

# Regional Earthquake Recovery Dialogue for Building Back Better



Government of Nepal



# Regional Earthquake Recovery Dialogue for Building Back Better

Organized by  
United Nations Economic and Social Commission for Asia and the Pacific,  
SAARC Disaster Management Centre and  
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**Cover Photo:** House reconstruction in Nepal, SEEDS/Aakash Vishwakarma

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## EXECUTIVE SUMMARY

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) along with SAARC Disaster Management Centre (SDMC) and the National Planning Commission (NPC), Government of Nepal organised a regional recovery dialogue for building back better after the earthquake in Nepal on 26 April 2015. The dialogue aimed for providing a road map for the recovery process after the Nepal earthquake. Disaster management experts from various organisations across the region participated in the dialogue to share their experience and best practices followed in the region after major earthquakes. Their valuable contributions, in terms of the practices followed for disaster recovery, were eye-opening and will be of great value in the reconstruction process of Nepal.

This report summarises the exchanges and outcomes from the dialogue, and also captures additional case studies from the region that were referred to, but not shared in the workshop. The report is divided in four chapters. Chapter 1 presents the lessons from Asia-Pacific for Nepal's earthquake recovery. Chapter 2 includes case studies of various earthquakes in the Asia-Pacific region. Chapter 3 includes deliberations carried out in the dialogue workshop. Chapter 4 provides a way forward for building back better in Nepal.

The summary of the outcomes encompasses the following:

- Recovery is a time-consuming process.
- Sustainability is a fundamental principle for building back better.
- Institutional arrangements need to be collaborative and incrementally evolve.
- Keep people at the centre, and focus on processes.
- Technical approaches should be detailed and context specific.
- Capacity building is a must for long term self-reliance.
- Quality and accountability are keys to a successful reconstruction programme.

A number of specific steps to be taken in the near future as a way forward are as follows:

1. A detailed risk profile study of the affected areas needs to be carried out. The technical support through APDIM and the technical assistance of the Islamic Republic of Iran will be very useful. A team of international experts may be formed, who along with counterparts in the national research and technical institutions can use the latest technology for the preparation of this risk profile.
2. Retrofitting of cultural monuments and heritage settlements is a critical need in Nepal, which requires highly sensitive technical approaches. The Islamic Republic of Iran's experience and expertise will be very valuable in this relation, and appropriate knowledge transfer mechanisms can be established for this.
3. The need for trained engineers and masons is immense in Nepal, in view of the large number of houses and other buildings to be constructed. The technical content as has evolved in Sikkim, including mason training material in Nepali language, will be a very useful starting point for Nepal in its recovery. The Sikkim Government's offer of exchange or alternatively cross-border visits and knowledge exchange is very valuable and will be of great benefit to Nepal. Sikkim also has a similar terrain, culture, language and set of issues to Nepal, making such an exchange very valuable.

4. Accountability and transparency are very important in large scale reconstruction programmes, and Nepal is very serious about establishing state-of-the-art systems for this purpose. Sikkim's experience of online real-time monitoring of housing reconstruction is very relevant in this context.
5. It was also seen from various cases that process documentation is extremely important in a reconstruction programme. The inputs of Sustainable Environment and Ecological Development Society (SEEDS), right from the early stages of needs assessment in Nepal, has been very valuable. Documentation may not seem important to many right now, but will be a very useful asset in the future when details of the experience may be forgotten. Process documentation needs to be taken up in earnest.
6. Regional networking emerges as a very important step to be taken, and MoUs can be signed among various institutions for this to be effective. The SAARC Disaster Management Centre may help in putting together such an institutional arrangement for networking to emerge as a means for a more effective reconstruction programme in Nepal.
7. First-hand experience of a number of relevant cases will be of great use to the Nepali agencies responsible for reconstruction. Exchange or cross-border visits to affected areas of the Islamic Republic of Iran, India, Pakistan and other countries that have carried out reconstruction programmes will be useful. A clear and objective oriented programme may be evolved for this, based on Nepal's specific needs.
8. Sectoral policy dialogues will be needed in Nepal; particularly on housing, education and health. Bihar's school safety campaign, as described in the workshop, emerged as a specific experience that could be beneficial in the Nepal context. In coming months, an engagement may be worked out for sharing knowledge from this and other such experiences.
9. ESCAP's position as a key knowledge hub in the region has been very valuable and instrumental in the organisation of this workshop. Such dialogues need to continue to support the very complex reconstruction programme being taken up by Nepal.

## ACRONYMS

APDIM	Asia and Pacific Centre for Disaster Information Management
BAKOSURTANAL	National Coordinating Agency for Surveys and Mapping
BSDMA	Bihar State Disaster Management Authority
CFW	Cash for Work
CSAP	Core Shelter Assistance Project
DSWD	Department of Social Welfare and Development
ERRA	Earthquake Reconstruction and Rehabilitation Authority
FRC	Federal Relief Commission
GSDMA	Gujarat State Disaster Management Authority
HFIR	Housing Foundation of Islamic Republic of Iran
HPC	High Powered Committee
IAEA	International Atomic Energy Agency
ICNR	International Conference on Nepal's Reconstruction
ICT	Information and Communication Technology
IOM	International Organisation for Migration
IRP	International Recovery Platform
ITBP	Indo-Tibetan Border Police
LGUs	Local Government Units
NAR	National Authority for Reconstruction
NCREE	National Center for Research on Earthquake Engineering
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NDRRMC	National Disaster Risk Reduction and Management Council
NFI	Non Food Items
NGOs	Non Government Organisations
NIDM	National Institute of Disaster Management
NPC	National Planning Commission
ODR	Owner Driven Reconstruction
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PMUs	Project Management Units
RFL	Restoration of Family Links
SAARC	South Asian Association for Regional Cooperation
SDMC	SAARC Disaster Management Centre
SEEDS	Sustainable Environment and Ecological Development Society
SFP	Supplementary Feeding Program
SSDMA	Sikkim State Disaster Management Authority
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USGS	United States Geological Survey

# Chapter 1

## LESSONS FROM ASIA PACIFIC FOR NEPAL'S EARTHQUAKE RECOVERY

### 1. Recovery is a time consuming process

Recovery carried out after a major disaster is a time consuming process, involving a large number of stakeholders. One of the biggest challenges is that of coordination.

Early recovery is seen as an interim process. Temporary shelters are built with the intention that these will be a stopgap arrangement, but other than two countries (Japan and Mozambique), these have invariably been found to turn into permanent houses.

The agencies responding for early recovery work in a very different mode as compared to the development agencies, and the gap in transition eventually leaves affected communities in the lurch.

### 2. Sustainability is a fundamental principle for building back better

Recovery is about development, and building back better is about sustainable development. This is specific in terms of not recreating a risk that existed earlier, and not creating any new risks.

The larger picture needs to be seen, with the various dimensions and activities ranging from plans to the implementation of various programmes coming together seamlessly.

Sikkim took the pathway of making a safe and sustainable recovery process, strengthening the position taken by the State regarding the environment, whereby Sikkim is a fully organic state.

### 3. Institutional arrangements need to be collaborative and incrementally evolve

Experience also shows that one national reconstruction authority cannot execute work at all levels, and thus appropriate authorities need to be established at province, district and local levels.

Pakistan established the Earthquake Reconstruction and Rehabilitation Authority (ERRA) after the 2005 earthquake, and is now looking back and reviewing how to merge the two authorities – ERRA and the National Disaster Management Authority (NDMA), which was established two years after ERRA.

In Pakistan's case, the Act provides powers to the NDMA to call upon the agency to respond. The authority cannot be challenged. The Act should be with a long term vision, and not merely focus on the reconstruction in the context of one disaster event. The Act has also given leverage to the NDMA to have a disaster response force. Fixing of responsibility of various stakeholders in detail is also something the Act needs to do.

In many examples the evolution of authorities has been such that the Project Management Units (PMUs) got converted into societies, and finally into authorities. Clarity is needed in terms of whether future disaster response will be the responsibility of the authority or the Ministry of Home Affairs.

Ground level recovery is a long drawn process. In nations that face recurrent disasters, the operating procedures are generally in place but are not sufficient to manage a very large scale reconstruction programme. It is best in these situations to build upon what is already present, rather than bringing in an entirely new system that may have worked in another context.

There is great value in establishing collaborative processes, bringing together diverse knowledge and experiences otherwise not available locally. In the process, your own institutions can be built and strengthened in the long run.

A National Institute of Disaster Management or a similar institution will be of use for Nepal to build long term and large scale capacity for disaster recovery and risk reduction. Towards this, initial international networking will be of great use, and memorandums of understanding with technical and academic institutions need to be undertaken, rather than establishing new capacities for all aspects. In the process, existing capacity and knowledge within institutions in Nepal and the region must be tapped into.

#### 4. Keep people at the centre, and focus on processes

People's participation is a key element requiring attention whilst setting up mechanisms, as the community is the primary stakeholder in the entire process.

Chile was studied in 2010 and two main lessons emerged for the successes in building up risk reduction capacity:

- Safe construction
- Public information and education

An owner-driven approach within the reconstruction process is a very sound principle. Owners, however, have very complex and diverse mindsets. Community level consolidation, and the role to be played by community leaders is crucial and needs to be put in place in the early days.

Mobilisation, incentivisation and convergence of packages, for example of livelihoods and house construction, can be of use. Pakistan constructed 11 centres in the affected areas that acted as hubs for this purpose.

Iran has rebuilt over 1.3 million houses, and the process has involved the learning from past experience. Besides the physical aspects of reconstruction; social, economic and environmental aspects require significant attention right from the beginning. This needs to be engrained in the process from visioning to the creation of action plans.

The level of reconstruction in disaster damaged areas is dependent on the potential and current capacities. Ambitious goals will usually not ensure success. Recovery projects should be seen as opportunities for development. Local capacities should be the backbone for this process.

The ends have to be given priority and are visible targets of recovery and reconstruction programmes, yet the means remain important and processes are key to the success of such programmes.

Documentation of the process was carried out in detail in Bam, and proved to be a very useful exercise for managing subsequent phases and for building in risk reduction and preparedness measures for the future.

Owner Driven Reconstruction, however, has its own challenges:

1. Owner Driven Reconstruction (ODR) demands more from governments than being contractor/donor driven.
2. Not all owners have the capacity to undertake reconstruction on their own.
3. Control of material cost is critical – address inflation.
4. An information and education campaign is critical.
5. Technical guidance and a quality audit is critical for ODR.
6. Without enabling mechanisms, ODR will reinforce pre-disaster pattern of vulnerability.
7. Livelihood rehabilitation should not be asset-centric.
8. Setting up an extraordinary mechanism is necessary, but should have a clear mandate.
9. Non-involvement of beneficiaries in reconstruction by NGOs, non-adherence to quality and a lack of accountability.
10. Careful selection of NGOs is needed, and they should have an exit policy.
11. Funding from institutional lenders and banks involves complex contract management, which often leads to cost and time over runs.

