



Government of Nepal
Ministry of Science, Technology and Environment

Nepal Earthquake 2015: Rapid Environmental Assessment

Volume 2



Credits

© Ministry of Science, Technology and Environment 2015

Ministry of Science, Technology and Environment (MoSTE), Government of Nepal Singh Durbar, Kathmandu, Nepal

Photo credits

Cover photo: © Samir Jung Thapa

Disclaimer: *This document is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of WWF Nepal and do not necessarily reflect the views of USAID or the United States Government.*

Acronyms and Abbreviations

AEPC	Alternative Energy Promotion Centre
BFI	Banks and Financial Institutions
BZUC	Buffer Zone User Committee
CA	Conservation Area
CAMC	Conservation Area Management Committee
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community-Based Organization
CBS	Central Bureau of Statistics
CDRC	Central Disaster Relief Committee
CFUG	Community Forest User Group
CoRD	Centre of Resilient Development
CSO	Civil Society Organization
DDC	District Development Committee
DDRC	District Disaster Relief Committee
DNPWC	Department of National Parks and Wildlife Conservation
DRCN	District Road Core Network
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DSCWM	Department of Soil Conservation and Watershed Management
DUDBC	Department of Urban Development and Building Construction
EFLG	Environment Friendly Local Governance
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FAO	Food and Agriculture Organization of the United Nations
GBV	Gender Based Violence
GEF	Global Environment Facility
GESI	Gender Equality and Social Inclusion
GLOF	Glacial Lake Outburst Flood
GM	Genetically Modified
GoN	Government of Nepal

GRR	Green Recovery and Reconstruction
GRRT	Green Recovery and Reconstruction Toolkit
HCFC	Hydrochlorofluorocarbon
I	Immediate
IAS	Invasive Alien Species
ICCG	Inter-Cluster Coordination Group
ICIMOD	International Centre for Integrated Mountain Development
ICS	Improved Cook Stove
IEE	Initial Environmental Examination
IFRC	International Federation of the Red Cross and Red Crescent Societies
INGO	International Non-Governmental Organization
IPP	Independent Power Producer
IWM	Integrated Watershed Management
IWRM	Integrated Water Resource Management
LAPA	Local Adaptation Plan of Action
LPG	Liquid Petroleum Gas
LRN	Local Road Network
LSGA	Local Self Governance Act
LT	Long Term
MOAD	Ministry of Agricultural Development
MoCTCA	Ministry of Culture, Tourism and Civil Aviation
MoE	Ministry of Education
MoEN	Ministry of Energy
MoFALD	Ministry of Federal Affairs and Local Development
MoFSC	Ministry of Forests and Soil Conservation
MoHA	Ministry of Home Affairs
MoHP	Ministry of Health and Population
MoI	Ministry of Industry
MoLRM	Ministry of Land Reform and Management
MoPIT	Ministry of Physical Infrastructure and Transport
MoSTE	Ministry of Science, Technology and Environment
MoUD	Ministry of Urban Development
NARC	National Agricultural Research Council
NBSAP	National Biodiversity Strategy and Action Plan

NBSM	National Bureau of Standards and Metrology
NEA	National Electricity Authority
NGO	Non-Governmental Organization
NP	National Park
NPC	National Planning Commission
NRA	National Reconstruction Authority
NRM	Natural Resource Management
NSDRM	National Strategy for Disaster Risk Management
NTFP	Non-Timber Forest Product
ODF	Open Defecation Free
OHS	Occupational Health and Safety
PA	Protected Area
PCB	Polychlorinated Biphenyl
PDNA	Post Disaster Needs Assessment
POP	Persistent Organic Pollutant
REA	Rapid Environmental Assessment
REDD	Reducing Emissions from Deforestation and Degradation
SEA	Strategic Environmental Assessment
SRN	Strategic Road Network
ST	Short Term
TU-CDES	Tribhuvan University, Central Department of Environmental Science
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development
VDC	Village Development Committee
VRCN	Village Road Core Network
WASH	Water, Sanitation and Hygiene
WR	Wildlife Reserve
WWF	World Wildlife Fund

Contents

Acronyms and Abbreviations3

Annex 1: Detailed Recommendations for Post-Earthquake Solid Waste and Hazardous Materials
Management1

Annex 2: Policy and Governance Issues.....6

Annex 3: Summary of Field Visit Findings in Districts and Kathmandu 17

Annex 1: Detailed Recommendations for Post-Earthquake Solid Waste and Hazardous Materials Management

By Chiranjibi Gautam

Recommendation 1

Improve the urban waste management system in Kathmandu to enhance environmental sustainability and maximize the use of building debris in reconstruction and development projects.

