Integrated Flood Management Model Engaging Stakeholder to Overcome Institutional Problems in Jakarta

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Abstract: *Flooding is one of the systemic problems of densely-populated urban areas in developing countries, which face many difficult problems that may overwhelm the institutional capacity to respond. The flood problems are ever-increasing and they are usually interrelated with many other issues such as urban development and environmental degradation. When the effects of global environmental and socio-economic change are combined with inadequate institutional support, risks can be magnified and threaten the quality of life for many people. Therefore an effective integrated flood management is needed and should involve all relevant sectors and communities. The approach must involve a mutual effort at the institutional and community levels by enhancing capacity in the local government and empowerment of the community. It will require a paradigm shift in how flood problems are identified, addressed, and solved. This study, which uses systems analysis tools to address flood disaster problems from multiple perspectives, recognized that flooding in Jakarta is a complex socio-technical problem and that an integrated approach is required to reduce the risk and mitigate the effects of flooding. The flood management system should be integrated with other urban subsystems in the city, which displays dynamic behavior among its subsystems.*

Keywords: *flood risk, integrated flood management, stakeholders engagement, systems analysis*

1. INTRODUCTION

Flood disasters, which involve complex interactions among natural events, geomorphologic conditions, and human interventions, add greatly to the hardships of low-income people in developing countries. Although floods are triggered by natural events, the hazards they present are also affected by the social, economic, and political environments where people live. Low-income people suffer most from flood disasters because they tend to live in flood-prone areas, often do not understand the hazards they face, and lack institutional support.

Given the systemic nature of flood disaster, traditional engineering approach alone will not be enough to solve the problem. Disaster preparedness by structural measures is costly and usually out-of-reach of developing countries where disaster mitigation funding must compete with other priorities. Solutions must be more cost-effective, socially and environmentally acceptable.

This urgent situation of flooding in developing countries led to this study, which uses systems analysis tools to address flood disaster problems from multiple perspectives with a case study of flooding in Jakarta. Since flooding in Jakarta is a complex socio-technical problem, an integrated approach needed to reduce the risk and mitigate the effects of flooding. The approach will require mutual effort at the institutional and community levels with enhanced stakeholders' collaboration.

2. URBAN DEVELOPMENT IMPACT ON FLOODING

Flooding is only one of the problems of densely-populated urban areas in developing countries, which face other problems of urbanization, such as social inequality, and environmental degradation. Flood disaster impacts are increasing due to population growth, pressures for land, and economic development in urbanized areas. The threats may overwhelm the institutional capacity to respond and governments may be unable to cope with the consequences.

Montz (2000) pointed out in order to reduce urban vulnerability to flooding, it is necessary to deal with the hydrologic system as well as to address the social, economic, and political pressures at work in defining and reinforcing vulnerability. As the urban area grows, there is a need to recognize the impact of all factors involved and keep up with the development. Because of the considerable economic and other benefits of floodplain, we cannot necessarily avoid them. The key issue is how to achieve wise use of flood-prone land.

Like other large cities in developing countries, Jakarta is attractive to migrants. Over the years, the city has grown rapidly, so much so its municipal governments have not been successful in coping with the impacts of urbanization. As a port city on alluvial lowland, Jakarta is naturally prone to flooding. Chronic flooding hits Jakarta every year during the wet season. An extensive drainage system exists to prevent flooding but it is poorly maintained. Flooding is mostly caused by lack of appropriate garbage collection, poor watershed management, deforestation and exploitation of natural resources. As a result, the flood situation in Jakarta is getting worse because the city is growing without proper control. Since the flood problems in Jakarta are interrelated with many other issues such as urban development and environmental degradation, there is a need for effective integrated flood management.

3. FLOOD MITIGATION AND PREPAREDNESS

Andjelkovic (2001) explained that flood mitigation comprises a variety of measures that alter the exposure of life and property to flooding. It reflects the holistic nature of those flood management measures that do not have structural nature, such as planning, setting policies, raising awareness, assisting, educating, reporting, forecasting, warning, and informing. Flood disaster preparedness plans should include arrangements for public education and warning to flood-affected communities, evacuation and rescue, and post-flood debriefing. The plan should be subject to periodic review in consultation with the local floodplain community and they should be placed on public display and made widely available within the community.

