Sustainable Development and Emerging Research Programs in Flood Hazard Mitigation and Risk Management

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ABSTRACT: Analysis of up-to-date trends of water-related disasters, flood in particular, clearly reveals that many adopted policies for disaster mitigation have not been fully adequate to alleviate vulnerability. Therefore, it is a primary concern to assess the effectiveness of adopted policies in flood mitigation worldwide and identify the emerging needs in research and countermeasure initiatives. This paper presents the efforts made in this direction by the Secretariat for Preparatory Activities of UNESCO-PWRI Centre for Water Hazard and Risk Management to be established at the public Works Research Institute (PWRI). Particular emphasis will be put on the analysis of results of the International Workshop on Water Hazard and Risk Management (held January 2005 at PWRI), the International Symposium on Approaches for Global Water Hazard and Risk Management in the 21st Century (held January 2005 in Tokyo, Japan) and the PWRI-Workshop held during the International Conference of Asia Pacific Association of Hydrology and Water Resources (Singapore, July 2005). The workshops were participated by world renowned scientists in the field of water hazard and risk management bringing together outstanding expertise viable to boost forward future research initiatives to secure sustainable development.

1 INTRODUCTION

The escalation of severe disaster events triggered by natural hazards is undoubtedly among the most prevailing obstacles for sustainable socio-economic development and poverty-reduction initiatives. The international figures (FAO, 2004) show that water-related disasters are dominating in number and have more devastating effect on human survival, health and livelihood, the environment and economics. Figure 1 depicts the scale of water-related disasters in Asia for the period 1975-1999 as compared to other natural disasters. Similar figures for others parts of the world show that the scale and number of water related disasters has more than doubled since 1996, but we still do not fully recognize the scale of the problem. From 1992 to 2001, developing countries accounted for 20% of the total number of disasters with approximately 13 times more people die per reported disaster than in developed countries and 35% of this figure occurs in Asia (PWRI-1, 2004). This alarming crisis have forced the issue of disaster reduction and risk management higher on the policy agenda of affected governments and called regional bodies, the private sector, civil society and UN agencies to unite their efforts with governments' institution for building resilient societies and developing a culture of

prevention and preparedness. Among these global momentums, governments in collaboration with UN agencies adopted the establishment of the International Strategy for Disaster Reduction (UN-ISDR) to serve as the focal point in the UN System to promote links and synergies between, and the coordination of, disaster reduction activities in the socio-economic, humanitarian and development fields, as well as to support policy integration (ISDR 2004). Concurrently, at the national levels, commitments to support and endorse ongoing international initiatives have been declared at several occasions. In this direction, the 3rd World Water Forum, held on March 2003 in Osaka, Shiga & Kyoto, Japan, has marked the road by the announcement of the will and commitment of the Government of Japan (GoJ) to endorse the global efforts in disaster mitigation by establishing a new international center for water hazard and risk management under the auspices of UNESCO (hereafter refereed to as CHARM). Since the GoJ declaration, the administrative preparatory process for the official establishment of CHARM in fall 2005 is marking an encouraging progress in collaboration with UNESCO headquarters in Paris, acknowledging the support of many national, private and international organizations. In the mean time of the official launch of the center, the Secretariat for Preparatory Activities of CHARM at PWRI, is undertaking active research program to bringing together outstanding expertise viable to define and put into practice the details of its pillar activities, namely research, training and information networking.

Among these prominent research activities are the organization of three international meetings (workshops and symposium) participated by world renowned scientists in the field of water hazard and risk management to view flood mitigation issues from its multifaceted hydrologic, environmental, ecological, political and social characteristics. The major outcome of these meetings is discussed hereafter, whereas the details can be found at the web site of the center (PWRI-1, 2004).



Figure 1. Distribution of natural disasters by country and type of phenomena in Asia (1975-1999). Source: FAO 2004, based on CRED disasters database.