## 5. Technical approaches to be detailed and context-specific

Urban and rural plans require different approaches, and should be based fundamentally on the realization of development plans.

Construction orders should be detailed in terms of architectural rules, designs, quality control and compliance with codes.

Supervision in such large and complex situations needs to be established as a networked activity.

Specific lessons from Bam:

1. Affected area reconstruction should be considered first as a social subject.
2. Planning of reconstruction should be based on principles of justice.
3. Reconstruction of buildings should be based on local capacities.
4. The reconstruction process should lead to enabling of people to continue their activities.

Sikkim adopted a ‘build back better’ approach, wherein 3000 masons and 300 engineers were trained after the earthquake, and the trained masons and engineers are also now available for deployment in Nepal. Risk reduction and community-based approach were central to the programme.

Disasters provide an opportunity to carry out a widespread programme on safety, that goes beyond the structures damaged and families affected. Nepal should fully utilize the present opportunity to address multi-hazard and country-wide issues that may be faced in the future.

Bihar has already been working on revision and dissemination of building codes. As part of the initiative, an earthquake safety clinic has been set up at the National Institute of Technology at Patna through BSDMA funding, and is operated by student volunteers.

It must be noted that there are also some significant dilemmas of recovery. Three such dilemmas are:

- Speed versus quality
- Speed versus participation
- Speed versus accountability

Sikkim has also developed mason training material in the Nepali language, which is also available for use in Nepal.

One of the key elements of the Bam reconstruction programme in the Islamic Republic of Iran was a technical services and material exhibition complex.

## 6. Capacity building is a must for long term self reliance

Capacity building needs to be taken up in a comprehensively planned manner – if masons are to be trained, the training should be part of a large scheme of things with sensitization of decision makers, awareness amongst home owners, training of engineers, and the inclusion of electricians, carpenters, fabricators and plumbers along with masons to make it a comprehensive programme for training construction workers.

## 7. Quality and accountability are the keys to a successful reconstruction programme

In post-earthquake reconstruction Sikkim, features included software based monitoring, wherein the progress of each house can be reviewed through an online system from anywhere.

Accountability and transparency are critical for smooth implementation of a programme. Due to online and fully transparent systems, there was not a single court case during the Sikkim reconstruction.

### Some issues to be borne in mind:

1. How to ensure compliance? In Gujarat, there was no option but to withhold the third instalment to force retrofitting
2. How to ensure real participation? What is the lowest level of the identifiable last unit?
3. How to ensure accountability of external agencies to take part in reconstruction? Can't be very strict, can't be very lax.
4. How to institutionalize the initiatives?
5. Mechanisms for enforcement
6. Problems with tenants – legal and illegal tenants
7. Assistance to commercial establishments; particularly rented commercial establishments
8. Political pressure to disburse money early – formulation of policies and guidelines may take some time
9. Livelihood rehabilitation generally gets neglected as the focus of reconstruction remains the reconstruction of the physical environment

### Case Study 01: Japan Earthquake and Tsunami on 11 March 2011



<http://static2.stuff.co.nz/1299899194/872/4761872.jpg>



#### About

A massive 9.0-magnitude earthquake struck Japan on Friday afternoon of 11 March 2011 at 05:46 GMT. The quake was centred 130 kilometres to the east of the prefecture's capital, Sendai. It was originally reported to be at a magnitude of 7.9, but was later upgraded to 8.9 and then to a 9.0. It lasted for six minutes making it the fifth largest recorded worldwide quake since 1900, according to the US Geological Service, larger than the 7.9-magnitude Great Kanto Earthquake that devastated Tokyo in 1923 or the 6.8 magnitude quake that hit Kobe in 1995. It had 10,000 times more energy than the 6.3 magnitude earthquake in Christchurch, New Zealand, which struck 17 days earlier.

#### Impact

Japan was largely prepared for the earthquake and many buildings remained standing afterwards, but it was not prepared for the subsequent tsunami. A tsunami warning extended to at least 50 nations and territories as far away as South America. Damage was caused in Tokyo and a lot of destruction in the north where the quake was centred. The Yen fell sharply, but recouped most of its decline several hours later.

A tsunami measuring between one meter to 7.3 meters hit at various places along the coast, while a 10-meter tsunami was seen at the port in Sendai near the epicentre. Aftershocks continued, with one having a magnitude of 7.1, according to the USGS. Tall buildings swayed violently in central Tokyo as the aftershocks hit. Immediate power outages in Tokyo and eight other prefectures reportedly affected some 4 million homes.

In Iwate Prefecture, a bridge collapsed and a building was washed away, with boats and cars swirling around in the rising waters. Tokyo's major airports halted flights, though Haneda Airport was later reported to have reopened several runways. All trains in the Tokyo area were halted and the Shinkansen bullet train service was suspended.

Two nuclear plants on the Pacific coast in Fukushima were automatically shut down. At Fukushima, the subsequent tsunami disabled emergency generators required to cool the reactors. Over the following three weeks, there was evidence of a partial nuclear meltdown in units 1, 2 and 3; visible explosions, suspected to be caused by hydrogen gas, in units 1 and 3; a suspected explosion in unit

2, that may have damaged the primary containment vessel; and a possible uncovering of the units 1, 3 and 4 spent fuel pools. Radiation releases caused large evacuations, concern over food and water supplies, and treatment of nuclear workers. The International Atomic Energy Agency rated the events at level 7, the same as Chernobyl, and the highest on the scale – meaning that there was a major release of radioactive material with widespread health and environmental effects.

The situation was further compounded by numerous aftershocks. About 2,000 people were confirmed dead, 2000 people injured, 530,000 people displaced staying in 2,500 evacuation centres, such as schools and public halls. There were 4,700 destroyed houses, 50,000 damaged houses, 582 roads were cut off, and 32 bridges destroyed.

## Response

The following steps were taken in response after the earthquake:

- A tsunami warning was issued three minutes after the earthquake.
- Prime Minister Naoto Kan, who convened an emergency Cabinet meeting, urged the nation to be calm and said the Government will do its utmost to minimize damage from the quake. He told a news conference that a large amount of damage had occurred in the northern region of Tohoku.
- A Meteorological Agency official appeared on TV urging those affected by the quake not to return home because of possible tsunamis. “In some areas we have issued a warning of tsunamis of higher than 10 meters and we expect these areas will experience the high water levels soon,” said the official. “Please stay on high alert.”
- The Governor of Miyagi Prefecture asked for Japanese military forces to be sent in to help.
- The Defence Ministry was sending eight fighter jets to check the damage, the agency said.
- The Government set up a task force at the Prime Minister’s Office. The Bank of Japan (BOJ) set up a disaster control team, headed by BOJ Governor Masaaki Shirakawa, to assess the impact of the earthquake on financial markets as well as on financial institutions’ business operations.
- In response, 91 countries have offered aid, from blankets and food to search dogs and military transport.
- The Japanese Government is amongst the best prepared in the world for disasters and has so far only made specific requests for help, such as calling for search and rescue teams.
- Several charities, including Save the Children UK, British Red Cross and World Vision UK, asked for donations.
- A British rescue team arrived in Japan to join the search for survivors of the earthquake and tsunami.
- Fifty-nine search and rescue experts, four medics and two sniffer dogs flew out on a private charter plane with 11 tonnes of equipment on board.
- Modern innovations, such as Twitter, were bringing updates on the situation far earlier than the media.

## Key Learnings

- Building public trust and confidence in the government’s ability to respond adequately to large-scale disasters reinforces the government’s actual ability to handle disasters.
- Energy security should be well planned and secured by forming and standardizing a “culture of safety” for science and technology.
- International engagements should be developed for sharing learning.

## Information Sources

- <http://joeblakey.com/geography/case-study-japan-earthquake-tsunami-110311/>
- <http://www2.jiia.or.jp/en/pdf/kouenkai/2011/110616e-cronin.pdf>

## Case Study 02: Gujarat Earthquake, India on 26<sup>th</sup> January 2001



[http://3.bp.blogspot.com/-wQVD6eYJMPI/Up-QgcsLF8I/AAAAAAAAADgI/32EejR7g\\_lw/s1600/Village-destruction-.jpg](http://3.bp.blogspot.com/-wQVD6eYJMPI/Up-QgcsLF8I/AAAAAAAAADgI/32EejR7g_lw/s1600/Village-destruction-.jpg)



### About

A powerful earthquake of magnitude 6.9 on Richter-Scale rocked the Western Indian State of Gujarat on the 26<sup>th</sup> of January, 2001. It caused extensive damage to life & property. This earthquake was so devastating in its scale and suffering that the likes of it had not been experienced in the past 50 years. The earthquake left thousands seriously injured, bruised and handicapped; both physically, psychologically and economically.

The epicenter of the quake was located at 23.6 north Latitude and 69.8 east Longitude, about 20 km Northeast of Bhuj Town of the Kutch district in Western Gujarat. At a depth of only 23 km below surface this quake generated intense shaking which was felt in 70% region of India and far beyond in neighbouring Pakistan and Nepal too. This was followed by intense aftershocks that became a continued source of anxiety for the populace.

The seismicity of the affected area of Kutch is a known fact with a high incidence of earthquakes in recent times and in historical past. It falls in Seismic Zone V. The only such zone outside the Himalayan Seismic Belt.

### Impact

The earthquake caused extensive loss of life and property. Over 20,000 persons were reported dead and about 1.7 lakh injured. Its depth of focus was relatively shallow, just 15 km below the earth surface.

Twenty-one of the total 25 districts of the state were affected in this quake. Around 18 towns, 182 *talukas* (a sub-district level administrative unit in India) and 7904 villages in the affected districts have seen large-scale devastation. The affected areas even spread up to 300 km from the epicentre. The rural areas in the region were also very badly affected with over 450 villages almost totally destroyed.

### Response

The post disaster response measures were divided into three categories:

#### Immediate measures:

- Evacuation to safer places
- Emergency shelter
- Search and Rescue
- Provision of food and water
- Military assistance
- Restoring communication

- Medical assistance
- Relief disbursement
- Epidemiological surveillance
- Debris clearance

**Short term measures:**

- Damage Assessment
- Re-establishment of communities network and contact with remote areas
- Financial assistance to the damage and loss caused

**Long term measures:**

- Effective warning signals
- Precautionary measures
- Construction of safely structured buildings
- Follow building regulations
- Public education and awareness

The State Government immediately conceptualized a comprehensive rehabilitation and reconstruction programme which addressed all important concerns that arose from the earthquake starting from immediate relief, economic rehabilitation, livelihood restoration as well as long term capacity building of all stakeholders to fight future disasters.

