

Experiences of Shelter Response Planning for Earthquake Disasters in Kathmandu Valley

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SUMMARY:

The earthquake risk of Kathmandu Valley, Nepal is very high due to the large stock of weak buildings and the lack of preparedness and awareness among the people and institutions. Studies have shown that in case of a large earthquake affecting Kathmandu Valley, possible casualty and damage estimates are: approximately 100,000 deaths, 100,000 serious injuries and 1.5-2 million displaced population requiring emergency shelters. Approximately 60% of the valley's building stock will be damaged beyond repair. This situation clearly explains the need for improving earthquake safety of buildings and the level of preparedness required to face the impacts. One of the key areas for improving preparedness is Shelter Planning and Preparedness. Realizing this, the National Society for Earthquake Technology – Nepal (NSET) has recently worked for developing the Shelter Response Strategy and Plan for Kathmandu Valley. Philosophical background, approaches, methodology, activities, outcomes and lessons learned from the initiative are dealt in detail.

Keywords: Earthquake preparedness, shelter strategy, shelter plan, open spaces, build back better

1. INTRODUCTION

The earthquake risk assessments carried out for Kathmandu Valley in past show that approximately 1.5 to 2 million people has been estimated to be displaced potentially if a major earthquake occurred affecting Kathmandu Valley. This estimation has been made on the nature of existing building stock. Managing this large number of displaced population will be a huge and difficult task during such disasters. The requirement of shelters for the population displaced from such disasters will be increased. Providing shelters to such large number of displaced and affected population had always been a great challenge in the past major disasters. A strategy and plan for shelter response prepared beforehand the disaster would greatly help to effective response during the disasters. Nepal has realized this fact and has been working towards developing Shelter Response Strategy and Plan for Kathmandu Valley.

Estimations of losses in terms of casualties and building damage has been carried out in the past (JICA 2002) at ward level (lowest unit of administrative). Based on JICA 2002 Report, updated estimations on building damage scenario, casualty estimates and number of possible displaced population from each ward have been done. Large (number of) open spaces in different wards and communities within the Kathmandu Valley Districts (KV) have been identified, surveyed and verified at the field. Possible evacuation centres and shelter sites have been identified among the available open spaces. Such identification was done with the close coordination with local government authorities (i.e. municipal officers and village development officers (VDC)) including community people who are the direct users of the sites. Extensive use of GIS has been done for mapping and planning purposes. Shelter response strategies have been developed which are based on the principles of *Building Back Better*. Different shelter model designs have been prepared and agreed. Locally available materials for the construction and technologies have been considered in the designs. The provisions of globally accepted standards have been followed with required adaptation to suit the local reality in preparing the designs. All the works have been carried out with the active involvement of relevant institutions,

professional societies and local communities.

The process of strategy and plan formulation builds upon the experiences and achievements made in the past. The work also tries to utilize the rich experiences of recent disaster response from around the world specifically the experiences from the region (India, Pakistan and Indonesia). Moreover, it also tries to look the immediate shelter response, transitional shelter response and long-term housing reconstruction and rehabilitation into a logical continuum and try to address the inter-linkage between all three phases.

1.1 Objectives and Expected Outputs

Specifically, the objectives were a) to formulate framework for shelter plan for Kathmandu valley in case of disaster, and 2) to develop improved capacity to assess and address post-disaster shelter recovery needs and shelter planning.

1.2 Methodology

Similar initiatives were carried out in Tijuana (Mexico) and Maputo (Mozambique). Based on the lessons and experiences of the three cities (including Kathmandu), the aim of this project was to develop consolidated methodology for shelter response strategy and planning.

The various methodologies carried out during the process of formulating shelter strategy plan for Kathmandu Valley. Following activities were carried out in this process as:

Review of past and ongoing works related to shelter response — An extensive review of reports and documents related to shelter response planning and the on lessons of shelter response within country and around the region has been carried out as an initial step to develop the shelter response strategy and plan for Kathmandu Valley. The list of such relevant documents is included in the references section of this report.

Development of broad framework of shelter response strategy and plan — Framework of shelter response planning and strategy has been prepared based on the lessons and experiences in the past. The framework is later elaborated after consultation meetings and workshops.

Consultation and Workshops — Consultation meetings and workshops were organized to discuss on various issues of shelter response. Such meetings and workshops were very much helpful in deriving conclusions on the issues of main concerns among stakeholders.