2 IDENTIFING EMERGING RESEARCH PROGRAMS

Assessment of the effectiveness of adopted policies in water-related disasters mitigation worldwide is undoubtedly an important step before any tentative action for defining future policy improvements in water-related disasters mitigation. In this direction, the meetings have reviewed the evolution and progress of water-related hazard mitigation in many regions of the world as well as the reasons behind the increasing vulnerability of people and property to water disasters. The great differences in social conditions and cultural values (an example is shown in Fig. 2.) and miss-understanding of these values have been clearly identified as one of the major obstacles in defining practical and sustainable approaches to alleviate the threat of water related disasters. Additionally, in urban areas climate variability concurrently associated to population explosion, rapid urbanization, high accumulation of assets of high values and changes of land use in flood-prone areas are considered the most inherent causes of the increase in vulnerability. Furthermore, in many regions of the world flood control situation interlaced with shortage of water resources, degradation of water quality and severe soil erosions have brought a series of new challenges that have weaken our traditional and up-to-date flood control systems. Therefore, professionals and policy makers are incited to re-consider flood issues and mitigation approaches from a broader view of socio-economic, ecologic, environmental and technical aspects.



Figure 2. Contrast of social constraint and cultural values for life, land and property during disasters; (Source –exclusive use-: PWRI-1, 2004).

A number of facts consolidating the above arguments have been identified and extensively discussed during the above mentioned PWRI workshops and symposium, these include to cite only few:

- Downward spiral of impoverishment of the rural poor where traditional rehabilitation techniques means to alleviate the social impact but not the vulnerability and risk.

- Poor flood damage evaluation systems where traditional assessment procedures are based on materialistic estimation and neglecting physiologic and livelihood losses.

- In many urbanized area, serious damages have occurred along small scale river usually excluded from all traditional mitigation plans; and

- Conflict resolution between water authorities, different users, the public, ecologist and environmentalists etc., are often excluded from the traditional disaster mitigation approaches; among other identified issues (PWRI-1, 2004).

To respond to the new challenges of today's world it is important for future research programs to identify knowledge improvement in all fields of water-disasters mitigation sciences including basis definition and terminology as starting background. For instance, the new trends and increase of frequency and peak floods requires the development and field test of more reliable techniques that would result in raised awareness, improved definition of alert levels, improved warning systems, effective evacuation procedures, better design criteria and improved engineering capabilities and knowledge of local decision-makers. Nevertheless, in order to optimize the results of any adopted scientific approach a new concept of risk assessment and risk management that would result in better political-institutional aspects, reliable risk zoning criteria and basin vulnerability criteria, accurate affordable risk level etc., must be considered as an integrated part of the development and application process. To the above is also associated the importance to developed improved flood monitoring systems, and to increase the availability of hydrologic data with improving its quantity and quality for promoting international collaboration. Lessons about these aspects and additional critical issues can be also found in the reports of PWRI workshops (PWRI-1, 2004).

3 ASSESSMENT OF ADOPTED POLICIES IN WATER DISASTER MITIGATION IN ASIA

Additionally to the above, in aim to establish a well based future research program activity in water disasters and risk management, comprehensive understanding and assessment of the effectiveness of past policies and methodologies in flood disasters mitigation must be primarily undertaken. Many countries in the world, especially Asian countries located in the heart of the monsoon region, witness every year severe water disasters creating new challenges for all governments due to the diverse social and economical impacts. In this direction, PWRI in collaboration with UNESCO-IHP and the UN-World Water Assessment Programme (WWAP) Secretariat, organized a side events workshop during the International Conference of Asia Pacific Association of Hydrology and Water Resources 2004. The PWRI workshop invited professionals from the Mekong River Commission, China, Republic of Korea, Sri Lanka, Thailand and Japan and was participated by a wider international community to introduce and discuss the state of the art in flood hazard mitigation policies and risk management in their respective countries. Analyzing the historical trends as presented by the experts, a general consensus (PWRI-2, 2004) was on the similarities of water disasters impacts and problems hampering the effectiveness of adopted mitigation policies in most countries in Asia. That is, despite the continuous efforts and investments of governments in flood disaster mitigation (i.e., promote structural and non-structural measures) there exist a number of impediments retrograding the effectiveness of adopted policies to ensure sustainability. Among these impediments, to site only few, climate variability and concurrent change of flood regimes, population explosion and social conditions, urbanization and occupation of flood prone areas, and increasing value of assets. To ensure excellence in analyzing the state of our progress and propose effective actions that secure sustainability, it was confirmed that there is an emerging need for an international entity to serve as a clearing house for flood database and experiences as well as to coordinate and consolidate operative international cooperation. To this aim CHARM was recognized as the ideal body.