Debris Management

Approximately 3.9 million tons of debris waste from demolished buildings remained after electronic equipment, furniture and fixtures, iron, wood, and useful bricks were recovered. Different options for debris management include:

- Repurpose waste into useable material, such as cement blocks and fill material, which can then be used as base and sub-base material in road construction and expansion.
- Reuse waste for the expansion of the river bank and ring roads.
- Reuse waste as fill material for the mining pit in Chovar to redevelop the unused area for alternative land uses.

After evaluating the alternatives above, option 3, reusing debris as fill material for the old mine in Chovar, is recommended because it was determined to have the fewest environmental impacts, most significant benefits, and take the least amount of time to implement. This option supports several environmental benefits such as promoting alternative land uses, i.e. parks or recreational areas, and reduces the impacts of filling the Chovar mine in the future with mined materials such as mud. However, during implementation the project is expected to result in an increase in vehicular traffic, emissions, and particulate matter (TSP, PM10/PM2.5) in the Kathmandu Valley. Air pollution impacts can be reduced by restricting access to vehicles compliant with national standards, covering vehicle loads to reduce dust, and ensuring workers fully comply with the occupational, health, and safety (OHS) standards.

Municipal Solid Waste Management

An alternative landfill site in Kathmandu valley is urgently needed. The current landfill is reaching capacity, in need of upgrades and is highly vulnerable to landslides. Strategies for developing an effective and more environmentally responsible municipal waste management system in the valley include:

- Segregating waste at the source (households, industries, commercial institutions, schools and colleges) to be reused, recycled and composted. This strategy also reduces the transport of waste and waste incineration.
- Organizing additional demonstration programs to promote household level composting.
- Providing technical and financial support to municipalities in design, construction and operation of safe landfill sites. Safe landfills include facilities to trap methane, provide leachate collection and treatment facilities, and recover energy from methane. This type of project would qualify for and could be registered as a Clean Development Mechanism.
- Monitor and sample current landfill sites for hazardous or toxic waste, both downstream water sources and ground water, since some toxic wastes are dumped into the current landfill site in the valley.

Hospital and Biomedical Waste Management

- Promote private sector investment in a hospital waste management facility in Kathmandu valley where small hospitals and clinics could pay to dispose of their medical waste safely.
- Enforce the Hospital Waste Management Guideline and finalize the draft regulation on hospital and biomedical waste management.

Recommendation 2

Inventory, monitor, and manage hazardous materials, including healthcare, industrial, agrochemical, and household hazardous wastes to address post-disaster impacts.

Hazardous Waste Management— A Few Noteworthy Considerations

Nepal is party to four Multilateral Environmental Agreements related to Chemicals and Hazardous Wastes— Basel Convention, Stockholm Convention, Rotterdam Convention and Minamata Convention. Nepal has already taken several steps toward fulfilling its national obligations, namely:

- Nepal prepared the National Implementation Plan on Persistent Organic Pollutants (POPs) and implemented a national inventory of POPs; prepared, collected and developed a storage system of POPs; and recently sent 80 tons of POPs and obsolete pesticides to Germany for disposal in an environmentally responsible manner.
- Through the joint efforts of MoSTE, UNIDO, and GEF all of the power transformers and the majority of distribution transformers (provided by Nepal Electricity Authority (NEA)) are PCB free after using the dechlorination chemical process.