Inventory of open spaces — Open spaces are the initial requirements for the any shelter planning, so this has been done throughout the Kathmandu Valley. Primary data collection has been done for the inventory of open spaces with their characterises especially assessment of population carrying capacity of each open space.

Shelter model and layouts in ready — The plan has also prepare shelter model of different options for families to be ready for the use in disaster.

Comprehensive shelter plan preparation —Based on surveys and several consultations, the framework for shelter response plan has prepared.

2. THE RATIONALE: LESSONS FROM MAJOR PAST DISASTERS

From the previous disasters occurred in the region have demonstrated the essential of pre-disaster shelter planning for effective disaster response and management. These lessons can be applied in every step of emergency response and rehabilitation process for the small to large number of displaced population. This clearly shows the rationale for formulating strategy and plans before disasters for

effective and timely response (including shelter response) during the actual disaster situations.

Providing emergency evacuation and shelter to around 800,000 population (160,000 families), and transitional shelter to the families and long-term housing reconstruction houses after a massive earthquake disaster are huge tasks. These cannot be effectively accomplished without sound strategy and plan agreed upon by related stakeholders prior to the disasters. Hence efforts have been put to formulate an outline of such an agreeable strategy and comprehensive response plan.

With the experience from past disasters in Nepal (for example, 1988 Udayapur Earthquake, the Flood of South-Central Nepal in 1993 and the Koshi Flood of 2008), several lessons were learned. Challenges in such emergencies for shelter management were the key for the preparation of shelter response strategies. These lessons give additional idea for shelter plan with local requirement and characteristics for effective response. Moreover, the plan also considers on the agreed upon guiding principles and approaches, key strategies and the plan for shelter provisions for Kathmandu Valley. This agreed upon strategy has been formulated through a series of consultation meetings and workshops. This further enhances coordination among stakeholders.

The table 1 shows the different characteristics of the disasters in different countries due to earthquakes, which shows the impact of on population, economy, reconstruction and rehabilitation.

Table 1. Comparison Table of shelter related facts during different earthquakes in different countries

Description	2001 Gujarat, India	2005 Kashmir, Pakistan	2010 Haiti Earthquake
Earthquake magnitude (Local Richter)	7.9	7.6	7.0
Epicentral (maximum) intensity (MMI)	X	X	
Total area of significantly affected locations (upto intensity VI)	21 out of 25 districts (7,633 villages adversely affected)	30,000 sq. km.	
Total population in affected areas	37.8 million		3.5 million
Total houses/buildings in affected areas		800,000	
Affected population	15.9 million	3.5 million	3.5 million
Total deaths	20,086	73,338	200,000+
Displaced (homeless) population	600,000	3.5 million	2.3 million
Damage of houses/buildings (no.)	approx. 1.2 million (2,22,035 collapsed and 9,17,158 damaged)	600,000	300,000 (188,383 houses collapsed or badly damaged and 105,000 completely destroyed)
Cost of damage to housing sector (million \$)	1,111		
Shelter Provisions:			
Population living in tented camps (after 3 months)		200,000	
Population living in tented camps (after 1 year)			650,000
Number of temporary shelters (after 1 year)			100,000
Number of transitional shelters (after 3 months)		300,000	
Number of permanent houses reconstructed (after 3 years)	9,08,710(99%) repaired/retrofitted & 1,97,091 (89%) reconstructed		

Similarly, Nepal has faced several disasters in past, and have different experiences on shelter requirements. The figures (table 2) can give a tentative idea for the potential scenario and shelter need assessment in such disaster scenarios.

Table 2. Comparison Table of shelter related facts during different major disasters in Nepal

Description	1988 Earthquake of East Nepal	1993 Flood of South-Central Nepal	2008 Koshi Flood
Total area of significantly affected locations (upto intensity VI)			
Total population in affected areas			109,817 (18,238 families)
Total houses/buildings in affected areas			
Affected population		85,451 families	100,000+ (6,183 households)
Total deaths	721	1,460	40 (male 16, female 18, children 6)
Displaced (homeless) population			70,000+
Damage of houses/buildings (no.)	65,453	39,043	3,400 (230 <i>pakki</i> and 3,167 <i>kachchi</i>)
Cost of damage to housing sector (million \$)			
Shelter Provisions:			
Population living in tented camps (after 15 days)		52,562 (in 65 relief camps)	
Population living in tented camps (after 1 month)			
Number of permanent houses reconstructed (after 1.5 years)	25,118		

3. SCENARIO DURING A MAJOR EARTHQUAKE DISASTER IN KATHMANDU

A scenario based approach has been followed for developing the strategy and plan for shelter response for Kathmandu Valley. Potential situation during a scenario earthquake was developed, based on which plans for different components of shelter response were formulated.