As an initiative to endorse research in this direction, among other important identified research streams related to water hazard and risk management, CHARM is contributing to the UN-System wide initiative to develop water risk indicators under the World Water Assessment Programme (WWAP). Among the challenges for efficient developments needs of the future is to learn to describe the changes with time of flood disasters potentials (PWRI-2, 2004). Therefore, there is a need for indicators to identify and quantify: the current state of our river systems; the predominant driving forces and pressures susceptible to increase the risks (such as negative impacts and vulnerability); the effects of natural disasters, and furthermore the effect of adopted response policies in improving social, cultural, environmental, ecological, economic developments. Examples of important indicators are those able to describe: society resistance (also called society resilience) against extreme floods, vulnerability against extreme floods, trends of the driving forces and pressures (natural and human-made features), trend of negative impacts (e.g. inundated land, economic losses, etc.), trend of progress in policies (e.g. legislations, budget allocation for water related disasters) among others. At this stage, it is important to notice that not all indicators can be identified, and not all identified indicators can be measurable and still not all measurable indicators are easy to assess and compile. Further, it is essential to notice that there is a need to identify the minimum data requirements in order to fit our science to the real-world and current conditions in many regions (such as poor data quality, poor data quantity or even inexistence of measuring system). Other impediment when developing water risk indicators is the existing gap between policy elaboration and policy implementation, as well as the gap among scientists with different disciplines, decision makers, policy makers and other stakeholders.



Figure 3. Historical trend of selected indicators for PWRI Risk Index (Japan Case Study)

The proposed PWRI Risk Index (Merabtene et all, 2004) and related indicators have received a large recognition from all agencies and professionals involved in the process of editing the second World Water Development

Report. Figure 3 shows the trend of the indicators used in the application of PWRI Risk Index to Japan case study. From the figure it is clear that change in precipitation is a prevailing indicator when analyzing impacts (i.e., economic losses) due to floods. It is also clear from the trend of the response indicator (i.e., budget allocation for flood disaster mitigation) that the Government of Japan has devoted continuous and considerable efforts to promote prevention measures (structural and non structural) in order to alleviate the threat of flood under the continuous pressures of population explosion and massive urbanization of flood prone areas. These efforts were fruitful and efficient to reduce the total area of inundated land and pave the way for enormous economic development among other clear positive states. However, the analysis of the impact of flood on the vulnerability of people and property clearly shows that the challenge of water hazard and risk management sciences is by far more complicated than what have been thought before. The difficulties to define optimal balance between commonly adopted policies have also been perceived by other experts when analyzing their respective country case study (PWRI-2, 2004). It is for solving these complex challenges that CHARM is dedicated to contribute and serve as platform for research, training and information networking where international cooperation is important to excel the mission of the center.

4 CONCLUSIONS

To secure sustainable strategy and save achieved development, it is important to ensure basin-wide integrated management by looking into the different relevant factors influencing the global equation of risk and vulnerability to water related disasters. It is recognized by many experts that the initiative to create an international center to deal with the multifaceted issues of the field is a peerless initiative. In order for the center to achieve its mission and contribute to solve water-related disaster challenges from a global point of view based on accumulated knowledge and experiences, it is important to ensure effective international cooperation by combining the strength of each relevant organization working in the field of water hazard and risk management alongside of the Public Works Research Institute (PWRI) designated as the host organization of the center.

5 REFERENCES

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