

# DEVELOPING OF A STRATEGY FOR IMPROVING SEISMIC SAFETY OF SCHOOLS IN NEPAL



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## **SUMMARY:**

Working for the 14 years in school safety in Nepal identified the need of a strategy for making all the schools of Nepal safer. National society for Earthquake Technology-Nepal (NSET) and GFDRR implemented a program to develop a national strategy based upon present situation and the lessons and experiences from the past. National scenario of school vulnerability developed shows; in worst case scenario about 60,000 school buildings out of existing 83,000 school buildings of Nepal require urgent intervention. The strategy has proposed a 15 years of efforts including significant training and capacity building program for different stakeholders under the education sector to make all schools of Nepal safer. The strategy has also proposed responsibilities of different national and international institutions for the effective implementation. This paper highlights process, priority actions, technical solution, institutional set-up, time frame, cost required and detail implementation plan including different cross-cutting issues relating to school safety.

*Key words: Strategy, Seismic safety, Vulnerability, Issues and gaps, Priority actions*

## **1. INTRODUCTION**

### **1.1 High Seismic Hazard and Risk**

Public schools in Nepal, both buildings and their occupants, face extreme risk from earthquakes due to vulnerable physical structures and lack of awareness and preparedness at the local level. Majority of the school buildings, even those constructed in recent years are generally constructed without considering measures for earthquake safety. The responsibility of managing the facilities and running of public school lies under the local community. The Government contribution in public school is a very small amount for physical improvement, stationeries and salary for teachers. Major part of the cost for building construction, repair and maintenance and other activities are to be managed by the local community. Such condition increases the potential to use poor materials or workmanship, inadequate/ under size structural elements making the buildings structurally vulnerable to earthquakes and other hazards. Due to financial and the limitation of available land, schools intend to expand horizontally and vertically of the existing poorly constructed buildings increasing further vulnerability. High vulnerability of schools was evidenced during the 1988 east Nepal earthquake of magnitude 6.6 Richter resulting six thousand schools to collapse and thousands being damaged. Such massive damage to the school infrastructure disrupted the affected community- approximately 300,000 children were not able to attend schools properly for several months after the event, [Ref: UNDP/UNCHS 1].

### **1.2 Seismic Vulnerability of School Buildings in Nepal**

While implementing School Earthquake Safety Program (SESP) in different parts of the country, NSET had the opportunity to observe several school buildings and the physical condition of almost all

were the same. Most of them were constructed through informal process and were non-engineered (although the Department of Education has prescribed certain guidelines, those were not followed fully in majority of the school buildings) and were found vulnerable to earthquake. Major factors identified for such vulnerability were

- a) Lack of mandatory policy to control design and construction of schools. Some schools supported by donors and/or government require design/drawings but many directly constructed by communities are constructed without any design.
- b) Lack of awareness on earthquake risk and safety measures at all levels;
- c) Lack of sufficient knowledge and skills on earthquake safer construction with engineering professionals, masons and the management committee who is responsible for school construction;
- d) Inadequate funding mechanism ( schools are constructed in cost sharing basis and majority of cost for construction is to be managed by the local community, Government share is minimal which leads to use poor quality of materials and quality decreases);
- e) Inadequate policy for monitoring and quality assurance of the construction
- f) Poor capacity of the institutions under the Department of Education in implementing safer construction and strengthening of school buildings,
- g) Disaster safe education is not fully thought in formal education system so as to aware and make the school family capable on saving lives,
- h) Schools are constructed at vulnerable sites (Government and even development partners do not provide funds for purchasing land for school building construction. The buildings are constructed on the lands donated by the local people and mostly these lands are no use for any purpose) ;
- i) School safety not a national priority

In 1998-1999, NSET tried to evaluate the earthquake risk of public schools in Kathmandu Valley as a component of the Kathmandu Valley Earthquake Risk Management Project (KVERMP) which was implemented during September 1997 – February 2001. Survey of existing buildings in public schools was conducted and the collected data was analyzed. Finding of the vulnerability assessment was alarming. Over 66 percent of the valley's public schools are likely to collapse if the valley experiences intensity IX shaking in an earthquake. [Ref. NSET,<sup>1</sup> 2]

