

GIS TECHNIQUES FOR HAZARD PROFILING

By Shivangi Chavda
SEEDS India

Basic Introduction of the Selected Tool: GIS

Geographical Information Systems (GIS) are primarily used to capture, store, analyze, manage and present data or information linked to a specific location. GIS tools are widely used for resource management, asset management, environmental impact management, urban planning and vulnerability mapping. Geographic Information is a software application that helps users access, transfer, transform, overlay, process and display information. It helps to generate data sets that are accessible through interactive mapping and web applications.

Project Brief

SEEDS initiated and implemented a project entitled “Earthquake Safety Initiative Himachal Pradesh – From School to Community Safety.” The project has been supported by ECHO and implemented by SEEDS in partnership with Christian Aid. The basic aim of the project was to create a model for how school, community and government disaster risk reduction processes can be interlinked in order to create a disaster resilient community. The state of Himachal Pradesh is prone to earthquakes and is located in a high damage risk zone. School safety has been the key area of disaster risk reduction interventions by SEEDS. The initiative not only reached out to a larger number of schools but also tried to involve local community and government institutions. The entire exercise built the capacities of schools, villages, and blocks to implement Disaster Management Plans and attempted to bridge the gap between policy interventions and community practices. The project demonstrated how school safety can involve and accelerate the community-based disaster management processes, which can be directly linked to block, district and state level disaster management planning. A comprehensive Disaster Risk Reduction Approach was demonstrated, whose activities included structural mitigation and response, non-structural mitigation, model block disaster management planning, linking BDMPs with school and district plans, and training for masons and teachers.

Relevance of the Tool

The critical element in this project was the formulation of an action plan based on vulnerability assessments and risk analyses conducted in partnership with the community. Vulnerability maps were prepared by the 45 clusters of villages in the most vulnerable Mashobra block of the Shimla district. These maps were made based on the risks perceived by the community. GIS tools have become indispensable for adequately analyzing all the parameters involved in solving problems related to the sustainable management of natural resources, the development of urban areas, the design of infrastructural projects and the mitigation of natural hazards, and GIS tools were therefore used in this project. The tool was thoughtfully designed so that it could be used by multiple stakeholders for various purposes, including disaster management and preparedness. GIS tools has developed to be more than a reproductive tool and due to their dynamic characteristics, such as their interactive and analytical functions, they have proven to be ideal for addressing problems where the clarity of information, the speed of elaboration and the rapid evaluation of alternatives are required, as they are in disaster management situations.

Application of the Tool

Disasters are usually spatial events, such as earthquakes, landslides, floods and forest fires. Mapping and spatial information acquisition is therefore critical in disaster management. The assessment of emergency needs and emergency response often deals with complex, multidisciplinary spatial databases. This requires intensive processing and integration of spatial information. Thus, GIS tools and techniques were integrated in the mapping process of the project, to facilitate and assist the policy makers as well as the community in understanding and assessing the specific territorial problems. The

GIS tools and techniques were applied and integrated within the project to enhance the utilization of community maps by multiple stakeholders.

Vulnerability and capacity assessments were performed as part of this project, with community involvement. Risks perceived by the communities were analyzed and risk responses in the form of both short-term and long-term mitigation plans were formulated. The final outcomes of the whole exercise were translated into a disaster risk reduction plan such that different functionaries were assigned role and trained through the process of community participation.

The proposed action plan had one of the most important components of vulnerability mapping of the village that they belonged too. These maps were made by the community. Community mapping is one of the important participatory risk assessment tools, utilized to make communities understand the availability of resources in the village, the road networks, local habitats, vulnerable zones and risks in the area. Using GIS, the community maps were made using layers depicting the occurrence of potential disasters in different disaster-prone areas. Disaster managers, with the help of this multilayered data, can analyze the possibility of mitigation needs in hazard-prone areas.

Outcome of the Tool

Impact on the Community

In order to meet the needs of multiple stakeholders at the community level, these maps needed to be detailed enough to show separate views of different components. The GIS tools were used to create an atlas through the compilation of maps at the village level. Base maps were collected from the community. However, the data was then vectorised to be put on different layers. Different layers included specific details regarding road networks, agricultural land, low lying areas, highlands, landslide-prone areas, and available facilities and resources such as hospitals, community halls, banks and schools. The development of such maps using GIS tools has been useful not only for communities, but also for local governments who can utilize these details in their disaster management planning. GIS tools therefore make it possible to use vector graphics on traditional maps. Vector data helps to improve the level of analysis conducted in terms of identifying safe routes, safe shelters and other features.

Although community maps show where things are located in the village, they are necessarily drawn to scale. However, these maps are useful for identifying the shortest and safest routes to emergency shelters in disaster-prone areas. They are useful resources for community leaders who must use the maps to direct the activities of task force leaders and community members in the event of a disaster. Short-term and long-term mitigation plans are now being developed using these maps as reference materials.

Impact on the Implementing Staff

The project staff was able to use these base maps in helping local governing bodies to formulate short-term and long-term mitigation plans for disaster risk reduction.

Case Study

Bridging Communities for Safer Lives

"High velocity water flows in local bodies of water during the rainy season make it difficult for villagers, especially children, women, and seniors, to move to other locations. The intensity of the flow of the river water was very high and school children often lost their school bags and valuables while crossing this rivulet. Since the construction of the bridge, we have been safe and are not much concerned about any mishaps among school children, women, and seniors during floods in local bodies of water," said by Kavita, a ward member of Thari village panchayat when the footpath bridge opened for the villagers of Thari Village Panchayat of Development Block Mashobra.

During a CBDM Action Plan workshop as well as community mapping activities, the village participants identified the risks of crossing the overflowing rivulet especially during the monsoon season, a hazard

that affected three to four nearby villages. The location of the bridge was finalized after having plotted the community map using a GIS tool. The gradient and topography were studied using GIS and then the community was advised on where to construct bridge. The land needed for the bridge was contributed by the villagers.

The activity will directly benefit to three to four villages of Thari panchayat with a total population of about 500, and will also benefit the adjoining villages of Solan district during the rainy season. According to the village head of Panchayat, the activity will serve more than 1,000 people in this area and will reduce the risks to villagers during floods.