3.1 Community Awareness and Public Education on Flood Hazards

Planning for flood management strategy requires a clear understanding and awareness of the risk. The development and dissemination of awareness programs is an essential prerequisite of successful flood risk reduction measures. Community awareness is needed for resource mobilization to build resilience. However, public perception about flood risk and its consequences may vary due to education levels as well as economic and social conditions.

Public education can augment regulation to be an important means for affecting development patterns and encouraging flood mitigation and preparedness programs. The programs should emphasize solutions that change attitudes in society that could make people more vulnerable. In areas where flood or property modification measures are undertaken, individuals should be made aware that these measures do not entirely eliminate flood risk.

The level of community awareness and knowledge on flood disaster risk management in Jakarta is still low. Currently, the community and institutional capacity to develop and implement flood disaster risk reduction programs is inadequate due to limited knowledge and resources. Therefore public education and motivation are very important to reduce their vulnerability.

3.2 Stakeholders Identification

An important element of the institutional analysis is the identification of actors and organizations involved. It is crucial to identify all the relevant stakeholders involved in flood management in Jakarta as well as their roles and responsibilities within flood risk management in order to be able to develop a truly integrated approach. However, too many stakeholders can render the process unwieldy and unproductive. For effective integrated flood management and river basin development, it is important to carefully identify all relevant stakeholders. According to WMO/GWP (2006), stakeholders involved in IFM can be divided into: government ministries, department and agencies; flood-prone communities; other basin communities; scientific institutions; registered NGOs; and voluntary organizations.

3.3 Stakeholders Participation and Collaboration

Stakeholders' involvement is needed in planning for disaster management because in many cases there is a missing link between the disaster response actually needed and what is provided. Local community organizations can serve as an important bridge to link the ground-level response to a higher level of decision-making. Such involvement is indispensable in building the resilience of communities. Resilience-building measures at the household or community levels are effective means of minimizing flood losses. If flood management is to be sustainable, it must accommodate the economic, environmental, and social needs of the basin, and stakeholders reflecting these elements must have a role in the way flood management is planned and implemented (GWP/WMO, 2006).

The difficulties experienced in the implementation of flood management strategies are usually linked to the issues of institutional arrangement and capacity. As flood management needs integrated approaches that involve multi-disciplinary studies and interagency coordination, the challenge that emerges is to build good communication and coordination among stakeholders with different backgrounds, perceptions and status levels. Different groups of stakeholders have different needs and requirements and therefore must be engaged through different methods. Institutions must redefine responsibilities and priority scope of the work, reallocate resources, and provide incentives to meet the priority objectives, to build mechanisms for monitoring and adjustment, and to enhance outreach capacity for better interaction with stakeholders.

ESCAP (2003) explained active collaboration among stakeholders to work together in flood mitigation and preparedness program is crucial, despite the fact that they may have different interests, values, or goals and come from different political, cultural or socio-economic backgrounds. Partnerships are likely to lead to more viable solutions than would be developed by any one group independently. Mitigation partnership bring together the leadership and expertise of business, governments, utilities, research and academia, non-profit groups, and other community organizations to develop integrated strategies to reduce exposure to hazards and make post-disaster recovery easier.

Community participation has come to be recognized as an important aspect of disaster management, as it is the local community which can provide immediate help when a flood disaster strikes suddenly. However, like in many other developing countries, community involvement and participation is still in its early stage, and community participation level in Jakarta is still low. Existing institutions need to be modified to facilitate community involvement. Building community cohesion and recognizing the special needs of individuals or social groups is also needed. A common platform for stakeholders needs to be developed. It is also important to develop rules dealing with flood management to see how they provide for the mobilization and involvement of the local community in the decision-making process at various levels.