### **1.3 The School Earthquake Safety Program**

These findings motivated NSET to advocate for School Earthquake Safety Program (SESP) in Nepal. The studies have shown that school-going children will constitute a significant proportion of the casualty. The study for Kathmandu Valley suggests a potential death of more than 29,000 children and teachers, and potential serious injury to an additional 43,000 persons in schools (18% of total) if the earthquake occurs in school hours. The risk is believed to be increasing rapidly mainly due to the growth in population, especially in urban and urbanizing areas. Another major factor for the increasing risk is the lack of a favorable policy and legal environment commensurate with the present-day situation, needs, opportunities and resource availability. [Ref. NSET<sup>2</sup> 3]

Since then, NSET has continuously implemented SESP in Kathmandu Valley and beyond in collaboration with the Department of Education of the Government of Nepal and with several national and international development partners. Currently, there are many agencies, national or international assisting Nepal in enhancing disaster safety of schools in Nepal. So far, the focus has been on public schools mostly.

### **1.3 The Project**

NSET in association with the GFDRR of the World Bank conducted similar study in other 3 districts in 2008/2010. The results of these studies were more or less similar with the scenario of Kathmandu Valley with slight difference in building typology over the time. The results showed almost 75 of the existing school buildings need immediate intervention for making safer against earthquake. This result was extrapolated to develop National scenario of school vulnerability in Nepal. The national scenario

predicts, out of total 82,000 school buildings, about 15% of them are in such a bad condition that they cannot be used even before earthquake and hence need to demolish and reconstruct. Another 60% are seismically vulnerable and need strengthening as soon as possible to protect children before next earthquake strikes. The study also highlights that if an earthquake of intensity level IX strikes any part of the country, there could be more than hundred thousand death and about seven hundred injury. [Ref. NSET/GFDRR 4]

The above scenario gave rise to the following serious questions related to the vulnerability reduction and earthquake preparedness in Nepalese schools.

- a. How to expend SESP to all the 33,000 schools of Nepal with
  - Structural safety
  - Earthquake preparedness

Can Nepal do it? If yes how?

- b. How to take in to consideration recognizing vulnerability factors such as building typology which depends upon construction materials, climatic condition, social and cultural variation, and the prevailing and indigenous construction techniques.
- c. Need / requirement of resources – human, physical, institutional, policy, legal frame work, research stations for how long and how much?
- d. What are the priority actions?

Above analysis encouraged NSET and GFDRR of the World Bank to “Develop a Nationwide program for school vulnerability reduction through proper policy guidelines, risk assessment, capacity building and institutionalization of earthquake preparedness in schools of Nepal” and the concept of the National strategy was developed with the vision All schools of Nepal Safe from Earthquake by 2025. GFDRR and NSET conceptualized National Strategy in Nepal to build on a 10-year experience of NSET of improving seismic performance of both school buildings and the entire schools system in Nepal. This was exercised to explore replicable potential of the methodologies and experience to the entire country by piloting the program in two districts, and to develop a strategy for improving seismic safety of the entire school population of the country.

## **2. THE STRATEGY (DRAFT)**

The Draft National Strategy for Improving Seismic Safety of Schools in Nepal (SSS) endeavors to facilitate the required change in order to achieve the goal of disaster resilient schools in Nepal. It aims to provide guidance for improving the policy and legal environment, identifies and prioritizes strategic interventions, and provides details on technical aspects of the solutions. The Strategy as well as the elaborated process of its development addresses Nepal’s long-felt need to come up with a long term policy document and build on the enormous amount of work in school disaster risk reduction implemented by the Department of Education of the Government of Nepal and several NGOs, national as well as international community, with support from the development partners and the programs. Based on a sound analysis of the existing gaps, the SSS aims to trigger a process of change in both aspects of DRM, namely, disaster reduction and emergency response planning and capacity enhancement for the school system of Nepal. The SSS reflects the spirits and aspirations of the government and people of Nepal as embodied in the National Strategy for Disaster Risk Management (NSDRM) [Ref. NSDRM 5]. The Strategy also seeks to provide guidance to the implementation of several school-related programs, initiatives and efforts, including those pertaining to the reduction of disaster risk in the school system of Nepal. Notable among those are the Flagship Area 1: contained in the Nepal Disaster Risk Reduction Consortium (NDRRC) that has a membership of the UNISDR, UNDP, UNOCHA, IFRC, The Asian Development Bank, the World Bank, USAID, UKAID, and the European Commission. [Ref. NRRC, UNDP 6]

SSS is also in consonance with the stipulations of the 10<sup>th</sup> Five-year Development Plan (2002-2007) [Ref. 10th Five-year Development Plan 7] and also the Interim National Development Plan (2008-2010) [Ref. Interim plan8].