- MoSTE is initiating the Minamata Initial Assessment project which is expected to develop a national inventory of mercury and mercury wastes, including an assessment of the problem, and possible ways forward.
- Draft regulations on Hazardous Waste Management, Biomedical Waste Management and Nuclear Law are currently under review.

Future Strategy on Hazardous Waste Management

The future strategy should aim to establish a national system for the environmentally responsible management of hazardous wastes and other wastes as an essential component of attaining sustainable livelihoods, and protecting human health and the environment. Strategic focus areas include:

- Preparation of technical guidelines to promote the implementation of the forthcoming national legislation.
- Design of demonstration or pilot projects to promote DRR in waste management, reduce waste, and encourage the recognition of waste as a resource.
- Promote private sector investment in environmentally sound management (ESM) of hazardous and other wastes including safe treatment or disposal facilities.

Dealing e-Wastes with Priority

- Preparation of the Technical Guidelines particularly regarding distinctions between waste and non-waste, collection and storage of e-waste, and transport including transboundary movement of e-waste.
- Participation in the regional programs for environmentally sound management (ESM) of e-waste promoting recovery, recycle and reuse of precious and heavy metals in electrical and electronic equipment. As per the decision made at the Basel Convention Conference of the Parties (COP) programs exist for the environmentally sound management of e-waste at the regional level, and Nepal can benefit from such programs.
- Place restrictions on the import of old models of computers/laptops, and other electrical and electronic equipment, to avoid becoming a dumping site for e-wastes.

Managing the Mercury and Mercury Wastes

- As a party to the Minamata Convention, Nepal shall not allow the manufacture of, import or export of mercury-added products after the phase out date of 2020. Mercury-added products include batteries, switches and relays, compact fluorescent lamps (CFLs), linear fluorescent lamps (LFLs), high pressure mercury vapor lamps (HPMV), cosmetics (with mercury content above 1ppm), pesticides, biocides and topical

antiseptics, and non-electronic measuring devices such as barometers, thermometers, hygrometers, manometers.

- Develop a collection system for waste containing mercury (particularly used fluorescent lamps, thermostats, mercury batteries and thermometers) at public places or shops with appropriate separate collection containers. Only containers specifically designed for this purpose and capable of containing mercury vapor from broken lamps should be used in public collection locations. Authorized collectors should collect the waste in the waste collection boxes or containers.

Environmentally Sound Management of Used Lead-Acid Batteries

Lead recycling plants with pollution control systems require significant investments, and the current volume of batteries in Nepal is not sufficient enough to warrant the establishment of a plant. Therefore, lead scraps need to be exported for recycling in a country where a recycling plant with a pollution control system is in operation. In order to promote ESM of lead scraps:

- Develop and enforce the National Guidelines for Collection, Storage and Transport of Lead Acid Battery.
- Introduce a dual system of distribution-collection by providing new batteries to users and collect the used ones to be forwarded to collection centers.
- In order to prevent acid leakage during transboundary movement and reduce the cost of transport, properly designed acid neutralization facilities are needed within the regional collection centers (this includes batteries from solar systems and vehicles).

Moving Towards Lead-free Paint

- MoSTE recently introduced a national standard for lead content in paint (90 ppm), but monitoring mechanisms are lacking. Today, substitutes for lead paint are cost-effective and relatively easy to obtain. Paints without lead additives have been used in many countries for decades and have proven to be viable, cost-effective alternatives to lead paint. While enforcing current paint standards is beneficial, it is recommended to promote lead-free paints in the future.

Recommendation 3

Develop environmentally responsible solid waste management plans for all settlements and housing construction projects in the affected districts at the municipality and VDC levels.

- Develop a guideline for environmentally responsible solid waste management in settlements and small urban areas.

- Organize training programs for local bodies, NGOs, and community organizations on the proper use of guidelines.
- Design and implement pilot projects on environmentally responsible solid waste management in select municipalities within affected districts.