3.1 The Loss Scenario

The results of “Study on Earthquake Disaster Mitigation for Kathmandu Valley, Nepal (SEDM)” (JICA, 2002) have been used for potential losses in case of a scenario earthquake in Kathmandu Valley. The loss estimation by SEDM was carried out in 2000-2002 and hence it reflects the possible situation in 2001. Obviously, there have been significant changes in population and number of buildings in Kathmandu Valley from 2002 to 2009. Therefore, an effort has been made to update the loss estimation figures. The update is limited just to extrapolate the loss estimations by using increased figures in population and buildings, the rest information such as proportion of building typologies, infrastructures remains same. A summary of the updated loss estimation is in table 3.

Table 3. Updated Loss estimation figures for Scenario earthquake in Kathmandu Valley

Municipality / VDC	Projected Population, Buildings and Impacts due to Scenario Earthquake in 2009					
	Population	No. of Buildings	Death	Injury (Severe and Moderate)	Building Damage (Heavy and Partial)	Displaced Population
Kathmandu District						
Kathmandu Metropolitan	956,364	187,137	14,585	120,717	87,193	291,232

City (35 Wards)						
Kirtipur Municipality (19 Wards)	50,065	9,065	240	2,030	4,563	18,673
VDCs (Total 56 VDCs)	494,684	89,722	8,996	74,578	51,426	227,784
Kathmandu District Total	1,501,112	285,924	23,821	197,325	143,182	537,689
Lalitpur District						
Lalitpur Sub Metropolitan City (22 Wards)	211,501	45,202	990	8,310	19,355	49,016
VDCs (Total 26 VDCs)	218,863	39,583	2,463	20,523	21,833	95,224
Lalitpur District Total	430,364	84,785	3,452	28,834	41,188	144,239
Bhaktapur District						
Bhaktapur Municipality (17 Wards)	82,574	12,381	271	2,287	5,836	25,011
Madhyapur Thimi Municipality (17 Wards)	64,770	10,423	147	1,249	4,359	17,656
VDCs (Total 16 VDCs)	139,371	24,065	925	7,759	11,996	53,944
Bhaktapur District Total	286,714	46,869	1,342	11,295	22,191	96,612
Total Valley	2,218,191	417,577	28,616	237,454	206,561	778,540

The pattern of casualties based on Mid-Nepal Earthquake Scenario as presented by JICA study have also been presented in the following maps together with the potential distribution of building damage in Kathmandu Valley by VDCs and at ward level for Municipalities.