The Government prepared the Gujarat Earthquake Reconstruction and Rehabilitation Policy which encompasses all measures and institutional initiatives taken by the Government in the earthquake affected areas. The Policy represented a framework of entitlements and a prospectus of development which reflected the vision of a successful reconstruction and rehabilitation plan.

**Key Learnings**

- Fast roll out of actions led to early fulfilment of needs and further reduced damages.
- Preparation of policies and assigning clear responsibilities made the response initiatives easy to implement.
- Various packages for housing were issued based on detailed disaggregated assessment, thereby meeting the needs of people.

**Information Sources**

- <http://saarc-sdmc.nic.in/pdf/Earthquake3.pdf>
- <http://www.crisp.nus.edu.sg/~acrs2001/pdf/138gupta.pdf>
- [http://www.adrc.asia/publications/recovery\\_reports/pdf/Gujarat.pdf](http://www.adrc.asia/publications/recovery_reports/pdf/Gujarat.pdf)
- <http://www.gsdma.org/policies-acts/gujarat-earthquake.aspx>

## Case Study 03: Bam Earthquake, Iran on 26 December 2003



<http://www.cais-soas.com/CAIS/Images2/Parthian/Bam/bam10a.jpg>



### About

Bam, the ancient historic city in Iran, was hit by an earthquake measuring 6.6 on the Richter scale on December 26th, 2003 resulting in the death of over 43,000 people and leaving over 60,000 people homeless. Many of the mud-brick buildings in Bam collapsed resulting in the high loss of life. The mud-brick disintegrates easily into rubble, making rescue difficult and hopes of survival low. The survivors had not only lost friends and family, but their homes and everything else they had. Many were left destitute on the streets, some forced to spend the cold nights wrapped in blankets; whilst some were given tents, others made use of any shelter they could find. About 90% of the buildings in the ancient citadel was completely destroyed.

### Impact

- 70% of buildings in Bam destroyed
- 26,200 dead which covers more than half of the population
- 500 people still missing 3 months after the quake
- Citadel of Bam reduced to rubble
- More than thousand left homeless
- The earthquake happened in early morning hours which led to high death toll (either sleeping or going to morning prayer)
- Most buildings in Bam are not earthquake proof as they were built in traditional mud-brick style
- Lack of good building materials caused more destruction. Due to demand, bricks in kiln are not fired for full 28 days
- Two of the cities hospitals collapsed, crushing many of the staff
- Fifty percent of Bam's health workers were killed
- The injured could not be treated quickly, thus increasing the death toll
- Tremors cut electricity and water supplies as well as phone services

## Response

### Short-Term Response

- 40 countries sent aid
- Emergency centres and tents were set up for the homeless
- Water had to be brought in by tankers
- Temporary toilets were set up

### Long-Term Response

- Regular water and food supply set up by the United Nations (After 1 month)
- £543 million reconstruction cost
- £18 million needed to restore health service (WHO)
- Two weeks after the earthquake education system began to restore

### Key Learnings

- Community engagement should be enhanced by improved public awareness methods.
- Medical services should be developed and trained for emergency services.
- Unengineered construction practices are very susceptible to earthquake damage. Appropriate construction materials, designs and workmanship should be developed for safe construction.
- Restoration and retrofitting of heritage structures with attention to softer components should be carried out strategically to promote eco-tourism

### Information Sources

- [https://getrevising.co.uk/resources/bam\\_earthquake\\_case\\_study](https://getrevising.co.uk/resources/bam_earthquake_case_study)
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- <http://www.ncbi.nlm.nih.gov/pubmed/16892878>
- [http://www.iitk.ac.in/nicee/wcee/article/14\\_01-1035.PDF](http://www.iitk.ac.in/nicee/wcee/article/14_01-1035.PDF)

## Case Study 04: Pakistan Earthquake on 8 October 2005



<http://en.tengrinews.kz/userdata/RTR191N9.jpg>



### About

On October 8, 2005, at 8:50 a.m. local time, a magnitude Mw 7.6 earthquake struck the Himalayan region of northern Pakistan and Kashmir. The earthquake epicenter was located approximately 19 km northeast of the city of Muzaffarabad, the capital of the Pakistani-administered part of Kashmir, known as Azad Jammu Kashmir (AJK).

### Impact

The Pakistani Government's official death toll as of November 2005 stood at 87,350, although it is estimated that the death toll could reach over 100,000. Approximately 138,000 were injured and over 3.5 million rendered homeless. According to government figures, 19,000 children died in the earthquake, most of them in widespread collapses of school buildings. The earthquake affected more than 500,000 families. In addition, approximately 250,000 farm animals died due to collapse of stone barns, and more than 500,000 large animals required immediate shelter from the harsh winter.

It is estimated that more than 780,000 buildings were either destroyed or damaged beyond repair, and many more were rendered unusable for extended periods of time. Out of these, approximately 17,000 school buildings and most major hospitals close to the epicenter were destroyed or severely damaged. Lifelines were adversely affected, especially the numerous vital roads and highways that were closed by landslides and bridge failures. Several areas remained cut off via land routes even three months after the main event. Power, water supply, and telecommunication services were down for varying lengths of time, although in most areas services were restored within a few weeks.

Massive landslides was a particular feature of this event. A very dense, high-frequency band of landslides was triggered along the fault rupture trace in the mid-slope areas; however, it quickly dissipated with distance away from the fault rupture zone. Almost all landslides were shallow, disaggregated slides, with two of them larger than 0.1 km<sup>2</sup>. Due to the generally arid landscape, liquefaction was not observed or reported by others.

### Response

The earthquake affected a population of approximately 3.5 million people either directly or indirectly. The early days of the disaster response were marked by uncoordinated efforts among a whole host of organizations involved in relief work. There was little information on who was doing what and little oversight. A coordinating structure was later created by the government under the

Federal Relief Commission (FRC) and the ERRA (Earthquake Relief and Rehabilitation Authority) to coordinate activities with other international agencies and NGOs.

Shelter strategy was organized around three populations: people who lived in houses in the lower elevations, people living in higher elevations who could come to the lower elevations, and people living in inaccessible snowline areas (5,000-7,000 feet). Survivors were taught to build transitional shelter using material from retrieved debris, reinforced with locally available materials such as timber and hay in addition to the corrugated galvanized iron (CGI) sheets provided to them. The government created an incentive for people to use their own materials by giving free CGI sheets to people who use half of their own material.

Debris clearance has been slow because much of the heavy equipment has been tied up in road clearance and repair. Other sensitivities regarding debris removal included bodies and people's possessions. Debris from chemical warehouses, hospitals, and pesticide storage areas was a significant cause of environmental concern.

The earthquake destroyed 782 health institutions, so the area was nearly devoid of any type of health facility after the earthquake. Despite the base and field hospitals that worked around the clock, it was difficult to get the right kind of medical teams and equipment to the affected areas due to the difficult terrain. Instructions on hygiene were published to create awareness among the people in relief camps.

A long-term project for reconstruction and rehabilitation was set up. It was estimated that approximately 400,000 houses will be reconstructed by the government. Organizations interested in constructing houses were mandated to follow the standards and procedures set forth and coordinated by the Earthquake Reconstruction and Rehabilitation Authority (ERRA).

### Key Learnings

- Setting up an overall authority helps in monitored reconstruction process.
- A disaster management plan leads to a structured and coordinated response.
- A specialised team of first responders can save many lives.
- Strategic community engagement ensures effective implementation.

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## Case Study 05: Sichuan Earthquake, China on 12 May 2008



[http://dgeneratefilms.com/wp-content/uploads/1428\\_stills06.jpg](http://dgeneratefilms.com/wp-content/uploads/1428_stills06.jpg)



### About

On 12 May 2008, a massive earthquake measuring 7.9 on the Richter scale struck Sichuan Province's Wenchuan County in China. More than 120 million people in Sichuan and the adjoining provinces of Gansu, Shaanxi, Yunnan, and Chongqing were exposed to the moderate and severe shaking effects of the earthquake.

### Impact

The Wenchuan earthquake left 88,000 people dead or missing and nearly 400,000 injured. The earthquake damaged or destroyed millions of homes, leaving five million people homeless. The earthquake also caused extensive damage to basic infrastructure, including schools, hospitals, roads, and water systems.

On 30 August 2008, a second earthquake measuring 6.1 on the Richter scale struck Sichuan and Yunnan Provinces, leaving dozens dead and hundreds injured. This earthquake struck near the same fault line as the Wenchuan earthquake, but was located further south, with its epicentre in southernmost Sichuan's Panzhihua City.

### Response

The response to the earthquake was provided predominantly by the Chinese Government. Although the government invited international humanitarian assistance, few international NGOs engaged directly in emergency response. According to the Government, despite the extent of the devastation, disease outbreaks were avoided, populations in danger from subsequent flooding or landslides were safely relocated, medical services were generally restored rapidly and a return to the baseline mortality rate was achieved relatively quickly.

The direct provision of aid by the Chinese military was a key element in the emergency response phase. Officials reported that, within 14 minutes of the earthquake, the central government had dispatched the People's Liberation Army (PLA) to the affected areas, and within days 113,000 soldiers and armed police had been mobilised. Of the nine Government working groups set up for the relief effort, six were supported by the military.

Mitigation strategies included an immediate emphasis on controlling infectious disease through widespread medical care and surveillance, the provision of tents for shelter (albeit insufficient in number at the outset and eventually upgraded to temporary, prefabricated structures), maintenance of security and the rule of law through substantial police and military deployments,

traffic and supply-chain management at the regional and local level, as well as the triage of patients, the deployment of qualified volunteers and the efficient management of in-kind donations.

Additionally, the movement of people was strictly regulated in the affected areas. For months, police and military roadblocks prevented non-essential personnel from entering the disaster zone. These sensitivity largely succeeded in saving lives and reducing the secondary disasters of disease, flooding and damage from strong aftershocks; however, these results came at the expense of personal liberties, access to affected areas and, in some cases, the unquestioned acceptance of sub-standard living conditions.

A coordinated response was achieved through the sensitivities, and decisions followed the chain of command from national to provincial and down to the prefecture and county levels. Unlike the direction eventually chosen by the Government of Pakistan following the 2005 earthquake, the Chinese authorities did not immediately establish a parallel relief agency. Instead, relief activities were partitioned along the lines of the cluster approach, with the formation of working groups roughly corresponding with government agencies – an important approach for ongoing coherence in policy and practice.

Another partnership strategy used in the aftermath of the earthquake which may prove a model for long-term recovery was the ‘twinning’ of several badly affected counties and cities with other Chinese provinces and municipalities. These partnerships aimed to assist affected areas with resources, personnel and moral support for recovery. Teams of doctors, public health professionals and sanitation and disease control experts were immediately dispatched to the affected partner county; a reported 1–3% of the annual gross domestic product of sponsor provinces was pledged towards long-term recovery efforts in the affected county for at least three years. The state-led response focused on efficiency in providing resources and services to the largest number of people possible.