Annex 2: Policy and Governance Issues

By Narayan Belbase and Santosh Nepal

Nepal has put in place a legislative and policy framework, institutional structure and other governance mechanisms for biodiversity and environmental conservation, as well as for disaster risk management (DRM). The Forest Policy 2015, Draft REDD Strategy, Thirteenth Plan (2014/15-2017/18), National Biodiversity Strategy and Action Plan 2014, Climate Change Policy 2011, and National Strategy for Disaster Risk Management 2009, are some of the most important legal and policy instruments. Similarly, relevant legal instruments important for environmental policy and governance include the Interim Constitution of Nepal 2007, Solid Waste Management Act 2011, Environment Protection Act 1996, Local Self Governance Act 1999, Forest Act 1993, Water Resources Act 1993, Pesticides Act 1991, Natural Calamities (Relief) Act 1982 and Good Governance (Management and Operation) Act 2007.

A wide range of institutions has been established to address the conservation of biodiversity and the environment; adaptation to and mitigation of climate change, and provide institutional oversight. Central level institutional arrangements critical to the conservation of the environment and disaster risk management include: Parliamentary Committees on Development, Environment Conservation, Agriculture and Water Resources, and State Arrangement; the Environment Protection Council; Climate Change Council; National Tiger Conservation Committee; Central Natural Calamities Relief Committee; National Biodiversity Coordination Committee; and Environment Friendly Local Governance Central Steering Committee.

National Strategy for Disaster Risk Management

Although it has been six years since the National Strategy for Disaster Risk Management (NSDRM) was adopted by the Government of Nepal (GoN) in 2009, most of the 29 strategic activities under five priority actions have yet to be implemented. Government officials and representatives of non-governmental organizations in districts such as Gorkha are not aware of the existence of the NSDRM, nor its provisions and requirements. As district level government officials and NGOs are not cognizant of the provisions of the NSDRM, local government authorities such as the district development committees (DDCs), municipalities, and village development committees (VDCs) cannot be expected to implement it.

Effectiveness of laws, policies and institutions

The laws and institutions related to disasters and natural calamities are ineffective in anticipating, planning for and reducing disaster risks in order to effectively protect citizens and communities, specifically with respect to health, livelihoods, and natural assets. The main reason is the laws and institutions focus on rescue and relief rather than disaster prevention, preparedness and reduction. Although International Federation of the Red Cross and Red Crescent Societies (IFRC)

(2011) maintains that the main gaps in the legal and institutional framework for DRR in Nepal concern disaster management legislation, building code implementation, land use planning and relocation of high-risk communities, legal barriers to the participation of international and national civil society, and community information on impending disasters, a comprehensive disaster management law has yet to be enacted.

Inconsistency and overlaps among sectoral legislation

Sectoral laws provide the framework to set the mandates and powers of institutions responsible for managing or regulating an economic sector (Denier *et al.*, 2014). However, there is inconsistency and overlap among the sectoral policies and legislation of the development sector, and with conservation legislation. The policies and legislation for the development sector does not often include provisions for other sectors, in particular the forest and soil conservation sector and the environment and climate change sectors. . Even though the activities of the development sector, such as energy, infrastructure, industry, and roads can have a negative effect on biodiversity, the environment and forests, the sectoral ministries are only concerned with fulfilling their sectoral mandates and scope of work. These sectors seemingly have been "granted preferential treatment which has resulted in legal and policy choices that support deforestation rather than sustainability and conservation" (Denier *et al.*, 2014). Due to this reality, it is difficult to expect MoFSC, MoSTE and their line agencies alone to conserve and manage the biodiversity and environment of the country effectively.

The overall aim of the reconstruction and recovery program for the environment and forestry sector is to increase the resilience of ecosystems, the environment and vulnerable communities to future anthropogenic and natural shocks from earthquakes, climate change and other disasters. This will be done by enhancing management capacity, working with other sectors to promote sound development, and reducing unsustainable impacts in order to build back better, safer and greener (NPC, 2015). This should have been a key aim of the reconstruction and recovery program for the infrastructure, productive and social sectors in the Post Disaster Needs Assessment (PDNA), rather than the environment and forestry sector alone. However, the sectoral ministries such as energy, industry, irrigation and physical infrastructure have historically not prioritized increasing this type of resilience.