4. INTEGRATED FLOOD MANAGEMENT CONCEPT

The Integrated Flood Management (IFM), which developed by the Global Water Partnership (GWP) and World Meteorological Organization (WMO) aims to maximize the efficient use of floodplains while minimizing the loss of life from flooding. It represents a fundamental reorientation of how flood are perceived by society. This range from the "need to control" approach, where floods are considered to be threats as part of uncontrollable natural cycle, to the "need to manage" approach, where floods are seen as part of broader natural occurrence, with some beneficial elements. Therefore, considering the

evolution and trends, the approach to natural hazards requires a paradigm shift from defensive action against hazards to proactive action towards culture prevention by managing the risk and living with floods.

The emphasis on flood management within the context of IWRM will be on the adoption of flexible structural and non-structural solutions suited to each flood-prone region, recognizing the importance of evaluating differing options and their relative advantages and disadvantages. Integrated Flood Management also emphasized the importance of participatory approach to create a resilient community with the active involvement of all stakeholders and the community at large (WMO/GWP, 2006).

The IFM Approach expects various roles to be played by a complex set of actors to ensure coordination and cooperation across institutional and disciplinary boundaries. The successful implementation of flood management strategies depends also on interaction and collaboration among stakeholders. The roles and responsibilities of all stakeholders should be identified to build a more meaningful participation.

As a key path to a solution to the flood problem in Jakarta, the integrated approach must involve all relevant sectors and communities. This will require a paradigm shift in how flood problems are identified, addressed, and solved. Such an approach must involve a mutual effort at the institutional and community levels by enhancing institutional capacity at the local government level as well as empowerment of the total community.

5. APPLICATION OF THE SYSTEMS APPROACH AND TOOLS

Systems thinking provides a method to see the whole picture of flooding and identify the most productive interventions. It is a framework that is based on the belief that the component parts of a system can best be understood in the context of relationships with each other and with other systems, rather than in isolation. Systems thinking for complex problems such as flooding in Jakarta uses diagrams as tools to explain how the system elements work and to show how a change in one factor may impact other elements.

The methodological framework proposed to evaluate the flood issue in Jakarta is based on the DPSIR (Driving Forces, Pressures, States, Impacts, and Responses) model developed by the European Environmental Agency (2006), which is based on diagrams and explanatory information to provide an overall view of the dynamics of flooding. The problem architecture is explained by a process flow diagram. A causal-loop diagram shows the influences among the elements of the overall system. The set of these working together comprises a conceptual systems model that describes its functionality, explains its important components and processes, and identifies how the components and processes are connected. To add detail, institutional, technical, socio-economic and financial subsystems are also identified.

Figure 1 shows the DPSIR framework that is applied to flood problems in Jakarta. Driving forces such as urbanization add to pressures such as expansion of land uses, which adds to the state of risk. Impacts such as flood damage then elicit responses such as law enforcement. Figure 2 shows the problem architecture illustrates factors contributing to flood problem in Jakarta.