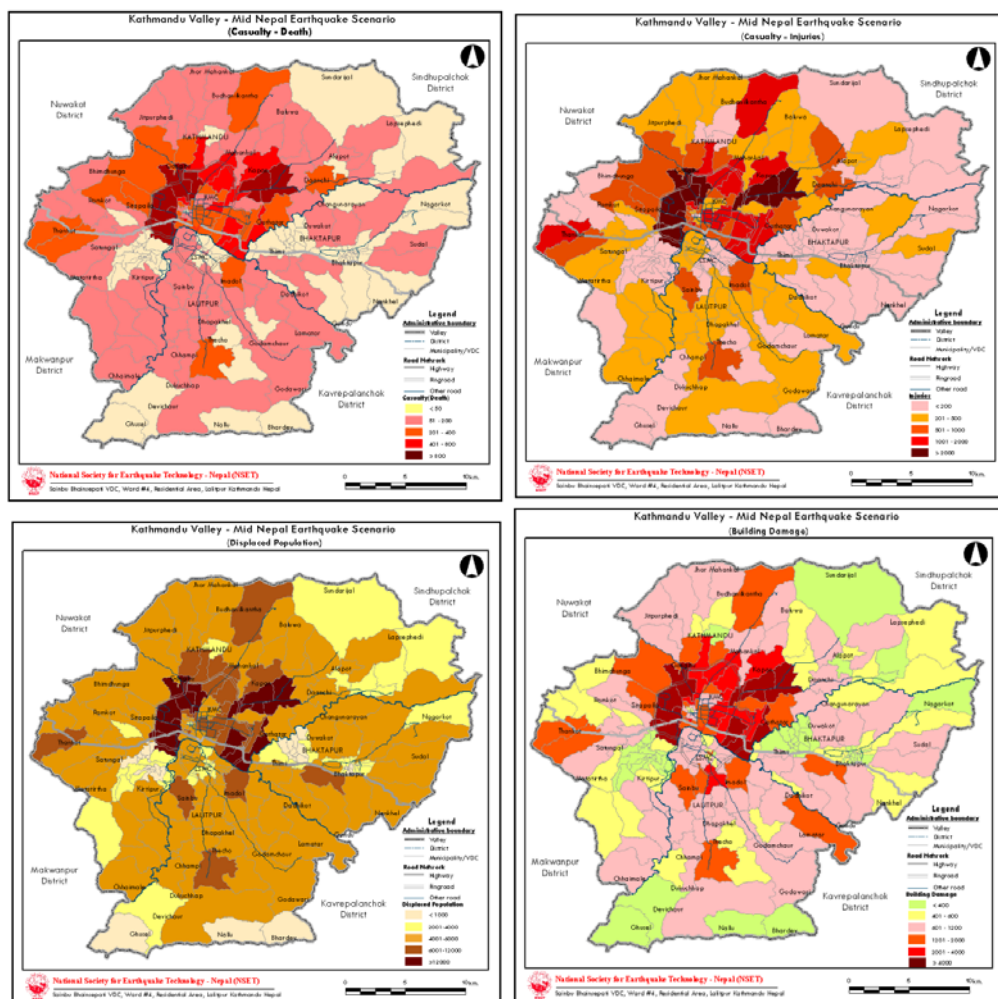


Figure 1. Distribution of potential casualties, displaced population and building damage due in Scenario (Mid-Nepal) Earthquake in Kathmandu Valley.

These figures can be used for initial planning for shelter response in Kathmandu Valley. Further, transitional shelters and/or permanent housing reconstruction will be required for the approximately 420,000 houses (total no. of damaged buildings).

3.2 The Shelter Needs

All displaced population from the damaged houses i.e. a total of 778,540 (see table 3) people will require shelters after the earthquake. Experiences have shown that out of the total displaced population, some takes shelter with their families and friends, and some will prefer to live in their damaged houses or self managed temporary shelters nearby their house. Likewise, a fraction of population will migrate to other locations or their original cities and villages in search of better shelter. Hence, only a part of total displaced population will require shelters in planned shelter camps. The proportion of such different options may be worked out from the experiences of recent disasters in the region. The proportions thus worked out however, would just be preliminary figures for planning purposes, actual numbers need to be assessed after the actual disaster situation on site.

Based on the above mentioned potential scenario in Kathmandu Valley during a major earthquake event and also with the experiences in other countries, following figures can be estimated for planning for shelter response.

- Total displaced population = 800,000
- No. of displaced families = 160,000 (with average household size of 5 persons per family)
- Families taking shelter with families and friends (approx. 5 %) = 8,000
- Families taking shelter in damaged houses or self managed temporary shelters nearby original houses (approx. 5%) = 8,000
- Migrated families (approx. 2%) = 4,000
- No. of families requiring shelter in shelter camps = 140,000 (total population = 700,000)

4. SHELTER RESPONSE PLANNING IN KATHMANDU: MAIN COMPONENTS

Providing emergency evacuation and shelter to about 800,000 people (160,000 families) for transitional shelter to the families and long-term housing reconstruction are huge tasks. These cannot be effectively accomplished without sound strategy and plan agreed upon by related stakeholders prior to the disasters. Formulating an agreeable strategy and response plan is the primary entry point for any effective plan. This was initiated by preparing outline of the agreed upon guiding principles and approaches, key strategies and the plan for shelter provisions for Kathmandu Valley. This was done through series of stakeholders' consultation.

Key issues for the shelter response planning for Kathmandu were recommended and considered for the shelter response planning as: a) ensuring involvement of beneficiaries during plan preparation as well as implementation phase for immediate, transitional and long-term shelter response, b) shelter designing depend on climatic, seasonal, cultural and geographical conditions together with materials, planning consideration, c) ensure smooth transition from emergency shelters to transitional shelters and permanent housing reconstruction (back to normalcy), d) linkage of shelters and livelihood support e) relocation vs. in-situ reconstruction, f) owner-driven vs. contractor driven, NGO driven reconstruction, g) cash grant support vs. cash for work, and h) reconstruction grant/support and technical support for hazard-resistant reconstruction.