### Key Learnings

- Setting up of clear criteria and appropriate restrictions leads to efficient use of resources.
- Maintaining transparency in all the efforts develops less confusion.
- Shared learning and development helps in fast and organised recovery process.

### Information Sources

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## Case Study 06: Sikkim Earthquake on 18 September 2011



<https://cf2.100r.org/media/2014/02/government-diverts-earthquake-recovery-money-in-northeast-india/India-Earthquake-2.jpg>



### About

An Mw 6.9 earthquake struck near the Nepal-Sikkim border on September 18 2011, at 18:10 local time. The earthquake triggered a large number of landslides and caused significant damage to buildings and infrastructure. Sikkim was the most affected state of India, followed by West Bengal and Bihar. Neighbouring countries of Nepal, Bhutan, Tibet (China) and Bangladesh sustained damage and losses to varying extents. The earthquake was followed by a series of aftershocks, two of which were Mw 4.5 and Mw 5.0, and hit within 75 minutes of the epicentre.

### Impact

Landslides, rock falls, and mudslides were responsible for most loss of life and damage to infrastructure, as well as the associated economic losses. There was also extensive loss of Buddhist monasteries and temples; these heritage structures are built in random rubble masonry with mud mortar. Most multi-story reinforced concrete (RC) buildings were unengineered and sustained considerable damage due to the earth shaking; a small number of these collapsed or suffered irreparable structural damage. Poor performance and widespread damage are of concern in important government buildings, such as the secretariat, police headquarters and legislative assembly, perhaps some of the few engineered buildings in Gangtok. The total loss of life in India is reported to be 78, 60 in Sikkim, and the rest in West Bengal and Bihar. The total loss was estimated at around US \$500 million.

### Response

During the main tremors, which lasted between 40 to 45 seconds, most people were in their houses as darkness had set in. The army units and the ITBP battalions located in Sikkim who were themselves affected, were the first to respond on their own, for search and rescue, first aid, and for providing immediate relief. By this time, the crucial “golden hour” had long elapsed when precious lives could have been saved had the Government of Sikkim responded by requesting help from local uniformed forces stationed in the state immediately after the main tremors.

The National Disaster Management Authority (NDMA) of India responded by sending 10 National Disaster Response Force (NDRF) self-contained teams (five from Greater Noida and five from Kolkata) by air to Bagdogra in special planes. The roadblocks due to the landslide were cleared by the Border Roads Organisation. The restoration of over 370 landslides along arterial roads was undertaken. Slope stabilisation was carried out in places of landslides.

The local community, consisting of young men and women who formed volunteer teams and helped in search and rescue, guided the first responders from outside the state and also helped in the cremation of the dead. They also managed the make-shift relief camps for those community members whose houses had either been destroyed, developed cracks, or had been declared unsafe to live in.

Local and national NGOs came forward for providing assistance. They set up an Inter-Agency Group under the umbrella of Sphere India and in coordination with the East District of Sikkim, distributed relief stores like dry food items, blankets, tents, utensils, and drinking water in the affected villages and towns. They also made a rapid assessment of the funds needed for rehabilitation, for livelihood restoration, and reconstruction.

### Key Learnings

- Trained personnel are required for engineered construction including local masons.
- Formalisation of traditional building practices supported with insurance schemes encourages “build back better”.
- Post disaster needs assessments give clear understanding of loss and how the available resources should be deployed in an efficient manner to benefit all at the grass root level.
- Restoring and securing lifelines including roads, bridges, etc. provides easy access to remote areas.

### Information Sources

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## Case Study 07: Chi Chi Earthquake, Taiwan on 21 September 1999



<http://www.bssaonline.org/content/101/3/1199/F10.large.jpg>



### About

At 1:47 am on September 21 1999, the island of Taiwan, located off the south-eastern coast of mainland China, was shaken by a 7.6-magnitude earthquake. Its epicenter was located in Nantou County in central Taiwan, but serious damage occurred across the island. It was the worst earthquake to hit Taiwan—where quakes are common due to its location in a seismically active zone of the Pacific basin—since a 1935 tremor that killed more than 3,200 people.

### Impact

More than 2,400 people were killed, while more than 11,000 others were injured and thousands of buildings were destroyed or damaged. Roads buckled, bridges collapsed and landslides diverted rivers, causing the impromptu formation of lakes. There was not enough freezer capacity in the country's morgues to hold all the bodies.

Buildings all over the island proved to be vulnerable. Several tall buildings in Taiwan's capital city, Taipei, located 90 miles north of the quake's epicentre toppled. The quake exposed the fact that shoddy construction had occurred during Taiwan's building boom in the 1990s. Tent cities popped up in fields and parks because many people were afraid of being in buildings while aftershocks continued. Overall, the disaster (which became locally known as the 921 earthquake, because it occurred on September 21) caused billions of dollars in economic losses.

### Response

At the national level, the government responded well. It was certainly not possible to satisfy all those affected by the earthquake. However, the lack in response stemmed from the lack of preparedness rather than the lack of emergency action. By September 28, there were 17 major policies implemented, including hotlines, information and health centers, temporary housing, disaster relief funds and materials, and others.

However, a lack of earthquake disaster preparedness at both the national and local levels was evident. In recent decades, the professional communities and the Government in Taiwan have made significant progress to mitigate earthquake hazards by, for example, funding the Strong Motion Instrumentation Programmes at the Central Weather Bureau of the Ministry of Transportation and Communication, and funding earthquake and earthquake engineering research projects by the National Science Council including the establishment of NCEE.

The Ministry of the Interior and the various structural engineering professional organizations have also been active in updating building codes, and the Ministry of Education has been investing in human resources development and earthquake engineering facilities at universities. Additionally, a National Science and Technology Programme for hazard mitigation was established several years ago to coordinate the development of national hazard mitigation strategies.

All these efforts have been carried out by many talented researchers and administrators. The researchers were pooled in for carrying out assessments and developing relevant solutions for addressing the issues.

Infrastructure development was taken on priority for income generation of people. The electrical and electronics industry were set up. Tourism prospects were also developed during the reconstruction process which supported the theme of “building back better.”

### Learnings

- Establishment of relevant policies streamlines the process of recovery.
- Allocating clear responsibilities for different hierarchy of agencies reduces overlap in implementing.
- Investment in knowledge generation leads to in-depth understanding of issues and development of need-based solutions.
- Developing growth engines keeps the economy running.
- Exploring additional development options along the process of recovery encourages sustainable development.

### Information Sources

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- <https://mceer.buffalo.edu/research/Reconnaissance/taiwan9-21-99/docs/lessons.asp>

## Case Study 08: Padang Earthquake, Indonesia on 30 September 2009



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[http://i.dailymail.co.uk/i/pix/2009/10/01/article-1217020-06A6F6DB000005DC-648\\_634x422.jpg](http://i.dailymail.co.uk/i/pix/2009/10/01/article-1217020-06A6F6DB000005DC-648_634x422.jpg)



### About

On Wednesday September 30 2009, at 5:16 pm, an Mw 7.6 earthquake struck the west coast of Sumatra, affecting an area with a population of about 1.2 million people, including 900,000 in Padang and 80,000 in Pariaman. Padang is the capital of West Sumatra, situated on the coast of the Indian Ocean between the Sumatra fault and the Sunda Trench fault.

### Impact

The earthquake caused 1,195 deaths and significant damage to about 140,000 houses and 4,000 other buildings. The casualties (383 deaths, 431 serious injuries) in Padang were mostly due to building damage and collapse. These numbers would likely have been higher had the earthquake struck earlier, when schools and offices were in session.

Landslides in the outlying rural mountain areas buried several villages, damaged roads, and caused over 600 deaths. That the earthquake did little damage to roads and bridges in and around Padang facilitated the restoration of power, communications and infrastructure to most regions within a week.

### Response

The national and international humanitarian actors supported the response activities by:

- supporting the restoration of family links (RFL) through communication networks;
- mobilizing volunteers to support distribution of non-food items (NFI), provide medical care and SAR operations;
- dispatching medical personnel including orthopaedic surgeons, general practitioners, nurses and psychologists;
- providing logistical support and transportation;
- providing NFIs and food, medicine and clothing;
- providing post-traumatic counselling; and
- providing temporary shelter.

The National Coordinating Agency for Surveys and Mapping (BAKOSURTANAL) of Indonesia had a quick response to this disaster. BAKOSURTANAL along with other government agencies and private sectors agreed to supply geospatial data and information to be utilized in Padang. The three maps needed for decision making—the Disaster Prone Areas Map, the Emergency Quick Response Map

and the Rehabilitation and Reconstruction map—were prepared and shared with the Government on an urgent basis. This helped Government take decisions swiftly.

### Key Learnings

- Establishment of communication networks for sending targeted messages to communities delivers relevant information as required.
- Analysis of geospatial data and related information gives a clear understanding of scenarios and thereby makes it easy for decision makers to respond.

### Information Sources

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## Case Study 09: Bohol earthquake, Philippines on 15 October 2013



[http://newsinfo.inquirer.net/files/2013/10/Philippines-Earthquak\\_Inte3.jpg](http://newsinfo.inquirer.net/files/2013/10/Philippines-Earthquak_Inte3.jpg)



### About

On October 15 2013, an earthquake of 7.2 magnitude was recorded in the island province of Bohol, Philippines. According to the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the epicentre of the tectonic earthquake was in the municipality of Sagbayan. An earthquake of intensity VII was recorded in Bohol and nearby cities in the adjacent Cebu Province.

### Impact

Municipalities in northwest Bohol were the hardest hit. At least 2,500 aftershocks were recorded since the first powerful earthquake, with 64 tremors strong enough to be felt. A total of 195 people died, 651 were injured, and 12 were missing. The majority of casualties were reported in Bohol, according to the National Disaster Risk Reduction and Management Council (NDRRMC). Nevertheless, the earthquake caused landslides and extensive damage to housing, hospitals, schools, infrastructure and utilities; with more than 53,300 houses severely damaged or destroyed.

### Response

The Department of Social Welfare and Development (DSWD), together with international and local humanitarian organizations, NGOs and the affected local government units (LGUs) immediately conducted disaster and relief operations to help the affected and displaced populace.

These included continuing food support distributed to the 17 hardest-hit municipalities. Livelihood support in the form of Cash-for-Work (CFW) was also provided to the earthquake survivors in exchange for their services or involvement in the rehabilitation efforts in the communities. The CFW programme was part of DSWD's early recovery efforts so the families affected by disasters would soon return to normal life.

The health and nutrition of children in disaster areas were also addressed through the Supplementary Feeding Program (SFP). A total of 12,251 children in the 17 municipalities benefited from the SFP.

