defined and classified in many ways. A natural disaster is one induced by a natural event (e.g. flood, earthquake, volcano), whereas a man-made disaster is one resulting from the breakdown of regular processes (Albala-Bertrand [1]) within the techno-economic or social systems (e.g. technological failures, war, riots). According to Cannon [3], we can define a disaster as an event associated with the impact of a natural hazard, which leads to increased mortality, illness/injury, and destroys or disrupts livelihoods, affecting the people of an area such that they perceive it as being exceptional and requiring external assistance for recovery. For proper understanding, natural disasters should be divided into *sudden* disasters (e.g. earthquakes, hurricanes, flood), and *slowly developing* disasters (e.g. droughts, epidemics, desertification). They also

according to the type of natural force which generate them can be classified into three groups: *biological* events such as floral and faunal infestations, migrations, forest fires, red tides, fungal disease; *geophysical* events like earthquakes, volcanoes, floods, hurricanes, tsunamis, storm surges, erosions, desertifications, landslides, mud-flows, droughts, tornadoes; and finally *astronomical* events such as fireballs, meteorite falls (Albala-Bertrand [1], CSLP [7]).

3 Disaster Situation and National System of Disaster Prevention and Management

A brief review of the literature shows that inappropriate vulnerability-reducing policy and unavailability of adequate knowledge (i.e. experts and research centres for disasters studies) in these countries enhance disaster severity (i.e. potential disaster intensity and scope: physical and social vulnerability). In other words, the absence of institutionalised knowledge and facilities for prevention, confrontation and management of disasters causes further physical destruction and socio-economic loss in these countries.

Disaster situation is a mix of two inseparable sets of events : the impact of a disaster with its effects on the techno-economic and social systems, and the society's readiness and response to them. It is clear that the primary factor in *'human-made'* or *'natural-oriented'* disaster is 'shock'. This means that the major hazard suddenly thrusts people as well as all the groups and organisations involved into another world, throwing everyone off balance (Albala-Bertrand [1]). In this situation, communities and organising authorities are faced a number of complex and confusing problems: large-scale risks appear, long-term problems develop, emergency procedures prove to be off-target, the number of actors to be dealt with grows exponentially and inexplicably, the critical phase is long (e.g. leading to exhaustion of people, systems and organisations) critical communications problems emerge (within organisations, among different organisations, and between organisations and the public, via the media), harsh conflicts develop among groups within a given society, among countries, or between influence zones (e.g. East-West or North-South divisions) and economic, social, technological, and cultural stakes are extremely high. Experience shows that despite the inevitable occurrence of some of these problems, most of them can be prevented, controlled and treated effectively.

The effects of disaster, whatever disaster situation, are negative and always cause a large losses. Human modification may reduce or increase impacts of natural disaster. Furthermore, a number of cultural, socio-economic and political factors such as standards of living, gender, ethnicity and institutions are related to the level of vulnerability in the causation of disasters. The measure of vulnerability depends on the level of *preparedness* (i.e. both social and self protections), *resilience* (i.e. strength and recoverability of livelihood), and *education, public health* and *precautions*.

In order to increase general knowledge of disaster and to facilitate initial prerequisites for individual and public safety, the level of public education is crucial. For instance in respect of environmental protection, the broad environmental education which has been implemented in all levels (from elementary school to university) within the Sweden National Education System is

a successful example (for details, see Martin et al. [28]). In order to implement an effective strategy for disaster prevention and management, therefore, the above mentioned elements should be considered in an integrated framework (see Figure 1). According to this rationality, the achievement of reasonable level of reliability it is seriously required the establishment of a national system of disaster prevention and management for policy making, planning and implementation, and for disaster mitigation. Such a system which involves the effective elements and factors will increase preparedness levels and also reduce vulnerability in developing countries prone to natural disasters. This urgency puts emphasis on the training and availability of human expert. Qualified experts provides adequate knowledge and better understanding that would lead to more appropriate and successful strategies for disaster mitigation *per se*.