4.1 Shelter Response Plan for Kathmandu Valley

The separate shelter cluster preparedness plan for Kathmandu valley has not been prepared yet except some disaster preparedness and response plan for Kathmandu District under the leadership of the District Disaster Relief Committee (DDRC) of Kathmandu. This plan which is in the development

process has clearly defined the cluster lead, its members and presented preparedness plan to be activated during the emergency within the Kathmandu District.

The Contingency Plan Framework has been developed for the country level however, which automatically applies for Kathmandu Valley too. This also engage with the Coordination and Camp Management Cluster on site identification and shelter planning for post earthquake internally displaced population (IDP) camps in Kathmandu Valley.

The cluster has proposed shelter plan layout and shelter model for different types of evacuation sites as available in Kathmandu Valley with different options (Figure 2). The survey of open spaces in Kathmandu Valley, which is recently carried out by NSET is one of the significant step towards open-space identification there by shelter cluster preparedness plan for Kathmandu Valley. Before this, there was a study carried out by IOM (MoHA /IOM 2009) has also identified 63 open spaces can be used as evacuation sites. Among them, some, 32 sites were identified as temporary shelter to be used in emergencies. The detailed overview of open-spaces survey in Kathmandu Valley is described in the following section.

4.2 Identification and Assessment of Available Public Open Spaces in Kathmandu Valley

Beyond loss of lives and injuries, earthquakes also leave many without homes. As was witnessed after recent earthquakes in Pakistan (2005) and Haiti (2010), sheltering large numbers of displaced people can be a tremendous challenge. Understanding the quantity and quality of potential shelter sites is an essential piece of planning before disaster strikes.

This study seeks to document and describe public open spaces available within Kathmandu Valley. Rapid urban growth both increases the need for more open space (a larger displaced population requires more shelter space), and reduces its supply (through development) – this is clearly a dangerous equation. Recognizing that all open spaces do not show equal potential for use in post-disaster shelter we have specifically targeted public lands, as private lands are both logistically difficult to use for post-disaster shelter, and they are quickly disappearing due to development.

Table 4. Number of Identified Open spaces by size of the area, Kathmandu Valley

Size of Open Spaces Area in sq.mt	Kathmandu Valley Districts					
	Bhaktapur		Kathmandu		Lalitpur	
	No. of Sites	Total area (sq.mt.)	No. of Sites	Total area (sq.mt.)	No. of Sites	Total area (sq.mt.)
< 10,000	39	113,582	409	1,035,154	303	557,172
10,000-100,000	12	490,458	66	1,698,091	39	859,292
100,000-300,000	2	394,779	11	1,587,949	4	676,172
> 300,000			2	1,617,625		
Total	53	998,819	488	5,938,820	346	2,092,636

Source: NSET, 2011

Based on different size of open spaces as identified, further the tentative estimation of population holding capacity have also been made. Since there are several different standards have been made for the requirement of open spaces for the family or individuals (Sphere Standard). The Sphere standard uses 45 sq. meters per person for camp sites and 3.5 sq. meters per person for covered accommodation for the shelter spaces needed. Whereas for the context of Kathmandu Valley Shelter planning, the IOM (n.d) has used the standard of 10 sq. meters per person for large camp sites, and 3.5 sq. meters per person for covered accommodation, and for medium and small camp sites. Similar to Sphere, DPRP for Lalitpur Sub-Metropolitan City (NSET/UNICEF 2008) used the 45 sq. meters per family (family size 5) for camp sites, hence 9 sq. meters per person for the estimation of area requirement and deficiency of areas to be identified for rest of population to be provided additional shelter.

According to the size of open spaces surveyed, and after their population holding capacity assessed, using 10 sq. meters per person requirement, open spaces were further identified as large (> 300,000 sq meters), medium (100,000 - 300,000 sq meters) and small (10,000 - 100,000) shelter areas according to the population holding capacity based on the (coarse assessed total usable area available within the identified open space). Open spaces of size below 10,000 sq. meter are not considered to recommend for the established shelters assuming that these size require higher cost per capita as well as they can be used as temporary collection points for the victims. This assessment and categorization help to the establishment of services and facilities to be provided for the population living in those shelters. This estimation also helps to clustering of open spaces by geographically so that the better estimation for service.