The Core Shelter Assistance Project (CSAP) provided environment-friendly, structurally strong shelter units built on-site that can withstand up to 220 kph wind velocity, at least intensity 4 earthquakes and other natural disasters. The DSWD, Habitat for Humanity and local chief executives of the 17

hardest hit municipalities signed a Memorandum of Agreement (MoA) on February 9 2014. Costing 88,000 Philippine Pesos, each unit is made of locally available materials to revitalize local economy. Each family beneficiary received shelter kits worth 10,000 Philippine Pesos and were given an option to choose from three construction kit options, namely; the Timber Kit with Amakan (woven bamboo wall), the Masonry Kit, and the Galvanized Iron Roof/Repair Kit.

### Key Learnings

- Community engagement is essential to keep the focus on the people during the recovery process.
- Ensuring monetary benefits to the people through schemes like cash for work increases livelihood security.

### Information Sources

- <http://www.unocha.org/cap/appeals/philippines-bohol-earthquake-action-plan-october-2013>
- <http://www.dswd.gov.ph/2014/04/response-and-early-recovery-updates-bohol-earthquake/>
- <http://www.gov.ph/crisis-response/updates-cebu-and-bohol-earthquake/>

## Case Study 10: Indian Ocean Tsunami on 26 December 2004



<http://cdn.phys.org/newman/gfx/news/hires/2011/tsunami.jpg>



### About

The earthquake that caused the tsunami struck on December 26 2004. The earthquake was caused by the subduction of the Indo-Australian plate (oceanic) under the Eurasian plate (continental) 240 km off the coast of Indonesia. This mega-thrust earthquake involved a 20 m uplift of the sea floor all the way along a fault line which was over 1000 km in length. The uplift of the sea floor caused a displacement of billions of tonnes of water setting in motion a tsunami wave which hit the coast of Indonesia within half an hour of the earthquake.

### Impact

The wave killed people in 14 different countries around the Indian Ocean totalling over 250,000 lives lost. The highest death toll was on the Indonesian island of Sumatra where over 130,000 were killed and over 30,000 remain missing. In Sumatra over 500,000 people were made homeless, over 80,000 houses were destroyed, as well as serious damage to any ports, boats, roads, bridges, hospitals, forests and crops within 1 km of the shore. Eight people were killed in South Africa which is over 8000 km from the epicentre and over 8000 tourists from Australia, Europe and America were also killed. In Sri Lanka, a train was derailed by the force of the wave killing over 1000 people.

Diseases such as cholera and dysentery spread due to the lack of clean water and sanitation in the refugee camps, killing an estimated 150,000. Incomes were lost due to the destruction of fishing boats and damage to the ocean bed. Loss of foreign income from tourism was significant in Thailand. There were emotional and psychological impacts on the survivors and aid workers. Land disputes broke out as documents were lost in the devastation and in some cases land was destroyed by erosion from the wave.

### Response

#### Short term responses:

- Bodies were buried in mass graves to help prevent the spread of diseases.
- Over US\$7 billion was provided by governments and NGOs (charities) in the aid effort and to help with reconstruction.
- Up to 5 million people had to be relocated to temporary refugee camps and had to be provided with shelter, food and water.
- It took months to simply clear the debris before rebuilding could start again.

**Long term responses:**

- The Indonesian Government decided to relocate people from the refugee camps straight into new homes. The building of these new homes took a lot longer than expected due to the lack of building materials and destruction of main transport routes.
- An tsunami early warning system has now been installed in the Indian Ocean at a cost of US\$20 million

**Key Learnings**

- Public awareness is an integral part of the recovery process. This should be embedded in the school education system.
- Effective early warning systems save precious lives.
- Along with government institutional arrangements, strong operational links with NGOs and other organisations makes ground activities more convenient and accepted.

**Information Sources**

- <https://cnnd.crawford.anu.edu.au/acde/publications/publish/papers/wp2005/wp-econ-2005-05.pdf>
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### Agenda Item 1: Opening of the dialogue

The session started with recognition of the fact that the Asia-Pacific region is the world's most disaster prone region, and within this South Asia is very frequently hit by devastating events including Himalayan earthquakes. Nepal's vulnerability to frequent earthquakes, flash floods, landslides, avalanches and glacial lake based floods makes the current recovery and reconstruction programme one that must build in resilience to future disasters.

It was also highlighted that there are similarities in contexts across a number of Asian countries, and cross-learning and knowledge transfer amongst neighbouring countries is the best way for moving forward.

Dr. Govind Pokharel, Vice Chair of the National Planning Commission of Nepal, highlighted the key needs of the country, stressing the need to have exchanges on physical, social and economic recovery. He mentioned the biggest challenges as:

1. Human resource management: organising people with knowledge and skills on recovery in various sectors, and getting Nepali personnel trained in these fields.
2. Collaboration and cooperation: ensuring that various stakeholders from across government and non-government sectors converge.
3. Resources and materials for building back better: organising adequate resources, especially for specific contexts like heritage sites where specific quality and type of material such as timber is required and the processes are so specialised that tendering processes cannot be followed in the manner of general practice for the construction of roads and bridges.

A number of points were highlighted in the deliberations for attention during the recovery process:

1. Capacity building is needed for government agencies as well as other stakeholders.
2. Inclusion of diverse communities and ethnic groups, particularly amidst conflicts.
3. Addressing dependency, and ensuring that free aid in terms of money, food and materials does not destroy enterprise and make people dependent.
4. Establishing systems to address complex situations: housing norms, codes and systems that can also take care of situations of multiple households of a divided family within one building under single ownership.
5. Aligning with other development targets and goals, such as Nepal's aim of moving out of the LDC category and also the new Sustainable Development Goals.
6. Leveraging the private sector presence: investing money and aiming to use it as a trigger to bring more funds in from the private sector.
7. Transparency and accountability: ensuring that all resources are put to the use they are intended for, and that processes are clean and appear to be clean.
8. Convergence of traditional and modern: how heritage sensitive reconstruction is carried out, using modern technical advancements.
9. Adherence to the Sendai Framework for Disaster Risk Reduction: using Building Back Better principles as laid down in the framework.

## Agenda Item 2: Challenges and opportunities for recovery and reconstruction: the 2015 Nepal Gorkha Earthquake

This session explored the opportunities and challenges presented by the Nepal's Gorkha earthquake recovery and reconstruction process. These findings were further supported by insights and perspectives from experiences in South and South-West Asia.

Dr. Govind Raj Pokharel shared that the National Authority for Reconstruction (NAR), envisioned for a period of five years, will carry out key functions ranging from detailed damage and loss assessment; preparation of policy, plans, programmes and budget for reconstruction; prioritise reconstruction and land acquisition; ensure safer settlement development and mobilize resources from various sources.

A Steering Committee as a central unit of NRA will be chaired by the Prime Minister and will have two ministers, CEO, Vice Chairman of the NPC and other experts. An Executive Committee will administer day-to-day functions, and will comprise of the CEO, three experts, and a secretary.

The initial momentum for reconstruction was lost as the NPC had to focus on the nation's annual budget preparation exercise and the government was not fully functional as the new constitution was being framed and political shifts were taking place. Protracted political conflicts have created further challenges, and there has been a delay in bringing out the Reconstruction Act and reactivating the NAR. Development partners have thus been working with low level of guidance from the government. The Asian Development bank (ADB) now forecasts GDP growth in the present fiscal year at 4.8% versus the 5.1% forecast in March before the earthquake.

There are a number of challenges, with the primary ones being political conflict deteriorating the working environment, delay in detailed damage assessment, mobilization of supply channels, identification of safe settlement sites, preparation of adequate technical human resources and establishment of coordination and monitoring mechanisms.

At the same time, there is a big opportunity with the outpouring of support from development partners, and appropriate timing for initiating the building of a resilient Nepal.

Mr. Anil K. Sinha, Vice-Chair, Bihar State Disaster Management Authority of India, shared that Bihar is an Indian state that borders Nepal, and suffered damage in the Nepal Gorkha Earthquake with 66 lives lost and buildings damaged across a number of districts. There are a number of experiences that can provide common learning opportunities.

Such a major earthquake results in lives lost, but also the total collapse of support systems. Recoveries out of major disasters are very time consuming processes, involving a large number of stakeholders. One of the biggest challenges is that of coordination.

The International Recovery Platform (IRP), a multi country and multi agency initiative based out of Japan has studied a number of major disasters across the region and even in other parts of the world to track different phases of recovery. Early recovery is seen as an interim process. Temporary shelters are built with the intention that these will be a stopgap arrangement, but other than two countries (Japan and Mozambique), these have invariably been found to turn into permanent houses. The agencies responding for early recovery work in a very different mode as compared to the development agencies, and the gap in the transition eventually leaves affected communities in the lurch.

Experience also shows that one national reconstruction authority cannot execute work at all levels, and thus appropriate authorities need to be established at province, district and local levels. People's participation is a key element requiring attention while setting up mechanisms, as the community is the primary stakeholder in the entire process.

Recently Chile faced an earthquake of a very large magnitude, but no major damage was observed, while Haiti resulted in the loss of many lives. Chile was studied in 2010 and two main lessons emerged for the success of successful risk reduction capacity:

- Safe construction
- Public information and education

Mr. Ishtiaq Ahmed, Member Ops, National Disaster Management Authority of Pakistan, highlighted that Earthquake Reconstruction and Rehabilitation Authority (ERRA) was established after the 2005 Muzaffarnagar Earthquake, and while it has now accomplished its task, the ERRA is now looking back and reviewing mechanisms of choice. We are now trying to find permutations and combinations to merge the two authorities – ERRA and the National Disaster Management Authority (NDMA), which was established two years after ERRA. In an emerging context in Nepal, it may be worth considering the long term convergence of reconstruction and disaster management.

An owner-driven approach within the reconstruction process is a very sound principle. Owners, however, have very complex and diverse mindsets. Community level consolidation and the role to be played by community leaders is crucial and needs to be put in place in the early days.

Mobilisation, incentivisation and convergence of packages, for example of livelihoods and house construction, can be of use. Pakistan had created 11 centres in the affected areas that acted as hubs for mobilising, supporting and monitoring purposes. Complaints redressal was made an integral part of the system.

Dr. Shekarchizadeh Mohammad, President, Road, Housing and Urban Development Research Centre of the Islamic Republic of Iran, informed the house that Iran has rebuilt over 1.3 million houses, and the process has involved the learning from past experience. Besides the physical aspects of reconstruction; social, economic and environmental aspects require significant attention right from the beginning. This needs to be engrained in the process from visioning to creation of action plans.

The level of reconstruction in disaster damaged areas is dependent on the potential and current capacities. Ambitious goals are usually not good for success. Recovery projects should be seen as opportunities for development. Local capacities should be the backbone for this process.

Urban and rural plans require different approaches, and should be based fundamentally on realization of development plans. Construction orders should similarly be detailed in terms of architectural rules, designs, quality control and compliance with codes. Supervision in such large and complex situations needs to be established as a networked activity.