## **2.1 Summary of Identified Problems of School Building Construction**

### **2.1.1 General Problems**

Past experience of implementing SESP in Nepal allows us to make the following summary of the problems in school buildings of Nepal

- a. Almost all school buildings are non-engineered.
- b. Most buildings are constructed using informal production mechanisms.
- c. The buildings are constructed using mainly the traditional materials (low-strength masonry, flexible floors and roofs mostly of timber) without considering the limitation of the materials and safety provisions.
- d. Most are elongated (rectangular) in plan.
- e. Most buildings are load bearing masonry structures, and
- f. Most are highly vulnerable to earthquakes.

### **2.1.2 Problems of School Building Structure**

Major structural problems so far identified in the various types of existing buildings belonging to the public schools are:

- a. Use of weak construction materials.
- b. Heavy wall and roofs.
- c. Poor quality control of construction process.
- d. Untied gable wall, and
- e. Lack of integrity between different structural components/elements.

The followings are the main factors identified that contribute to the generally high seismic vulnerability of school buildings in general:

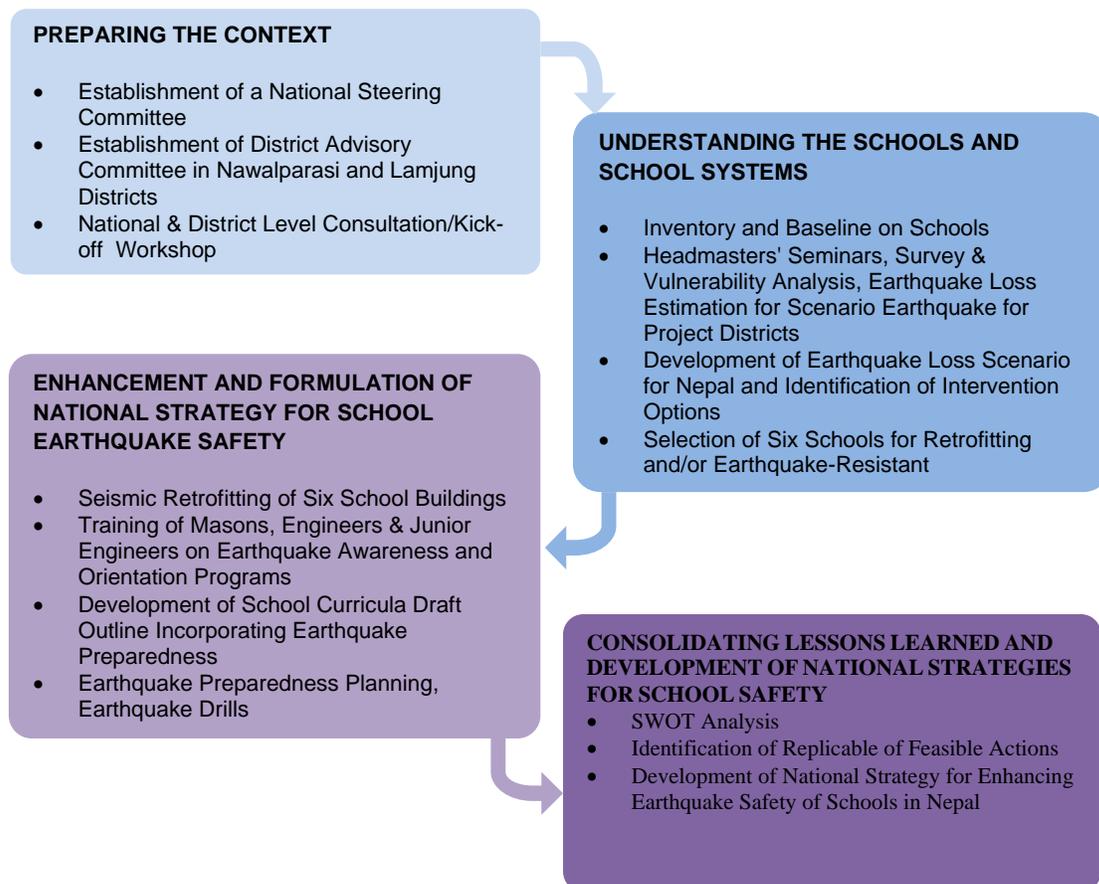
- a. Lack of mandatory policy to control design and construction of schools. Some schools supported by donors and/or government require design/drawings but many directly constructed by communities are constructed without any design.
- b. Lack of defined construction mechanism and clear guidelines resulting to improper supervision and quality control.
- c. Site specific hazards are not considered during design and constructions. Some type designs are available, which may not match to specific sites/locations.
- d. Lack of capacity at local level for understanding and implementing earthquake safe construction.
- e. Funding mechanism. Sometimes, 60-40 ratio of participation from government and community is found affecting the quality of school buildings construction. In the communities who could not generate 40% fund, are found completing the construction from the available 60% budget compromising the quality.