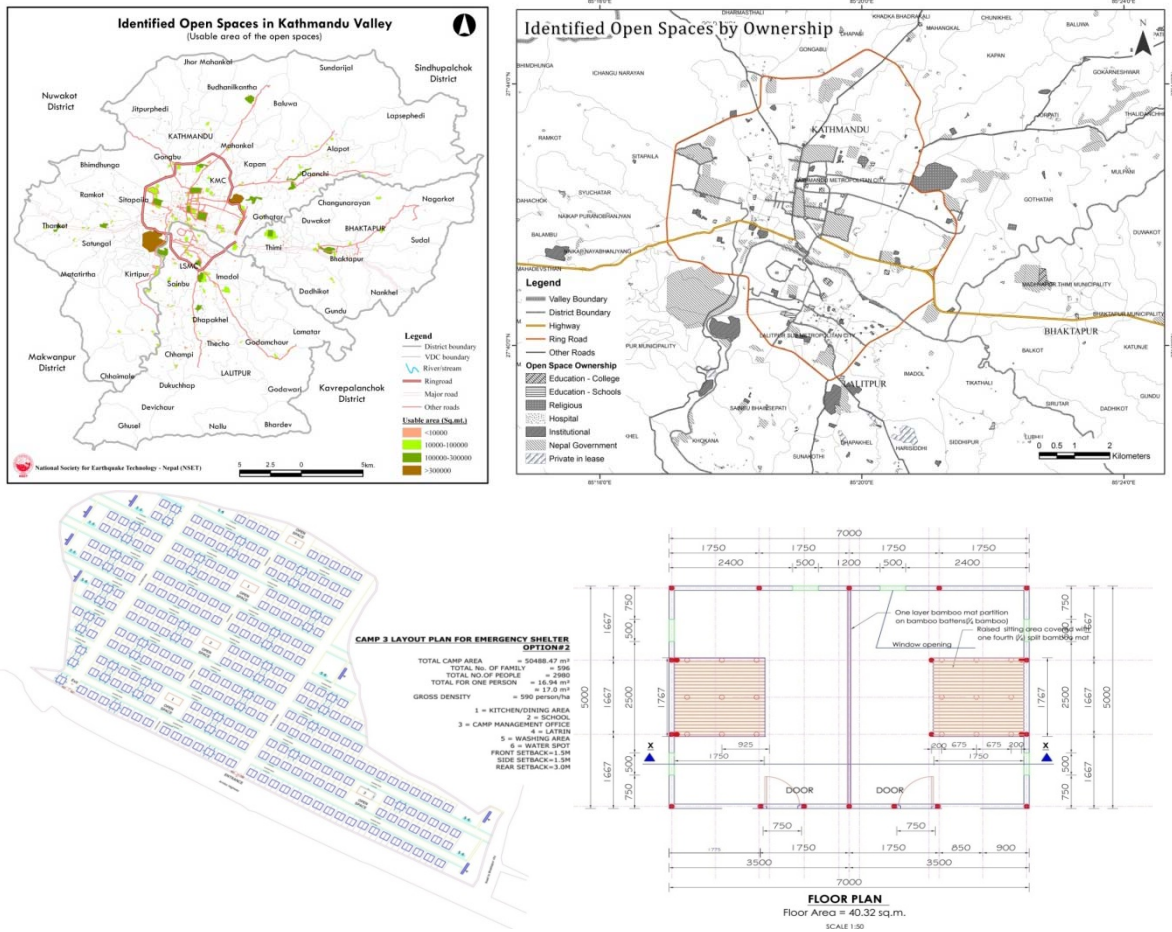


Figure 2 Open space distribution in Kathmandu Valley Districts according to population holding capacity (top left), identification of open spaces by ownership (top right), layout plan for the sample shelter location (bottom-left) and shelter layout-model (bottom-right) for the shelter planning.

5. ACHIEVEMENTS, IMPACTS AND LESSONS

Achievements, impacts and lessons from the shelter planning project gave an opportunity raising awareness for the stakeholders on the need of emergency shelter planning for effective response after disaster. With the survey, identification of public open spaces and their potential use for the time of disasters was carried out. This has circulated the message to the local government officials, community members to make them aware of open spaces around the community as well as the potential significance in emergency management. Integration of shelter planning and inclusion of open spaces in local disaster management planning is also seen some of local government units. Awareness

among district level authorities is highly raised together with other stakeholders. This opened engagement and dialogue among potential response agencies – will increase enhanced coordination during actual response.

6. WAY FORWARD

The shelter framework prepared will need proper implementation strategy as well as commitment of the concerned authorities and other stakeholders. For this, wider dissemination of the plan, awareness rising from local communities to national authorities, decision makers is needed. Regular update of information and improving plan on time basis is also essential for the better implementation and to make plan live.

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