In the 2004 Bam earthquake, over 31,000 people were killed and over 80% of the city was destroyed. Some key learnings from this experience were:

- Affected area reconstruction should be considered first as a social subject.
- Planning of reconstruction should be based on justice principles.
- Reconstruction of buildings should be based on local capacities.
- Reconstruction processes should lead to enabling of people to continue their activities.

General discussions and recommendations that followed included the key issues listed below:

1. Recovery is about development, and ‘build back better’ is about sustainable development. This is specific in terms of not recreating a risk that existed earlier, and not creating any new risks.
2. The Indian Disaster Management Act of 2005 was preceded by a comprehensive process of consultation across the country with various stakeholders. A High Powered Committee carried out the studies and consultations. This takes time, but rigour is important to be maintained. Key features of the Act are:
  - a. For the first time it gave a definition of disasters in the country. It is an open ended and complex definition – talking of catastrophe or mishap taking place due to

natural hazards, man-made reasons, accidents and negligence. It also includes all those activities having an adverse effect on environment, thus including climate change.

- b. It created a three tier authority structure: a national authority chaired by the Prime Minister, state authorities chaired by respective Chief Ministers, and district authorities headed by the District Collectors. The Act devotes about 10 sections to the district authorities, recognizing that the action is to be carried out at the local level and including the need for devolution of financial powers to the district level.
3. In Pakistan's case the Act provides powers to the NDMA to call any agency to respond. The authority cannot be challenged. The Act should be with a long term vision and not merely focusing on the reconstruction in the context of one disaster event. The Act has also given leverage to the NDMA to have a disaster response force. Fixing of responsibility of various stakeholders in detail is also something the Act needs to do. DRR was initially a weaker aspect, but is now being made a priority.
4. Disasters provide an opportunity to do a widespread programme on safety, that goes beyond the structures damaged and families affected. Nepal should fully utilize the present opportunity to address multi-hazard and country-wide issues that may be faced in the future.
5. Beyond the three levels discussed above, the fourth level of local bodies – village development committees in rural areas and municipalities in urban areas – are key players and need to be included in the processes to be taken up.
6. Capacity building needs to be taken up in a comprehensively planned manner – if masons are to be trained, the training should be part of a larger scheme of things; with sensitization of decision makers, awareness in home owners, training of engineers, and inclusion of electricians, carpenters, fabricators and plumbers along with masons, to make it a comprehensive programme of training construction workers.
7. The larger picture needs to be seen, with the various dimensions and activities ranging from plans to the implementation of various programmes coming together seamlessly.
8. In many examples the evolution of authorities has been such that Project Management Units (PMUs) got converted into societies, and finally into authorities. Clarity is needed whether future disaster response will be the responsibility of the authority or the Ministry of Home Affairs.

### Agenda item 3: Earthquake Recovery and Reconstruction Experiences from South and South-West Asia

This session presented and discussed earthquake recovery and reconstruction experiences from the region, with a focus on the housing and infrastructure sectors.

Dr. V. Thiruppugazh, Joint Secretary, National Disaster Management Authority of India, presented the process followed in the aftermath of the 2001 Gujarat Earthquake as part of the relief, early recovery, and long term rehabilitation efforts of the government, including the establishment of the Gujarat State Disaster Management Authority (GSDMA) and the various policies and programmes put in place by it.

Learnings from the Gujarat experience were highlighted as:

1. Owner Driven Reconstruction (ODR) demands more from government than contractor/donor driven.
2. Not all owners have the capacity to undertake reconstruction on their own.
3. Control of material cost is critical to address inflation.
4. An information and education campaign is critical.
5. Technical guidance and quality audit is critical for ODR.

6. Without an enabling mechanism, ODR will reinforce pre-disaster patterns of vulnerability
7. Livelihood rehabilitation should not be asset centric.
8. Setting up an extra-ordinary mechanism is necessary, but should have a clear mandate.
9. Non-involvement of beneficiaries in reconstruction by NGOs, non adherence to quality and lack of accountability.
10. Careful selection of NGOs is needed, and they should have an exit policy.
11. Donor and lender funding may involve cost and time over runs and also in cost escalation.

In addition, the following issues were highlighted as challenges that will be faced once the recovery programme starts in full swing:

1. How to ensure compliance? In Gujarat, there was an option but to withhold the third instalment to force retrofitting.
2. How to ensure real participation? What is the lowest level of the identifiable last unit?
3. How to ensure accountability of external agencies to take part in reconstruction? Can't be very strict, can't be very lax.
4. How to institutionalize the initiatives?
5. Mechanisms for enforcement.
6. Problems with tenants – legal and illegal tenants.
7. Assistance to commercial establishments, particularly rented commercial establishments.
8. Political pressure to disburse money early – formulation of policies and guidelines may take some time.
9. Livelihood rehabilitation generally gets neglected as the focus of reconstruction remains reconstruction of the physical environment

Mr. Anil Kumar Sinha, Bihar State Disaster Management Authority of India, shared a narrative of how the public reacted to the earthquake in the form of panic and rumours, and how the BSDMA took immediate steps to address the situation. This was however an opportunity to address those whose houses were not damaged, but there was sufficient concern to address the deep rooted risk of structural vulnerability.

A public communication initiative was taken up, and an extensive survey of houses was carried out in the affected areas with a standardized template of five levels of damage (G1-G5). Most houses were found to be in the low damage categories. While the Government could not take up activities of house repair and retrofitting of private houses, awareness was created on this issue.

Fortunately there was no major impact on livelihoods. The Government, however, ramped up its ongoing programme on training of architects, engineers and masons after this earthquake.

The incident brought into greater focus the annual disaster safety fortnight that Bihar observes in early July. This year 125,000 schools were covered, reaching out to 20 million children. Fire, earthquake, do's and don'ts, and first aid were some of the key aspects covered.

Bihar has already been working on revision and dissemination of building codes. As part of the initiative, an earthquake safety clinic was set up at the National Institute of Technology at Patna through BSDMA funding, and is operated by student volunteers.

It must be noted that there are also some significant dilemmas of recovery. Two such dilemmas are:

- Speed versus quality
- Speed versus participation
- Speed versus accountability

Multi-hazard district disaster management plans are now being made in Bihar, in keeping with the fact that the action level requires utmost attention.

Mr. Mohammad Alizamani, Head of Reconstruction Planning Department, Housing Foundation of Islamic Republic of Iran (HFIR), shared the Bam perspective: a brief review on Bam reconstruction

process. The presentation covered the story of the 2003 Bam Earthquake, and covered Bam before the earthquake, Bam after the earthquake, rescue and relief, emergency shelter, temporary housing, reconstruction of residential and commercial units, and Bam after the reconstruction.

The reconstruction process was based on the fundamental aspects of where, who, how and which approach. The approach is a core dimension, as it leads to the plan which will guide the entire process. Accordingly clear roles for the government and people can be laid down.

In the owner centric approach taken, the government enables the people by providing support, while people carry out the construction, supervision and management.

One of the key elements of the programme was a technical services and material exhibition complex. Another aspect was the systematic categorization of residential and commercial units. Each unit was assessed for damage, leading to two categories: not severely damaged and damaged. The damaged ones were further split into non-structural damage that required repairs, and structural damage. Structural damage was further categorized into that which is worth retrofitting, and not worth retrofitting that were to be demolished and reconstructed.

The control and supervision system was based on a supervision network. A soil mechanics lab was established, and quality control of concrete and of the welding was carried out very closely.

Documentation of the process was carried out in detail, and proved to be a very useful exercise for managing subsequent phases and for building in risk reduction and preparedness measures for the future.

A discussion that followed highlighted the following aspects to be kept in mind during the reconstruction process in Nepal:

- Ground level recovery is a long drawn process. In nations that face recurrent disasters the operating procedures are generally in place, but are not sufficient to manage a very large scale reconstruction programme. It is best in these situations to build upon what you have rather than bringing in an entirely new system that may have worked in another context.
- There is great value in establishing collaborative processes, bringing together diverse knowledge and experiences otherwise not available locally. In the process, your own institutions can be built and strengthened in the long run.
- A National Institute of Disaster Management or a similar institution will be of use for Nepal to build long term and large scale capacity for disaster recovery and risk reduction. Towards this, initial international networking will be of great use, and memorandum of understanding with technical and academic institutions need to be undertaken rather than establishing new capacities for all aspects. In the process, existing capacity and knowledge within institutions in Nepal and the region must be tapped into.
- The role of non profit research institutions is key. Establishing good research institutions in the long run will be beneficial but will take time. India's long term training and capacity building strategy, developed under a World Bank supported programme can be an example.

Mr. Ishtiaq Ahmed, National Disaster Management Authority, Pakistan, shared more on low-cost earthquake resilient building approaches from the 2005 Pakistan earthquake recovery and reconstruction. The presentation provided information on the damage caused by the earthquake and the response initiated by the Government. The earthquake was similar to the Gorkha Earthquake in terms of terrain, magnitude, and the large number of houses damaged.

The policy guidelines developed were a first step towards a long term recovery approach. The housing process was based on owner driven reconstruction, and a total of eleven sectors were identified for intervention. Now the entire rehabilitation process has been completed, and systems for disaster management established in the affected areas as well as national level.

Over 500,000 people were trained on different aspects and 250,000 were given technical training. Participation and grievance redressal were an integral part of the process.

Prof. Vinod K Sharma, Sikkim State Disaster Management Authority of India, spoke on the 2011 Sikkim earthquake recovery and reconstruction in India in terms of building a resilient infrastructure network in mountain areas. The case presents a context very similar to Nepal – with a wide ranging hilly terrain, fragile eco-system, and demographic pattern. Sikkim shares its border with Nepal and also uses the Nepali language, besides having similar customs and socio-cultural practices. The 2011 Sikkim Earthquake threw up challenges very similar to what is being faced by Nepal at present, though the scale is larger in Nepal.

Some aspects Sikkim imbibed from past experiences in India are also equally valuable for Nepal. For example, India took a loan for the first time for a post disaster reconstruction in the aftermath of the 1993 Latur Earthquake. In this case, the loan was from the World Bank and was of over US\$ 300 million. Loan management is a very complex process and requires due attention.

Sikkim took the pathway of making a safe and sustainable recovery process, strengthening the position taken by the State regarding the environment, whereby Sikkim is a fully organic state.

Sikkim took a build back better approach, wherein 3000 masons and 300 engineers were trained after the earthquake, and these learnings are also now available for deployment in Nepal. Risk reduction and a community based approach were central to the programme.

Key features included software based monitoring, wherein the progress of each house can be reviewed through an online system from anywhere.

Sikkim has also developed mason training material in Nepali language, which is also available for use in Nepal.