## **3. STRATEGY FORMULATION PROCESS AND METHODOLOGY**

The methodology employed for consisted broadly in:

- a. Getting an early on involvement and ownership of the program by government and non-government stakeholders by establishing a national steering committee
- b. Establishing one district level advisory committee in each of the two districts.
- c. Preparing a baseline of information of the schools in each of the two districts.
- d. Conduction of a national workshop and two district level workshops
- e. Conducting school headmasters' seminars and training on school survey methodologies and the use of the information for a preliminary seismic vulnerability assessment of schools;
- f. Conducting the school survey and analysis of the survey information for understanding the building typologies, the construction materials and construction processes used, management of

- schools, and assessment of seismic vulnerabilities for different building types and typologies and the relationship between vulnerability of school building vis-a-vis physiographic conditions (high Himalayas, high hills and the plains of Terai). A simple loss estimate was done for different scenario earthquake in terms of deaths, injuries, loss of school buildings and other amenities. The loss estimations for different scenario earthquakes (different levels of shaking) for the two districts and similar results from Kathmandu Valley were extended further to develop earthquake damage scenario for the entire country assuming that a single large earthquake can inflict serious damage to houses and critical facilities located in about a third of the country's populations.
- g. SWOT analysis- An assessment of strengths and weaknesses of present-day conditions and nature of the existing management systems in schools with respect to the potentials of improving earthquake safety along with looking through the opportunities and threat in the existing scenario was done through SWOT workshops at community level and at district level. The workshops drew main stakeholders of the school system – teachers, education officers, parents, members of school management committees, government officials and representatives of civil society organizations, national and international non-governmental organizations.
  - h. Using the national estimate of potential death, injuries and damage of facilities, and combining with the experience of seismic performance improvement in six schools and vulnerability assessment, a draft strategy has been formulated for consideration by the government for earthquake safety in Nepal. A thorough analysis of possible construction modalities, an outline of the implementation methodology for the school earthquake safety strategy was formulated.
  - i. Further, a curriculum on disaster safety and preparedness has been developed for grades 6-10 of Nepalese schools with the purpose assisting the government in institutionalization of earthquake safety in schools of Nepal.



**Figure 3.1:** Schematic diagram of strategy development process

#### 4. PROPOSED PRIORITY ACTIONS

The following section provides a listing of all strategic activities should be undertaken on a priority basis for achieving resilience of schools and school system in Nepal against earthquake hazard. These priority strategic activities are identified to address the identified issues and gaps. For the purpose of clarity and understanding, these proposed strategic activities have been grouped as per the well-known five priority-action areas identified by the Hyogo Framework for Disaster Risk Reduction (HFA 2005-2015).

There are altogether 26 Strategic Activities proposed to be implemented. Indicative activities and outcomes have been suggested for each of the 26 strategic activities. Obviously, these “indicative activities” should not be considered as “carved in stone”, nor the list is final.

Agencies that should be given the responsibility of implementing each of the strategic activities and the indicative activities have also been identified based largely upon the conclusions and findings of the different workshops, meetings and the SWOP exercise.