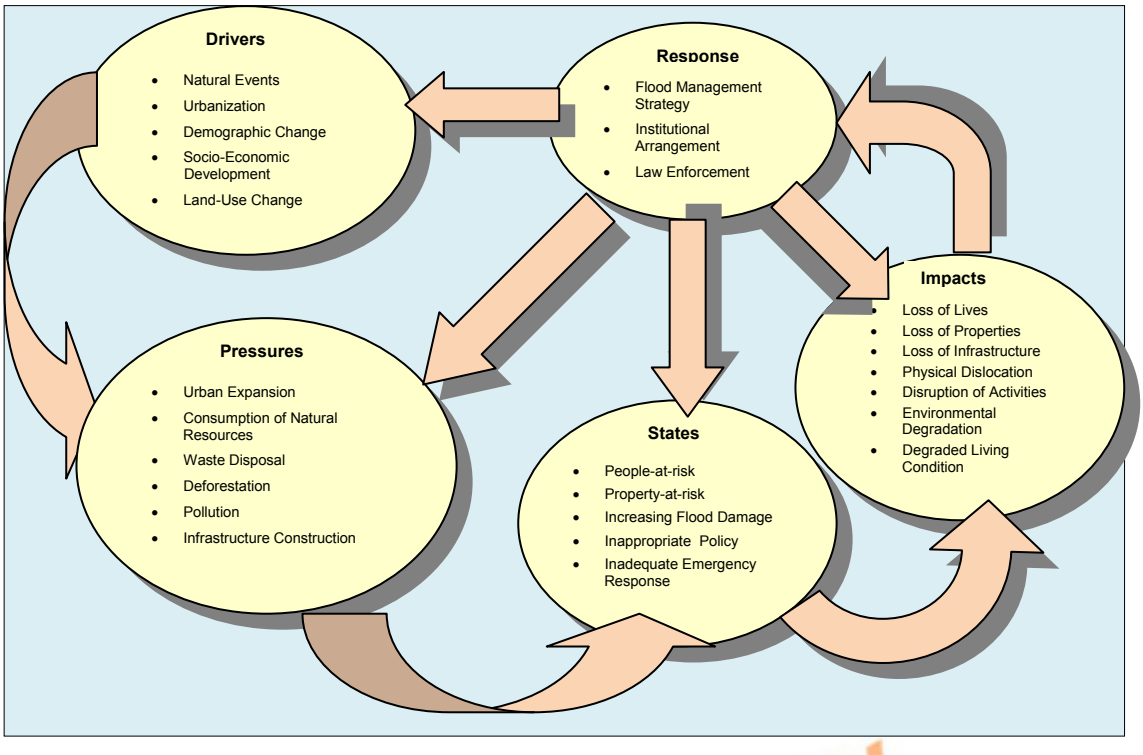

Figure 1 The DPSIR Framework for Flood Problem

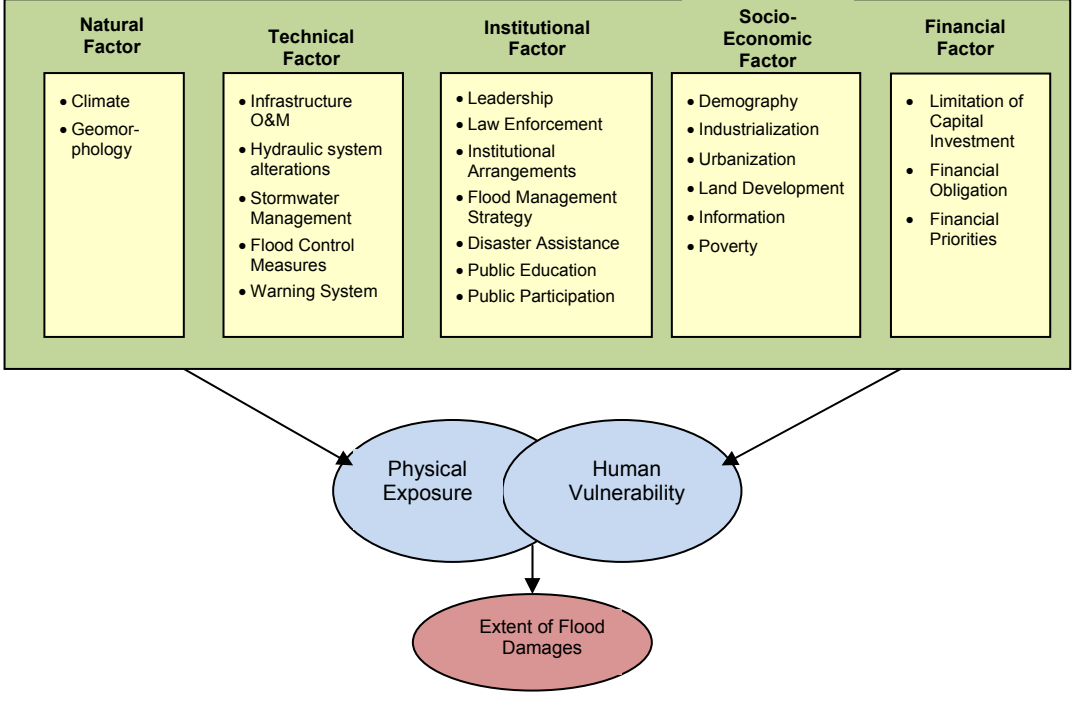

Figure 2 Factors Contributing to Flood Problem in Jakarta

Figure 3 shows the causal-loop diagram for Jakarta with the technical, institutional, socio-economic, and financial subsystems outlined.

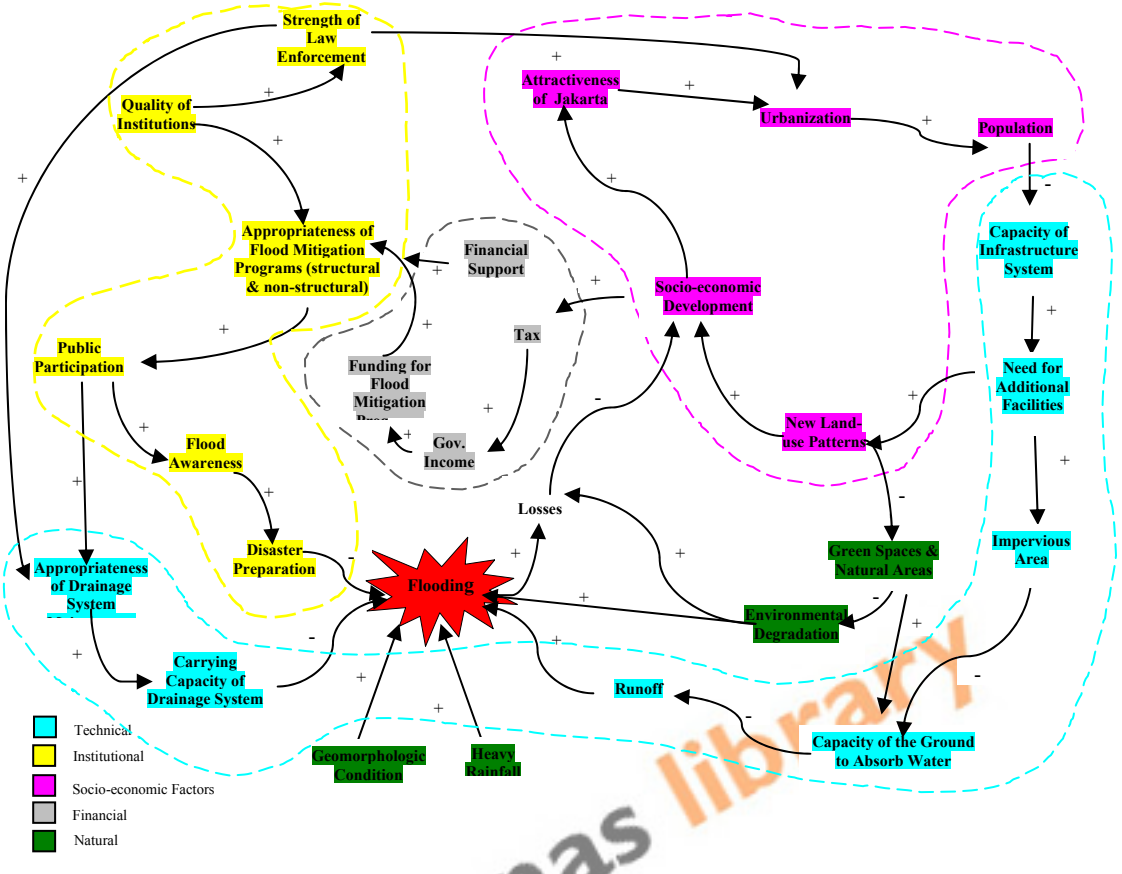

Figure 3 The Causal-Loop Diagram for Flood Problem in Jakarta

6. ANALYSIS OF JAKARTA CASE STUDY

As previously explained, Jakarta suffers from flooding mostly due to heavy rain, clogged sewage pipes and waterways, deforestation, and lack of adequate drainage system and flood control. The flood in 2007 is considered the worst in three centuries. The problem of flooding in Jakarta has long been recognized. However, the approach to flood management has always been reactive. In addition, disaster prevention and mitigation measures have been largely concerned with costly technical solutions. Public participation has been minimal.