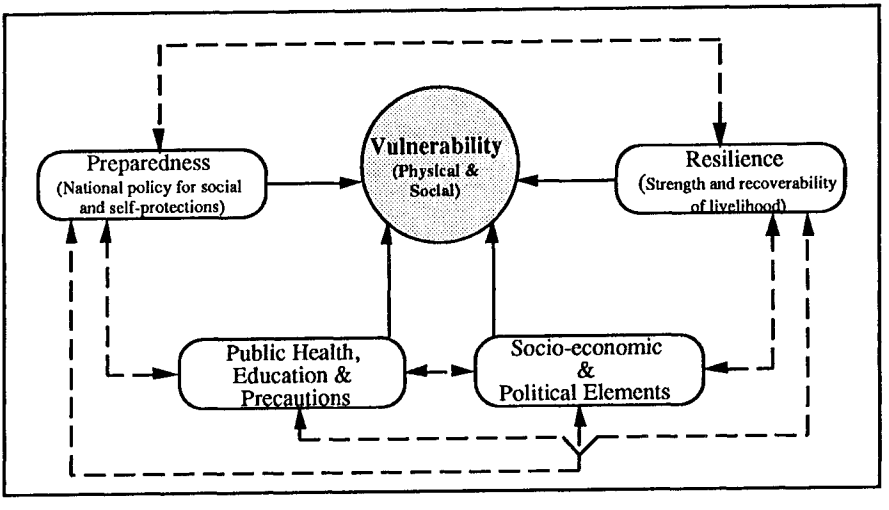

Figure 1: Vulnerability and effective elements within an integrated system

4 Human Experts and Vulnerability System

Due to this fact, the provision of experts and the localisation of technical and technological knowledge along with development of socio-economic features seem to be the major prerequisites. Responding to such essentiality, skilled, educated and research-oriented human resources play a crucial role. The transfer of appropriate technology, technical and Orga-Managerial knowledge to distinguish, prevent, manage, and probably predict disasters is the only way to reduce the scope of event and also to decrease the impacts of the crisis. These all are inevitably carried out by knowledgeable human resources and through specific research institutes in developing countries.

Concern about destructive consequences of the natural and also technological disasters on public safety have emphasised the need for appropriate systems, qualified experts and adequate information for preventing and managing crisis. It essentially addresses an *interdisciplinary* effort which is vital to increase understanding of the implications of relationships between organised prevention

and public safety in disaster management. The related knowledge (i.e. science-based or technology-based) is not only concerned with natural and environmental perspectives but also with man-made components of the engineering and environment. Natural, environmental, social, engineering, economic, and management sciences are prerequisite disciplines for people who may deal with disasters in the organisational, national, and international levels.

An important point should be mentioned here is that the field of disaster management is at risk when trying to manage complicated, or even conflicting disastrous and environmental issues with simple management tools and out-of-date approaches/models. It should therefore be pointed out that since prevention and protection policies are not effectively and efficiently planned nor are managed and implemented in the Third World, the rates of destruction and human losses caused by any event are generally very high. From a brief review of the literature, it seems that of particular relevance is the integration of disaster information and knowledge, prevention policy making and management, and the reorganisation of responsible agencies.

5 Natural Disasters in Iran and the Disaster MSc. Course

Earthquake and flood are the common disasters in Iran which take place almost every year in this country. For instance, earthquake in *Gillan* (North of Iran) in 1990 (in which 50000 were died) and the vast flood in *Teheran* (the capital of Iran) in 1987 can be addressed as the two earliest most destructive hazardous events in the region. Due to several floods that took place in different parts of Iran, more than 350 thousands houses were destroyed over the period of 1980-1992. The trend of natural disasters in Iran shows also that, in average, every year an earthquake took place in the country over the last nitty years (Etellaat [11]). Furthermore, financial losses caused by natural disasters in Iran has been more than two billions Dollar. This situation addressed the emergence of fundamental need to encourage organised research and to develop appropriate graduate studies in Iran; this course is one of the rational responses from the local academia to such an urgent national demand.