Conservation and DRR legislation

The stipulations of the Natural Calamity (Relief) Act, 1982, and the institutional mechanism it created, were inadequate in managing the emergency response for smaller scale disasters, including the Udayapur Earthquake of 1988 and the floods in south-central Nepal in 1993. For this reason, these institutional mechanisms are likely not able to handle larger disasters on the scale of the Gujarat Earthquake of 2001 or the Kashmir Earthquake of 2005 (MoHA, 2009). Given the scale of devastation of the April 2015 earthquake and its aftershocks, this conclusion was proven accurate. Nearly everyone consulted stated that if Nepal had effective laws, policies and institutions focused on DRM, there would have been less loss of life and property, and fewer impacts to ecosystems.

Furthermore, the Relief Act, even with its amendments, does not incorporate the shifting emphasis from relief to preparedness, mitigation and mainstreaming DRR into the development efforts of the country (MoHA, 2009). Therefore, it is critical to promote a paradigm shift in natural calamity related laws from reactive intervention in the form of relief to a proactive approach of mitigation in order to effectively protect communities and their health, livelihoods, and natural assets, particularly for the elderly, women, Dalits, and indigenous people. Although a DRM Bill was drafted prior to the adoption of NSDRM, it has yet to be enacted.

Although the purpose of the provisions in the Environment Protection Act and Forest Act is to conserve biodiversity, the environment and forests, and to promote sustainable development, the environmental requirements of these laws have often not been complied with, including conducting environmental impact assessments (EIAs) and not allowing the establishment of infrastructure projects in forest areas outside of national priority plans. The environmental management plans (EMPs) that are part and parcel of EIA studies and project approval have only been partially implemented, due to lack of monitoring and oversight. The National Biodiversity Strategy and Action Plan (NBSAP) states that development of infrastructure inside forest land is an important factor causing forest loss and degradation (MoFSC, 2014). Environmental requirements may not be respected during recovery and reconstruction unless ministries, and the firms and agencies undertaking construction, comply with environmental requirements while overseeing urban development, energy, irrigation, physical infrastructure and transport infrastructure.

Environmental laws also need to be revised and updated in order to ensure they contribute to maintaining the ecological bottom line; address the ecological footprint of the people of Nepal; implement a precautionary approach; integrate environmental, social and economic objectives; and ensure good governance, including public participation in the environmental decision making process.

Integration of conservation and DRM in sectoral mandates

Although Nepal cannot afford to perpetuate the disconnect between disaster risk reduction, sustainable development and climate change, there is no concerted effort to integrate these three essential aspects into development sector laws, policies, programs and activities. Ironically, there has not been significant achievement in mainstreaming DRR into policies and programs of the development sector, even though it was included in the second strategy of the Three Year Plan (2011/12-2013/14) and the sole objective the Thirteenth Plan (2014/15-2017/18).

Sectoral, local, regional and national land-use and development plans and processes that do not take into account ecosystem approaches tend to accumulate disaster risk by intensifying the impacts of natural disasters. It is vital that such plans and processes are aligned with DRR specific efforts, such as ecosystem restoration (Partners for Resilience, 2014). It is important to mainstream biodiversity and environmental considerations and DRR into laws, policies, plans, and scope of work of the development sector. This includes sectoral ministries in energy, industry, irrigation, physical development and transport, and urban development. The government needs to take appropriate measures to do this, taking into account the three dimensions of sustainable development, including strengthening coordination and cooperation to reduce exposure and risk to protect people, infrastructure, and natural and other assets from the impacts of disasters.

One of the PDNA's medium and long term priorities does cover measures to mainstream DRR into the development sector, particularly housing, private and public infrastructure, social sector (health and education) and livelihoods (NPC, 2015). However, unfortunately the PDNA ignored mainstreaming environmental considerations into the development sector. Despite this, most of the people consulted during the rapid environmental assessment (REA) suggested that the government needs to integrate biodiversity, environmental considerations and DRR into development sector laws, policies, institutional mandates, programs and projects.