**Table 4.1** Summary of Priority Actions recommended by the strategy

Issues and Gaps	Strategic Activity
<b>Priority Action 1: Institutionalize school earthquake safety with adequate policy, guidelines and legislation</b>	
1. There is a need to formulate policy and institutionalization of an integrated Earthquake Risk Management system that could address the entire spectrum of education system from vulnerability assessment, mitigation to preparedness and response. 2. Lack of a comprehensive legal and policy instrument for vulnerability reduction, emergency preparedness and enhancement of emergency response system at school and community level. Existing policies and guidelines does not address the issues fully.	<ul style="list-style-type: none"> <li>• Establish institutional framework for school earthquake safety</li> <li>• Institutionalize school earthquake safety program</li> <li>• Formulation/modification and enactment of policies, rules, regulations for incorporation of comprehensive earthquake risk management in schools</li> <li>• Establish formal system of disaster safety education</li> <li>• Develop a mandatory policy for earthquake risk assessment of schools for various scale of shaking incorporating with ongoing school physical improvement program.</li> <li>• Develop a policy to integrate vulnerability reduction and emergency preparedness in to ongoing national program for education sector.</li> <li>• Establish system of emergency planning and response in schools</li> <li>• Mechanism of training and capacity building of resource persons and teachers</li> <li>• Gradually implement various policies and protocols, standards, guidelines Standard Operating Procedures (SOPs), specific special national programs for earthquake risk reduction risk reduction</li> <li>• Mainstream school safety activities in to the initiatives of all institutions</li> </ul>
3. Lack of suitable funding mechanism for implementing DRR and Preparedness	<ul style="list-style-type: none"> <li>• Make necessary financial arrangement for school earthquake safety program</li> </ul>
<b>Priority Action 2: Identify, assess and monitor earthquake risks of schools and enhance early warning.</b>	
1. There is a need of earthquake vulnerability assessment and develop priority actions for vulnerability reduction	<ul style="list-style-type: none"> <li>• Assess earthquake /disaster vulnerability of all schools at various scales including public, private and schools running by religious organization of all levels and similar assessment shall be made mandatory including colleges and other educational institutes. Update the vulnerability stage periodically.</li> </ul>
2. There is a need of earthquake vulnerability assessment and develop priority actions for vulnerability reduction	<ul style="list-style-type: none"> <li>• Make priority of vulnerability reduction of assessed building</li> </ul>

<b>Issues and Gaps</b>	<b>Strategic Activity</b>
3. Lack of funding for risk assessment of schools	<ul style="list-style-type: none"> <li>• Develop funding mechanism for vulnerability assessment</li> </ul>
<b>Priority Action 3: Knowledge management for building culture of safety</b>	
1. Earthquake Risk Reduction, preparedness and safety measures are not fully included in the formal education curricula at any level	<ul style="list-style-type: none"> <li>• Update educational curricula incorporating disaster safety education in relevant/ appropriate subject of each grade in next 5 years</li> </ul>
	<ul style="list-style-type: none"> <li>• Incorporate disaster safety education in to informal education system</li> </ul>
	<ul style="list-style-type: none"> <li>• Incorporate disaster safety in extracurricular activities</li> </ul>
	<ul style="list-style-type: none"> <li>• Enhance knowledge and skills on earthquake risk reduction</li> </ul>
	<ul style="list-style-type: none"> <li>• Enhance capacity in emergency preparedness and response planning in the schools</li> </ul>
2. Lack of adequate funding for DRR education	<ul style="list-style-type: none"> <li>• Allocate required funding for enhancing capacity and imparting disaster education</li> </ul>
<b>Priority Action 4: Reduce underlying earthquake risk factors</b>	
1. Vulnerability reduction is not integrated in to ongoing national program	<ul style="list-style-type: none"> <li>• Integrate school vulnerability reduction in to regular national school physical improvement program and mainstream it in to national development program within next 15 years.</li> </ul>
2. There is a lack of capacity on vulnerability reduction measures	<ul style="list-style-type: none"> <li>• Develop and implement capacity building program for designing and implementing vulnerability reduction</li> </ul>
3. Lack of funding for school vulnerability reduction	<ul style="list-style-type: none"> <li>• Manage appropriate funding mechanism for vulnerability reduction of schools</li> </ul>
<b>Priority Action 5: Enhance emergency response capability of school sector</b>	
1. Lack of mechanism of emergency response in education sector	<ul style="list-style-type: none"> <li>• Develop a mechanism for preparing to respond emergency situation such as earthquake at school and community level</li> </ul>
2. Urgent need to enhance emergency response planning and capabilities at all levels	<ul style="list-style-type: none"> <li>• Provide funding to District Education Offices and schools to enhance emergency response capabilities</li> </ul>

[Ref. NSET/GFDRR 4]

## **5. ADDRESSING OTHER CROSS-CUTTING ISSUES**

### **5.1 Environmental Consideration**

Environmental issues shall be taken care during school establishment, construction and development of other physical infrastructures. Environmental factors are internal as well as external that have significant impact on education, health and safety of the students. Internal environment such as class room size, light, ventilation, adequate drinking water, hygienically maintained toilets, circulation and emergency evacuation access and external environment such as security, fencing, gardens, play ground, are the basic recommendations for environmental protection.

### **5.2 Gender consideration**

Each school shall plan separate toilets for boys and girls. Department of Education shall allocate budget in accordance with the need of separate toilet blocks adequately compounded for secrecy. The toilet blocks shall be separated from educational blocks.