As pointed out by Siswoko (2005), flood mitigation in Jakarta has relied heavily on structural measures. Despite millions of Rupiah invested in flood control, flooding still remains a problem and is getting worse. Moreover, most of flood mitigation activities have been carried out by the government with lack of public participation, especially over land acquisition and in maintaining their environment. Rapid population growth, lack of law enforcement and top-down approach by the government has also contributed to the problem.

6.1 Survey and Interviews

A survey was conducted to provide a better understanding of the flood-related problems in Jakarta, where the stakeholders would provide critical input and would help to identify issues of concern, develop goal and objectives, and propose management strategies for implementation. Interviews were conducted with the local government, academician, researcher, consultant, non-governmental organization, and citizen communities; while a questionnaire was used to gather information and understand people's concerns and needs.

6.2 Major Findings and Analysis

The results of the survey and interviews showed the following opinions and status of awareness:

1. Natural and technical factors were believed to be the primary causes of flooding in Jakarta.
2. The majority of the respondents did not know about flood mitigation program or regulations.
3. Most respondents did not receive any flood warning.
4. Almost half of the respondents have not taken any action to make their home flood-resistant, but they expressed great concern on reducing flood risk in their area.
5. Most communities do not have any flood mitigation program and have not participated in flood mitigation, but they expressed interest to join the program.
6. There is lack of trust in the government.
7. The majority of the respondents felt that the government has not been responsive enough to solve flood problem and there has been minimum assistance during flood events.

The causal-loop diagram showed how the technical, institutional, socio-economic, and financial aspects of the problem related to each other. It leads into the DPSIR framework which describes the driving forces, pressures, states, impacts and responses for each aspect.