MSc. in Disaster Prevention and Management, a postgraduate intensive course, which was developed by the author over a period of two years, has been implemented in the Faculty of Environment at Teheran University since 1993. The course consists of a mix of technical/theoretical lectures and seminars as well as workshop/laboratory sessions and field-studies (i.e. practical projects). Since the study of disasters is a multi-disciplinary, cross-sectional problem, therefore in order to convey the richness of the topic area, we approach it from a number of theoretical and practical perspectives. The essence of the course is based on the in-depth and multi-dimensional training of *mature* students which being gathered under an umbrella from a broad range of scientific disciplines (e.g. engineering, natural sciences, economic, management). Having an effective program a cross section of industry, government, and academia is brought about during each academic duration. This means that learning methods are very diverse, including lectures, classes, seminars from outside speakers, workshops, individual and group projects, discussion groups and a *role-playing* exercise.

In brief, the objectives of the course can be divided into three major sets as

follows:
1. Improvement of the level of research activities in natural and environmental disasters; development of national capability in specific information as a solid basis for policy making and planning at the national and sectoral levels in the country;
2. Proper understanding of the performance of the urban and rural built environments socio-culturally, technically, economically and institutionally in order to mitigate risk, reduce local vulnerability, and safeguard health;
3. Provision of well educated and trained personnel who are able to establish and manage appropriate planning systems for disaster prevention capable to cope with the crisis in the real situations. The experts should be qualified in such a way that would be able to predict (possibly), prevent and also reduce the physical and environmental destructions and human losses (i.e. the level of vulnerability). These all, would evidently be carried out in disaster-prone regions according to the local environmental, social, cultural, technological, and economic characteristics.

The merit of this course is based on a common core of knowledge and skills designed to ensure that students from engineering- and science-based (social or natural/environmental) disciplines achieve a specified level of literacy and experienced knowledge in the field of disaster. Emphasis in this course has been placed on the development of the relating technical/theoretical concepts, methodologies, technologies, and integration of Orga-Managerial aspects (Kahen [16, 18], Kahen & Sayers [20, 23]) and social sciences. The major target in this course is to train experts which are reinforced by both theoretical and experiential knowledge in the field. This is a response to the increasing local and regional needs for a vital system of preventing and managing natural disasters, and also for improving public safety in the country. Despite these specifications, the framework of the course is in such a state that could be developed and implemented in any region or especially in other developing countries face natural disasters.

In order to be graduated, students are required to undertake a specialist major study over at least two and half years. Students acquire relevant knowledge and technical skills that they will require as managers or planners in engineering and managerial aspects of natural disasters (in the inflicted area). As Figure 2 depicts, student should pass through four stages in their studies in order to be eligible for granting the MSc. degree: Prerequisite, Foundation, Professional and Option studies, and implementing Project (i.e. individual research studies). In fact, three fundamental features which have been incorporated into the course are the Technical (i.e. management and engineering) requirements, Social and Human interactions capabilities, and the need for an integrated or interdisciplinary approach to disaster sciences. According to this perspective, and due to the roles of fundamental elements which affect the level of vulnerability introduced in the previous section (Figure 1) the two following supplementary targets are intervened:
I. The use of real world case studies has been given the most priority within the all stages;
II. The major field study or practical research project (i.e. Theses) must be carried out within an area had been faced one of the hazardous events (e.g. earthquake, flood).