### **5.3 Disability consideration**

Schools shall provide easy access for people with all type of disability including physical, hearing, vision, and speech problem. Provisions such as ramps, hand rails, proper signage, openings, elevators, door handles, friendly water tapes, appropriate recreation facilities shall be established in all schools.

#### **5.4 Adult education**

Now adult education is taking place in to mass scale. Department of Education has been running adult education to reduce literacy rate. The education materials for adults shall also be incorporated with disaster awareness and preparedness measures. This shall also be used as an opportunity to raise awareness and enhance education on disaster safety.

### **6. IMPLEMENTATION STRATEGY**

Government of Nepal, Ministry of Education shall have the primary responsibility for the implementation and follow up of the strategic goals and priorities for action included in this Strategy. This strategy should be a part of National Strategy for DRR in education sector. There should be DRM focal point at the Ministry of Education, Department of Education and District Education Office of each District. Also the provision of disaster focal teacher in each school including institutional and religious schools shall be made for effective implementation of earthquake preparedness and risk reduction measures in education sector. There should be clear operational link and network between all DRM focal points from top to bottom that additionally include other vital stakeholders from outside the government. The Ministry of Education will be main central node of this extended networking structure, and will serve as the advisory body to assist the Department of Education to enhance the education sector approach and to monitor periodically the achievements made.

Effective implementation of this strategy can be done by adopting school seismic safety approach, with participation of all stakeholders. Vital stakeholders that can significantly contribute in supporting the implementation of school earthquake safety are the government agencies and the local governments, the civil society including volunteers and community-based organizations, the scientific communities and the private sector. Development partners and UN agencies operating in Nepal should also be drawn in the process as a key stakeholder.

The central government will have to commit necessary resources and budgets for the implementation of this Strategy by establishing a funding mechanism backed by proper legislation. The proposed Policy for School Earthquake Safety should include articles that direct the government to encourage and facilitate the NGO sector to mobilize local, national, regional and international resources, and to take up their responsibilities as stipulated in this Strategy. The government at all levels should ensure provision of financial assistance/grants to the NGOs for their programs drawn as per this NSDRM.

Human resources development conspicuously appears as one of the key areas for achieving success in the implementation of this Strategy. Ministry of Education should carry out a need analysis and develop a national program with clearly articulated targets and approaches for enhancing seismic safety in schools. Obviously, the programs for capacity development and training will have to involve all stakeholders, the central and local governments, the CBOs and NGOs, and the private sector.

Organizations, government or non-government, national or local levels, are encouraged to develop their programs for improving seismic safety of schools as spelt out in the Strategy. The Strategy could be used as a “Guide” for organizations for putting up proposals to get resources for the implementation of School Earthquake Safety Programs.

The HFA and other related international conventions emphasize providing especial support to the disadvantaged (e.g. landlocked) countries and least developed countries. Thus, Nepal is in a good position to garner such international support towards implementation of this Strategy. The success depends upon the extent Nepal respects the commitment in DRR and has made itself capable of implementing this strategy by enunciating conducive the policy, legal and institutional environments and suitable mechanisms.

The implementation will strongly depend on the extent school sector safety considerations are integrated into the education development policies, planning and programming at all levels. The international development partners should be made aware of this Strategy and encouraged to include the stipulations of this strategy into their respective Strategies for providing assistance to Nepal for educational development. It is expected that the international development partners will use the stipulations of this Strategy as a Guide for reviewing or formulating their funding decisions in schools.

The Ministry of Education shall be the agency primarily responsible for implementing the specific elements of this strategy and facilitating the implementation by other stakeholders, and monitoring the implementation of overall strategy.

## **7. EXAMPLE: IMPLEMENTATION OF MASSIVE AWARENESS RAISING**

The strategy suggested tested and proven program components for enhancing seismic safety of schools in Nepal. Developing the capacity of resource persons as trainers through the TOT and mobilizing them to train the teachers of different schools and mobilize the trained teachers to conduct training and orientation to the other teachers of their own school. This approach of training to students and teachers was tested in Kathmandu under a School Earthquake Safety Program implemented by the Department of Education and UNICEF with technical assistance from NSET during April-December 2011. NSET administered one training of trainers (TOT) course to 24 Resource Persons (RP) who in turn using the same curriculum trained 720 teachers of 360 schools by organizing 24 training programs. The trained teachers, in turn, organized earthquake awareness training /orientation programs and earthquake drills in each of the 360 schools bringing the message to 95,000 students and 3600 teachers.

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