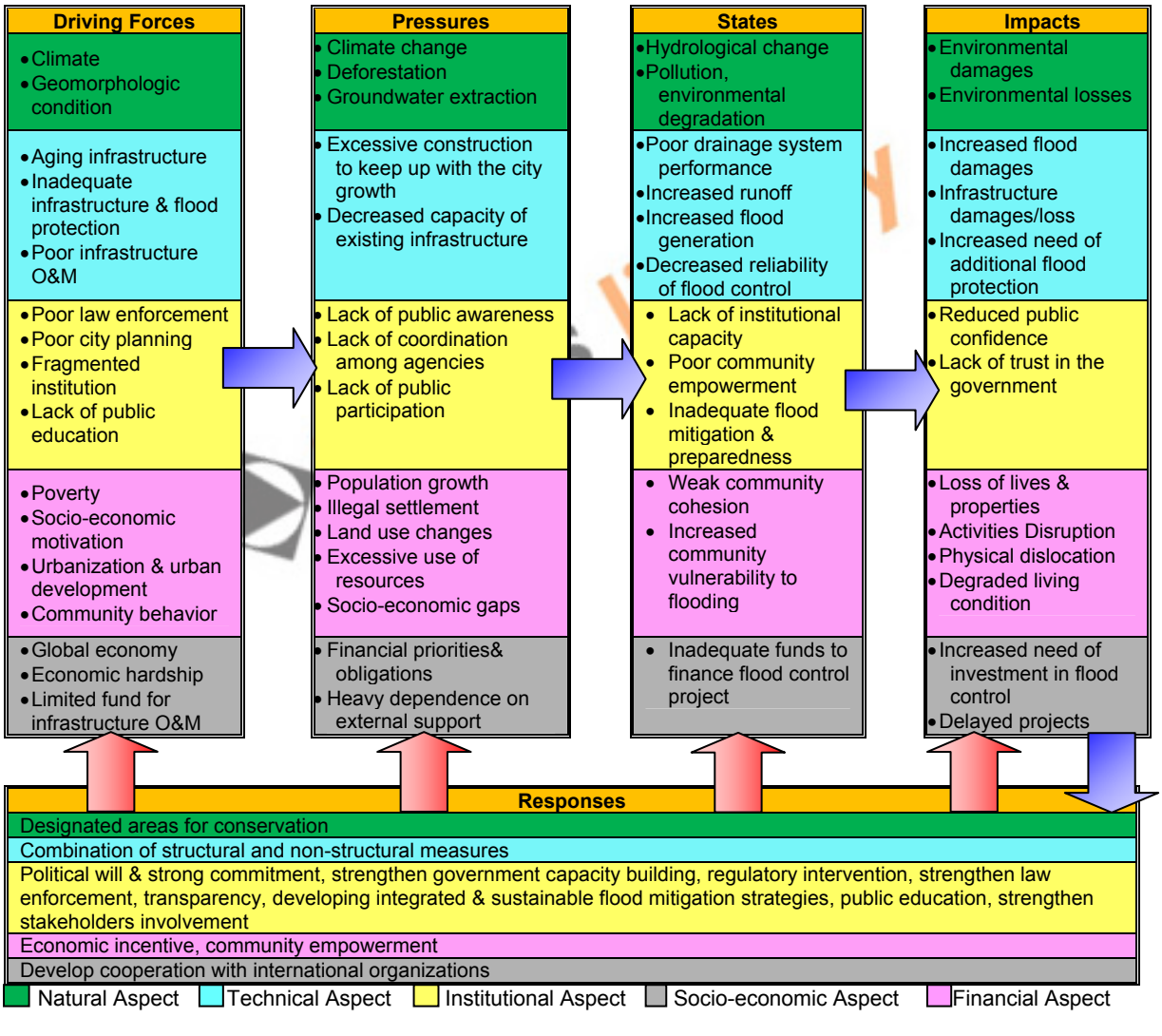

Figure 4 The DPSIR Framework for Flood Problem in Jakarta

7. CONCLUSIONS

In the final analysis, control of flooding is a daunting challenge in a fast-growing megacity like Jakarta, which has much of its area under sea level and is subject to heavy rainfall and increasing runoff from urbanization. With so many illegal residents and other problems of urbanization, the city will be hard-pressed to respond systemically to flood threats, but it can implement low-cost measures that engage the residents, while seeking larger scale solutions and the capacity to build and maintain new infrastructure. A culture of resilience must be developed through collective flood strategies, greater public awareness, and a flood management information system.

For practical reasons it may not feasible to implement immediate reforms in the context of inadequate institutional arrangements, especially law enforcement. An effective legal framework is required to provide a clear sense of direction with firm signals about changing culture. In the meanwhile, the support of the community for joint action is required. Promoting participation and constructive engagement between stakeholders involved in flood management, especially in a big city like Jakarta, is difficult. Social discourse and the need of integration of diverse stakeholders' interests into collective decisions are important. The institutional context can affect the level of participation thereby affecting trust and the ability to develop networks of constructive engagement.

While it is not possible or feasible to totally eliminate the flood risk, it should be recognized that floods also have some positive impacts. The challenge is to manage them as part of natural occurrences and take advantage of the beneficial aspects. This is in line with current thinking and the concept of Integrated Flood Management, which shifts away from fighting floods towards managing risk and integrating flood control with other urban systems. In Jakarta where most of the communities are adjusting to flooding, the approach should be focused on community resilience rather than costly total flood control. Since stakeholder participation is integral to the IFM concept, it is imperative that all stakeholders are involved in the decision-making processes that affect flood management. Multi-stakeholders engagement is a key to the success of IFM as it ensures strong stakeholder support and is a catalyst for proactive engagement in flood issues.

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