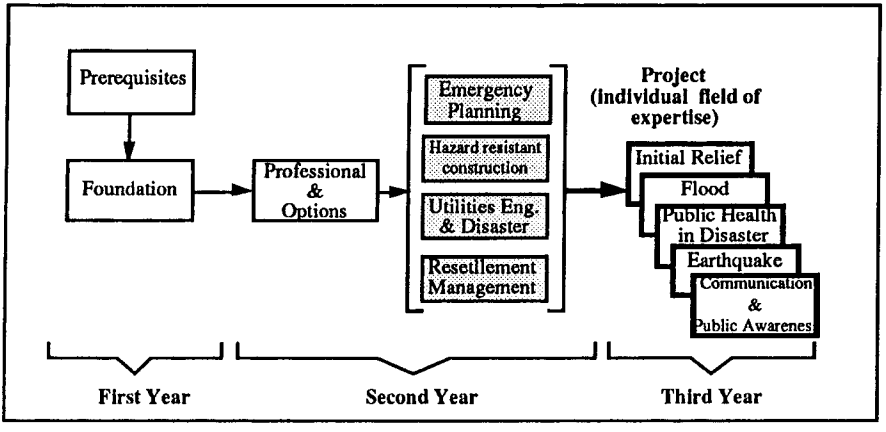

Figure 2: The structure of Disaster Prevention and Management MSc. course

6 Admission Requirements and the Course Content

The programme is open to candidates who fulfil the following conditions:
1. Hold a recognised Bachelor degree either in one of the Engineering fields, Agriculture, Environment, Physics, Chemistry, Geology, Geography, and Management Sciences or Economics;
2. Pass a qualifying exam (i.e. comprehensive entrance exam);
3. Fulfilling the Prerequisite subjects (i.e. undergraduate units) which would be selected by the course advisors according to the background of individual applicant;
4. Alongwith substantial and proven experience applicants are also expected to be eager and demonstrate a sense of 'professionalism', 'personal integrity' and 'social responsibility'.

In order to fulfil the above objectives, the course is structured into three supplementary components shown in Figure 2 over a period of at least 2.5 years. Topics within the course content covered by the credits (the total credits is 38). Syllabus are classified into the Basic or Fundamental and Professional units which are followed by a practical research project as the individual field of expertise (i.e. thesis). Units are presented as the Fundamental studies are subjects such as 'natural ecosystem of Iran, engineering geology, computer and statistics, hydrology, disasters in Iran (seminar), rural and urban sociology, prevention planning and management, psychology of injured, environment law and regulation, and mass communications skills' while the Professional and Option units cover topics such as 'land use (spatial) planning, emergency planning and management, hazard resistance construction, resettlement, physical reconstruction, utility engineering in emergency, disaster and environmental hygiene'. A major problem in implementing the course is selecting the most appropriate mix between the natural and socio-engineering sciences in terms of student's heterogeneous background and skills, for the proper understanding of the disastrous situation and its causes, and devising appropriate policy making/managing and feasible solutions.

7 Closing Remarks

Many developing countries such as Iran face the problem of natural disasters and their physical and human losses. These hazardous events cause undesirable local and supranational environmental negative effects. In this regard, the majority of people in most Third World countries are vulnerable due to the lack (or the inappropriateness) of preparedness measures and of livelihood level and resilience. There are a number of responsible factors (e.g. inadequate technical and financial resources, inappropriate infrastructures, bottlenecks in the transfer of technology, the weak and unreliable information sector) within which unavailability of expertise and of particular training systems are with the major concerns. This paper, through a theoretical discussion on disasters, has briefly outlined a MSc. course on Disaster Prevention and Management (developed in the Faculty of Environment at Teheran University) in order to address the urgency for appropriate education and training system in natural disasters in disaster-prone developing countries.

In content the course will examine theories of practice, practice skills and technical methods which are appropriate to the special circumstances of Iran, a disaster-prone developing country. The essence of the course is based on the in-depth and multi-dimensional training of mature students from a broad range of scientific disciplines (e.g. engineering, natural sciences, economic, management). It is proposed that, in long term, graduates would be able to improve the emergency planning and management performance of responsible local agencies through an organised professional development program in disaster prevention and management.

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