Some of the key learnings from the Sikkim experience included:

1. Owner driven reconstruction has shown success, and is highly preferable to contractor-based approaches.
2. Technical support is critical, and is the key for enabling safe reconstruction.
3. Accountability and transparency are critical for smooth implementation of a programme. Due to online and fully transparent systems, there was not a single court case in the instance of Sikkim reconstruction.
4. Appropriate design, material and technology are the keys.
5. Multi hazard resistant features are important.
6. Climate change is a new significant threat.

A discussion that followed focused on the following aspects:

- The housing area is important in averaging the loss recovery and the aspiration of a diverse group of affected people.
- In cases where houses are given to families as complete grants, their participation may be more in terms of decision making, management and supervision, and not in terms of finances, material or labour. In civil society supported programmes, often families contribute material or labour.
- The ends have to be given priority and are visible targets of recovery and reconstruction programmes, yet the means remain important and processes are key to the success of such programmes.

## Agenda item 4: The Economics of Building Back Better

This session presented and discussed the economic costs involved in building resilient housing, infrastructure and productive sector assets. Experiences from the South and South-West Asian region were presented.

Dr Shamika Sirimanne, Director ICT and Disaster Risk Reduction of ESCAP, set the context by highlighting the need to address economic aspects as a core of the recovery process, wherein it will be a driver for all other sectors to follow suit in a sustainable manner.

Dr. Anshu Sharma of SEEDS presented the need to look at time and risk as economic concerns. The process of fast recovery processes at the community level, yet with attention to detail, is something that needs to be imbibed in the overall reconstruction phase. Sensitivity to critical dimensions such as heritage-based reconstruction, education as an underlying recovery feature, inclusion of disaster risk reduction from the beginning, and strengthening local capacities for owner- driven processes in housing and community recovery will go a long way in making the reconstruction process faster and more appropriate.

Dr. Suman Karna, IOM Nepal, spoke of the economic implications of building back better. The concept, originally brought to focus in the reconstruction process after the 2004 Indian Ocean Tsunami by Bill Clinton, is now fundamental to any post disaster recovery process. The Post Disaster Needs Assessment carried out in Nepal after the earthquake identifies housing as a major sector and goes on to look at the building back better component of the housing cost at around 23 percent of the total cost.

Prof. Santosh Kumar, Director of the SAARC Disaster Management Centre, spoke of the need to focus on macro as well as micro economic aspects of recovery and reconstruction. There are a number of examples to show that the bulk of the issues to be addressed in the South Asian context lie in the microeconomic domain, including the informal sector, while national direction needs to be derived from the macroeconomic trajectory that was being followed, and was disrupted by the disaster. The post disaster reconstruction process and availability of resources can indeed be treated as an opportunity to address underlying gaps and risks.

The discussion on the economic dimensions of recovery revolved around nuances involved in specific dimensions such as heritage recovery, which has notional values attached to it and which cannot be taken up in the way other sectors will be dealt with.

The quantum of investment required for ensuring building back better concepts was also discussed in detail, and the need to deal with clustering costs and settlement planning costs as separate was highlighted. The true cost of retrofitting and building back better needs to be maintained at levels that will be attractive and viable in the context of reconstruction of core shelters in an emergency context with very limited resources.

## Agenda item 5: Identifying Key Lessons from the Earthquake Recovery and Reconstruction Experiences in South and South-West Asia

This session identified the key lessons from the earthquake recovery and reconstruction experiences in South and South-West Asia discussed in agenda item 3 along with the associated economic costs as presented in agenda item 4. The relevance of these key lessons for the recovery and reconstruction process in Nepal was discussed.

Prof. Dr. Govind Nepal and Dr. Swarnim Wagle, Members, National Planning Commission of Nepal, shared that at the time of the 2015 earthquake Nepal was not prepared. The nature and scale of the

disaster, which could have been worse, helped. The airport was functional, Kathmandu and the administration machinery were largely spared. The armed forces and the emergency machinery were operational and could swing into action immediately.

Public relations and communications shortcomings weakened the legitimacy of the state. There was misleading information. As an example, the PM Relief Fund earned a bad name and people held back from donating to it.

It was discussed that the system was not swift enough in the formation of the reconstruction authority, and did not swing into action. Due to this, it became a politically complex issue. Nepal also couldn't fully capitalize on the diaspora and utilization of social media etc. Multiple nodes of authority created hurdles in arriving at clarity quickly on roles and responsibilities for rapid decision making.

The Post Disaster Needs Assessment was a grand success, with the National Planning Commission taking the lead and gaining support from all concerned national and international stakeholders. Subsequently, based on this assessment the International Conference on Nepal's Reconstruction (ICNR) was also successful and could raise commitments of about US\$ 4.4 billion, sufficient to fund the public spending expected for the reconstruction process.

More could have been done, however, on awareness, media, curriculum, capacity of institutions, legal empowerment and mandates.

Mr. Shekarchizadeh Mohammad, Islamic Republic of Iran, shared the Iranian experience in which he highlighted some technical aspects such as seismic microzonation and BHRC's experience of deploying tools for factoring in disaster resilience into the reconstruction programme.

Shake table tests are a very useful tool, not only to calibrate and establish the resilience of various locally predominant construction materials and technologies, but also for generating awareness in the stakeholder groups including decision makers, homeowners, engineers and construction workers on the merits of disaster resilient techniques.

Similarly, early warning systems are a crucial aspect of disaster preparedness and risk reduction, and in the case of earthquakes even a few seconds of warning can make a major difference as critical installations can be shut down and responders can get life saving moments to trigger a response.

Mr. Ishtiaq Ahmed, National Disaster Management Authority of Pakistan, highlighted some critical aspects to be borne in mind while designing the details of the reconstruction programme. Payment should be through banks to the highest extent possible to ensure that the process is transparent and accountable, and for reducing corruption as well as last mile diversion of funds to other than needy family members. There is a need for flexibility in approaches so that local contexts and the very specific needs of individuals and communities can be met in an appropriate manner.

Decentralized mechanisms for decision making are very desirable for efficient post disaster recovery. Looking at merits and demerits of reconstruction authorities, disaster management authorities, and systems within ministries of home affairs, it may be beneficial in the long run to consider a separate Ministry for Disaster Management, on the lines of the Bangladesh system.

Dr. Vinod Kumar Sharma of SDMC India, highlighted the importance of political leadership in an emergency, sharing the political will displayed by the Chief Minister of Sikkim in the aftermath of the 2011 earthquake, and the slogan of 'Safer Sikkim' that was used by the Government machinery to engage with and encourage the public to jointly embark on a safety based reconstruction process.

The need to focus on temporary shelters, a safer approach, inclusion of sustainable and green principles in the reconstruction, people's participation, and accountability and transparency was highlighted.

## Agenda item 6: Capacity Development Challenges in Nepal: perspectives from the Asian and Pacific Centre for the Development of Disaster Information Management (APDIM)

This session presented and discussed the role of APDIM in providing capacity building for the post Gorkha recovery and reconstruction process in Nepal based on the challenges and opportunities presented in agenda item 2, along with experiences shared from the South and South-West region, as outlined in the discussions of agenda item 3 and 5.

Dr. Swarnim Wagle, Member of National Planning Commission, Nepal, stressed on the need for cross learning within the region, and appreciated the contextual similarities of the experiences being shared with what needs to be done in Nepal in the months and years to come.

Mr. Indrajit Pal, Asian Institute of Technology of Thailand (AIT), shared a process of capacity building that is required to drive a technically sound post disaster reconstruction process. Capacity is required at all levels, stretching from decision making down to the ground implementation of programme activities. It is required across a large number of sectors that will be addressed in the reconstruction process. There are a number of initiatives across the region from which aspects can be imbibed to do this effectively using a systems approach. Appropriate long term strategies need to be put in place for this to be done effectively.

Mr. Teraphan Ornthamarath of RIMES, Thailand, shared the shake crust experience and the Myanmar pilot project in which the sustainability of working with local partners has been established as the key to effective and efficient post disaster reconstruction.

Microzonation in Kathmandu was discussed, and the fact highlighted that damage potential is quite localized and not spread throughout, which would require a very specific and precise nature of a reconstruction and risk reduction process to be established.

Mr. Dr. Khajeh Ahmad Attari Nader, Senior Expert, Road, Housing and Urban Development Research Centre, Islamic Republic of Iran, shared the process of microzonation in Iran, which has been carried out in a very detailed and rigorous manner. The linkages of such studies with plans for carrying out retrofitting are very strong, and make the decision making process very systematic and cost effective. The use of shotcrete and other technologies that can help the reconstruction process be rapid and efficient were discussed.

The proposed programme of work for APDIM in Nepal was shared by Mr. Sanjay Srivastava, Chief, Disaster Risk Reduction Section of ESCAP.

The Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) is being established in Tehran as a subsidiary body of ESCAP with a Governing Board composed of 10 member States which will be elected by ESCAP for four years. The Centre will work to ensure a participatory approach in the activities, and to assist the management a Technical-Advisory Committee composed of high level experts from various countries of the region will be established.

The Centre will maintain a close cooperation and coordination relation with the ESCAP Secretariat and its sub-regional Offices in New Delhi and Almaty to ensure consistency in regional planning and programme implementation and avoid gaps and overlaps. In terms of human resources, in addition to the permanent staff, the Centre will strategically benefit from the available resources at national and regional levels by developing appropriate mechanisms such as networks of experts, technical forums, short-term assignments, etc.

The concept of the centre and its working is based on a network approach, wherein cross learning and the generation of knowledge from regional resources will be a key aspect.

It was discussed that to be safe risk assessment of the area where reconstruction will take place is required, and though this is a complex task in the difficult terrain of the affected areas in Nepal, there are a number of experiences from the region that can help make Nepal's reconstruction process as smooth as possible.

Dr. Govind Nepal, Member, National Planning Commission, Nepal, took the gathering through the outcome and ways forward emerging from the workshop as follows:

The technical sessions demonstrated that Nepal has a long and complex road ahead for its post-earthquake reconstruction programme, with many nuanced issues to be sensitively addressed. The lessons from similar socio-economic and geo-technical contexts in the region were thought to be of immense help in this journey. Networking with southern partners, and south-to-south cooperation emerged as the most useful way for gaining knowledge for moving forward. The experiences shared by the workshop participants, and the knowledge and technical support offered by ESCAP, SDMC, the Islamic Republic of Iran, Sikkim and all other agencies will be very valuable for Nepal.