Implementation of laws and policies

Most of the officials and representatives of CSOs that were consulted felt that the implementation of conservation and disaster related laws and policies has been weak, and consequently only partially implemented. There are already gaps in the DRR related laws, and there are insufficient human and financial resources for DRR. Another major problem is that the political parties do not take into account conservation when it comes to development projects. Their approach promotes infrastructure development projects at any cost.

The Soil and Watershed Conservation Act enacted in 1982, which entered into force 26 years later in 2008, has yet to be fully implemented. The effective and full implementation of this law could have assisted in reducing the devastating effects of the earthquake in some of the hardest hit districts. In spite of the fact that there have been solid waste management problems in most urban areas, including Kathmandu, the implementation of the Solid Waste Management Act 2011 is very weak in most municipalities.

Local government's role in conservation and DRM

The Local Self Governance Act 1999 requires VDCs to prepare and implement programs with regard to forests, vegetation, biodiversity, soil conservation, and environment conservation in the village development area. Similarly, they are also required to undertake necessary actions to prevent or control natural calamities/disasters, and minimize their impacts. Although the Local Self Governance Act (LSGA) has been in force for the past 15 years, VDCs, municipalities and DDCs have not prioritized the development of a separate program to prevent and control deforestation and degradation of forests. There is also a lack of integration of conservation and DRR into the local development planning process. Nevertheless, some DDCs, municipalities and VDCs have started initiatives, such as the preparation of DRM plans, that address climatic hazards, train professionals and staff, and implement community based disaster management programs (DPNet Nepal, 2013).

The role of local government in post disaster relief work is also reflected in the PDNA findings, and immediately after the earthquake, local government structures reoriented their work to coordinate relief efforts initiated by the government as well as NGOs (NPC, 2015). If the government is indeed sincere about reducing disaster risk, exposure of people to hazards, and vulnerability of people, infrastructure and natural assets, it should empower and mobilize local government by providing the appropriate legal authority and responsibility, human resources and budget.

The Building Act

The National Building Codes have so far only been partially implemented by a small number of municipalities. Thus high-risk buildings continue to be constructed, including in the heavily populated and seismically active areas. Even where the codes have been implemented to establish prior approval of larger buildings, however, no municipality has yet managed to implement the full cycle of building regulation by establishing (1) prior approval, (2) inspection and (3) enforcement/penalties. It is suggested that these three elements are essential to achieve building code compliance (IFRC, 2011). Another gap in the building law is that it does not require approval for buildings at the VDC level. One of the reasons for this non-compliance with the Building Code is the lack of effective monitoring by the municipality officials, which is due to limited human resources and rent seeking. There are also limitations in the Building Act itself, which need to be either amended or, alternatively, a new Building Design and Construction Act needs to be enacted based on scientific and technological innovations. There is a strong need to ensure that the individuals and government officials who do not comply with the legislation pay severe penalties; these should apply even after the retirement of the government officials concerned.

Institutional arrangements

As with the National Disaster (Relief) Act, the powers and functions of the Central Disaster Relief Committee (CDRC) and District Disaster Relief Committees (DDRCs) are focused on relief rather than preparedness, rescue, and recovery and reconstruction. This effectively limits the scope of these institutions. It is therefore essential to strengthen the central, district, municipality and VDC level Disaster Relief Committees by providing them with appropriate powers and functions and human, physical and financial resources. This is particularly true if the government still does not favor establishing a National Commission for DRM, National Authority for DRM, District Disaster Management Authorities, and Municipal Authorities for DRM and Village Development Committees, as it committed to do in the NSDRM approved in 2009. The PDNA, however, envisages the establishment of an institutional mechanism with a reporting line to the cabinet and other high-level political bodies (NPC, 2015).

There have also been negative effects stemming from the earthquake on community institutions such as buffer zone, community forest, irrigation and leasehold forest user groups. In most of the VDCs that have been hard hit by the earthquake, the resources that these community institutions have been managing have either been partially or fully destroyed, and it is likely that landslides triggered during the monsoon season had further negative impacts. A large number of community forest user group members and executive members were directly affected by the disaster (NPC, 2015), and lost their leaders and champions.