A number of specific steps to be taken in the near future as a way forward were outlined as follows:

1. A detailed risk profile study of the affected areas needs to be carried out. Technical support through APDIM and the technical assistance of the Islamic Republic of Iran will be very useful. A team of international experts may be formed, who along with counterparts in the national research and technical institutions can use the latest technology for the preparation of this risk profile.
2. Retrofitting of cultural monuments and heritage settlements is a critical need in Nepal, which requires highly sensitive technical approaches. Iran's experience and expertise will be very valuable, and appropriate knowledge transfer mechanisms can be established for this purpose.
3. The need for trained engineers and masons is immense in Nepal, in view of the large number of houses and other buildings to be constructed. The technical content evolved by Sikkim, including mason training material in Nepali language, will be a very useful starting point for Nepal in its recovery. The Sikkim Government's offer of cross-border visits and knowledge exchange was deemed very valuable and of significant benefit to Nepal. Sikkim also has a similar terrain, culture, language and a set of issues to Nepal, making such an exchange very valuable.
4. Accountability and transparency are very important in large scale reconstruction programmes, and Nepal is very serious about establishing state-of-the-art systems for this purpose. Sikkim's experience of online real-time monitoring of housing reconstruction is very relevant towards this.
5. It was also seen from various cases that process documentation is extremely important in a reconstruction programme. The inputs of SEEDS, right from the early stages of needs assessment in Nepal, have been very valuable. Documentation may not seem important to many right now, but will be a very useful asset in the future when details of the experience may be forgotten. Process documentation needs to be taken up in earnest.
6. Regional networking emerges as a very important step to be taken, and MoUs can be signed among various institutions for this to be effective. SDMC may help in putting together such an institutional arrangement for networking to emerge as a means for knowledge-sharing for an effective reconstruction programme in Nepal.
7. First-hand experience of a number of relevant cases will be of great use to the Nepali agencies responsible for reconstruction. Exchange visits to affected areas of the Islamic

Republic of Iran, India, Pakistan and other countries that have carried out reconstruction programmes will be useful. A clear and objective oriented programme may be evolved for this, based on Nepal's specific needs.

8. Sectoral policy dialogues will be needed in Nepal; particularly on housing, education and health. Bihar's school safety campaign as described in the workshop emerged as a specific experience that could serve as an example in the context of Nepal. In coming months, an engagement may be worked out for knowledge-exchange from this and other such experiences.
9. ESCAP's position as a key knowledge hub in the region has been very valuable and instrumental in the organization of this workshop. Such dialogues are steps toward supporting the very complex reconstruction programme being taken up by Nepal.

## PROGRAMME

Thursday, 1 October 2015	
09:30-10:00	<p>Agenda item 1: Opening of the Dialogue</p> <p>Chair: Hon'ble Mr. Suresh Man Shrestha, Member Secretary, National Planning Commission, Nepal</p> <ul style="list-style-type: none"><li>• Welcoming Remarks Mr. Rabi Shanker Sainju, Programme Director, Nepal Planning Commission Secretariat, Nepal</li><li>• Keynote Address Prof. Santosh Kumar, Director, SAARC Disaster Management Centre</li><li>• Opening Address Dr. Shamika Sirimanne, Director, Information and Communications Technology and Disaster Risk Reduction Division, ESCAP</li><li>• Inaugural Address Hon'ble Prof. Dr. Govind Raj Pokharel, Vice-Chairman, National Planning Commission, Nepal</li><li>• Chairman's Remark Hon'ble Mr. Suresh Man Shrestha, Member Secretary, National Planning Commission, Nepal</li></ul>
10:00-10:15	Break

10:15-12:00	<p>Agenda item 2: Challenges and Opportunities for Recovery and Reconstruction: the 2015 Nepal Ghorka Earthquake</p> <p>Moderator: Hon'ble Prof. Dr. Govind Raj Pokharel, Vice-chairperson, National Planning Commission, Nepal</p> <p>This session will explore the opportunities and challenges presented by the Nepal's Gorkha earthquake recovery and reconstruction process. These findings will be further supported by insights and perspectives from experiences in South and South- West Asia.</p> <ul style="list-style-type: none"> <li>• Introduction to the post Nepal's Gorkha earthquake recovery and reconstruction process by Hon'ble Prof. Dr.Govind Nepal, Member, National Planning Commission, Nepal</li> </ul> <p>Panel discussion</p> <ul style="list-style-type: none"> <li>• Prof. Shekarchizadeh Mohammad, President, Road, Housing and Urban Development Research Centre, Islamic Republic of Iran</li> <li>• Mr. Ishtiaq Ahmed, Member Ops, National Disaster Management Authority, Pakistan</li> <li>• Hon'ble Mr. Anil K. Sinha, Vice Chairman, Bihar State Disaster Management Authority, India</li> <li>• Q &amp; A</li> </ul>
12:00 – 13:00	Lunch
13:00 – 15:00	<p>Agenda item 3: Earthquake Recovery and Reconstruction Experiences from South and South-West Asia</p> <p>Moderator: Hon'ble Prof. Dr. Govind Nepal, Member, National Planning Commission, Nepal</p> <p>This session will present and discuss earthquake recovery and reconstruction experiences from Bhutan and India with a focus on the housing and infrastructure sectors.</p> <ul style="list-style-type: none"> <li>• 2001 Bhuj earthquake recovery and reconstruction in India: reconstruction of the housing sector in a high population density area, by Dr. V Thiruppugazh, National Disaster Management Authority, India</li> <li>• 2015 Nepal's Gorkha Earthquake- recovery and reconstruction in Bihar, India, by Hon'ble Mr. Anil K. Sinha, Vice Chairman, Bihar State Disaster Management Authority, India</li> <li>• 2003 Bam reconstruction process after earthquake, by Mr. Alizamani Mohammad, Head of Reconstruction of Bam City, Housing Foundation, Islamic Republic of Iran</li> </ul>
	<ul style="list-style-type: none"> <li>• Discussion</li> </ul>
15:00 – 15:15	Break

15:15 – 17:00	<p>Agenda item 3 continued: Earthquake Recovery and Reconstruction Experiences from South and South-West Asia</p> <p>Moderator: Prof. Santosh Kumar, Director, SAARC Disaster Management Centre</p> <p>This session will continue with presentations and discussions on earthquake recovery and reconstruction experiences from Iran, Pakistan and Turkey with a focus on the cultural heritage and infrastructure sectors.</p> <ul style="list-style-type: none"> <li>• 2005 Pakistan earthquake recovery and reconstruction: low-cost earthquake resilient building approaches, by Mr. Ishtiaq Ahmed, Member Ops, National Disaster Management Authority, Pakistan</li> <li>• 2011 Sikkim earthquake recovery and reconstruction in India: building a resilient infrastructure network in mountain areas, by Hon'ble Prof. Vinod K. Sharma, Executive Vice Chairman, Sikkim State Disaster Management Authority, India</li> <li>• Discussion</li> </ul>
18:30 – 21:00	Dinner hosted by Hon'ble Mr. Suresh Man Shrestha, Member Secretary, National Planning Commission, Nepal

#### Friday, 2 October 2015

09:00 - 10:30	<p>Agenda item 4: The Economics of Building Back Better</p> <p>Moderator: Dr. Shamika Sirimanne, Director, ICT and Disaster Risk Reduction, ESCAP</p> <p>This session will present and discuss the economic costs involved in building resilient housing, infrastructure and productive sector assets. Experiences from the South and South-West Asian region will be presented.</p> <ul style="list-style-type: none"> <li>• Dr. Anshu Sharma, SEEDS</li> <li>• Prof. Santosh Kumar, Director, SAARC Disaster Management Centre</li> <li>• Dr. Suman Karna, Early Recovery/Recovery Specialist, International Organization for Migration</li> <li>• Discussion</li> </ul>
10:30 - 10:45	Break

10:45 - 12:00	<p>Agenda item 5: Identifying Key Lessons from the Earthquake Recovery and Reconstruction Experiences in South and South-West Asia</p> <p>Moderator: Hon'ble Prof. Dr. Govind Nepal, Member, National Planning Commission, Nepal</p> <p>This session will identify the key lessons from the earthquake recovery and reconstruction experiences in South and South-West Asia discussed in agenda item 3 along with the associated economic costs as presented in agenda item 4. The relevance of these key lessons for the recovery and reconstruction process in Nepal will be discussed.</p> <ul style="list-style-type: none"> <li>• Lessons learned, by Dr. Anshu Sharma, SEEDS</li> </ul> <p>Panel discussion</p> <ul style="list-style-type: none"> <li>• Hon'ble Dr. Swarnim Wagle, Member, National Planning Commission, Nepal</li> <li>• Prof. Shekarchizadeh Mohammad, President, Road, Housing and Urban Development Research Centre, Islamic Republic of Iran</li> <li>• Mr. Ishtiaq Ahmed, Member Ops, National Disaster Management Authority, Pakistan</li> <li>• Hon'ble Prof. Vinod K. Sharma, Executive Vice Chairman, Sikkim State Disaster Management Authority, India</li> </ul>
12:00 - 13:00	Lunch
13:00 - 14:15	<p>Agenda item 6: Capacity Development Challenges in Nepal: perspectives from the Asian and Pacific Centre for the Development of Disaster Information Management (APDIM)</p> <p>Moderator: Hon'ble Dr. Swarnim Wagle, Member National Planning Commission, Nepal</p> <p>This session will present and discuss the role of APDIM in providing capacity building for the post Nepal's Gorkha recovery and reconstruction process based on the challenges and opportunities presented in agenda item 2, along with experiences shared from the South and South-West region as outlined in the discussions of agenda item 3 and 5.</p> <ul style="list-style-type: none"> <li>• Proposed programme of work for APDIM in Nepal, by Dr. Sanjay Srivastava, Chief, Disaster Risk Reduction Section, ESCAP</li> <li>• Dr. Indrajit Pal, Assistant Professor, Asian Institute of Technology, Bangkok</li> <li>• Dr. Teraphan Ornthammarath, Technical Advisor, Regional Integrated Multi-Hazard Early Warning System for Africa and Asia</li> <li>• Dr. Khajeh Ahmad Attari Nader, Senior Expert, Road, Housing and Urban Development Research Centre, Islamic Republic of Iran</li> </ul>

14:15 - 14:30	Break
14:30 - 15:00	<p data-bbox="435 300 997 333">Agenda Item 7: Conclusion and Way Forward</p> <p data-bbox="435 369 1498 439">This session will highlight the main conclusions and recommendations for the way forward in supporting the Nepal Ghorka earthquake recovery and reconstruction process.</p> <p data-bbox="435 474 603 508">Vote of thanks</p> <ul data-bbox="485 528 1406 651" style="list-style-type: none"><li data-bbox="485 528 1406 598">• Dr. Shamika Sirimanne, Director, ICT and Disaster Risk Reduction Division, ESCAP</li><li data-bbox="485 618 1337 651">• Prof. Santosh Kumar, Director, SAARC Disaster Management Centre</li></ul> <p data-bbox="435 703 635 736">Closing Remarks</p> <ul data-bbox="485 757 1406 826" style="list-style-type: none"><li data-bbox="485 757 1406 826">• Hon'ble Prof. Dr. Govind Nepal, Member, National Planning Commission, Nepal</li></ul>