Community based conservation and DRM

Nepal has many rural communities and villages scattered across remote, rugged terrain that is difficult for government agencies to reach, particularly during a disaster. For this reason, it is important to promote community based disaster management by providing statutory recognition for this, with equitable representation of women and other disadvantaged groups. Three key arguments justify the need for promoting community-led and community-managed DRR

initiatives: 1) local communities are in most cases the first responders when a disaster happens (e.g. after an earthquake up to 85% of people are rescued by relatives and neighbors); 2) most top-down risk reduction programs fail to address the specific needs and demands of at-risk communities; and 3) local actors have skills, knowledge and resources (materials, labor) which are often underutilized in DRR interventions by external actors (Partners for Resilience, 2014).

Almost all the government officials and NGO representatives consulted in districts such as Gorkha have suggested the importance of promoting community based disaster and environmental management through law, policy, and provision of capacity development and financial resources. The principle of subsidiarity also requires GoN to promote conservation and DRR initiatives at the lowest level, including in communities living nearest to biological and environmental resources, and communities that are at risk when disaster occurs.

Risk governance

In order to facilitate community participation in recovery and reconstruction efforts, the PDNA stipulates that the recovery program involve communities at the level of planning, monitoring, implementation, and monitoring. The focus of the GoN during the recovery and reconstruction should be strengthening program management; augmenting local governance capacity; setting up standards and practices for accountability and transparency; and grievance redress and strengthening disaster risk governance in Nepal (NPC, 2015). However, the emphasis of these important elements of governance are abridged by the PDNA governance sector focus on rebuilding and repair of government infrastructure and strengthening coordination within state institutions. Contrary to PDNA Volume A, Volume B envisages strengthening accountability processes, working collaboratively with civil society, strengthening citizen service centers and rule of law processes, and ensuring the participation of the most vulnerable affected populations in decision-making processes. Although the PDNA also notes that the possible translocation of villages will further worsen community-based forest governance and resource stewardship, it does not give any priority to issues related to environmental governance and risk governance. So there remains a risk that recovery and reconstruction might be at the expense of environmental resources, goods and services.

Implementation of policies and laws

It is likely that MoFSC and its line agencies will only be able to partially implement some of the working policies of the Forest Policy 2015, such as expanding carbon sequestration through sustainable management of forests; identifying, developing and using appropriate technology to reduce adverse impacts of climate change; and developing forest management plans that take into account climate change adaptation. This is particularly true if government agencies, the private sector and development partners do not give due regard to conservation and sustainable use of forest resources and products, especially during recovery and reconstruction. This applies to the vision and working policies of the Environment and Climate Change sector of the Thirteenth Plan, particularly the formulation of a green development framework and its internalization in all sectors related to economic activities, as well as priority actions of the NBSAP relating to adaptation to and mitigation of the effects of climate change.

The implementation of policies, plans and DRM law and, at times, the provisions of biodiversity and environment conservation laws have been mostly ineffective. Also, the provisions of the Land Act 1964 relating to land use have hardly been implemented. Therefore, the government needs to ensure that the provisions of different policies, plans and laws are effectively complied with and implemented in order to ensure disaster risk prevention, preparedness, and reduction, as well as green recovery and reconstruction.

The government should develop a system of pollution prevention and control as envisaged in the Environment Protection Act 1996 and Environment Protection Regulations 1997, and should also implement these policies effectively. The Initial Environmental Evaluation (IEE) and EIA are the only tools that the GoN has been utilizing to mitigate the potential adverse environmental impacts of development projects. The sectoral ministries do not prioritize monitoring the implementation of EMP, and MoSTE does not have enough human and financial resources to monitor implementation. To ensure that there is no significant adverse impact of the recovery and reconstruction program and activities on the environment, it is essential to develop, implement and monitor the implementation of the EMP of recovery and reconstruction programs. There is also a need for developing and implementing a system for strategic environmental assessments.

It is also a priority to monitor compliance with environmental requirements set by different pieces of legislation, such as the Solid Waste Management Act 2011, Local Self Governance Act 1999, Environment Protection Act 1996, Forest Act 1993, Pesticides Act 1991 and National Parks and Wildlife Conservation Act 1973. It is critical that lawmakers and policymakers realize the benefits of compliance with laws in general, and environmental laws, regulations and standards in particular. Otherwise there will be little incentive to comply with environmental requirements. The reality in Nepal is that non-compliance with environmental legislation is more beneficial than compliance.

Strengthening local governments

Strengthening the role of local governments is essential for conservation and DRR. This includes revising the Local Self Governance Act 1999, and also providing necessary human and financial resources to carry out activities related to biodiversity, environmental conservation and DRR more effectively. The VDCs, municipalities and DDCs should also be required to integrate biodiversity and environmental conservation and DRR into development, implementation, and monitoring and evaluation of VDC, municipality and DDC level plans and programs. Empowering the Environment Friendly Governance District Coordination Committees, the Environment Friendly Local Governance Municipal Coordination Committees and the Environment Friendly Local Governance Village Coordination Committees with powers and functions by law for conservation and DRR, and institutionalizing these powers, would be effective in promoting both conservation and DRR at local level.

Enactment of new DRR law

The enactment and effective implementation of a new DRR law is essential to anticipating, planning for and reducing disaster risk. This will more effectively protect the health, livelihoods, and natural assets of citizens, women and marginalized communities, and provide legal measures for rescue, relief, recovery and reconstruction when disasters happen. Improvements in the legal

and institutional framework are the medium and long term¹ priorities of the government (NPC, 2015). However, rather than waiting three to five years (medium to long term), it is wise to immediately enact and implement new DRR legislation based on the NSDRM, Thirteenth Plan and the priorities of Sendai Framework for Disaster Risk Reduction 2015 in the short term. The GoN must do so within the next few months and should give equal importance to the conservation of biodiversity, environment and forests during the recovery and reconstruction process, as well as in the new DRR law to be enacted.

The government should also enact the Agriculture Management Act and Biodiversity Management Act, as recommended respectively by the Strategic Framework for Sustainable Development (awaiting GoN approval) and National Biodiversity Strategy and Action Plan 2014. These Acts will help to ensure conservation and sustainable use of biodiversity, equitable sharing of benefits from biological resources, and farmers' rights.

The government also needs to commit to providing appropriate human resources. It is essential to provide at least two dedicated, Gazetted level staff to District Disaster Management Authorities and the Municipal Authority for DRM. This should include one staff member each for implementation of DRR and environmental conservation laws and policies, and a reasonable annual budget for operations. The staff should have the authority to prevent the implementation of any project that is likely to trigger human induced disasters and/or have significant adverse impact on the environment. The implementation of laws and policies will only be achieved if there is dedicated staff and budget.

The GoN needs to prioritize the formulation and implementation of a new DRR Strategy in accordance with the Sendai Framework for Disaster Risk Reduction 2015–2030. Nepal has committed to assign, as appropriate, clear roles and tasks to community representatives within disaster risk management institutions, processes and decision-making. The development of these laws and regulations should be done by adopting the Sendai Framework for Disaster Risk Reduction 2015-2030, and through relevant legal frameworks as well as comprehensive public and community consultations to support their implementation.

Integration of conservation and DRR in sectoral laws and policies

The integration and mainstreaming of conservation and DRR into sectoral laws, policies, programs and projects is non-existent. The PDNA attests to this fact, as one of the medium and long term priorities includes measures to mainstream DRR into the development sector. All people consulted in Gorkha suggested that the government needs to integrate conservation and DRR into development sector laws, policies, institutional mandates, programs and projects. Existing sectoral legislation such as the Electricity Act, Local Self Governance Act, Public Roads Act, Tourism Act, Town Development Fund Act, and Water Resources Act need to be revised to mainstream and integrate environmental conservation, DRR and climate change adaptation. The formulation and implementation of disaster risk and ecologically sustainable laws, policies and programs should be included in the scope of the sectoral ministries, including energy, irrigation, industry, physical infrastructure and transport.

¹ For the PDNA short, medium and long term respectively means up to one year, two to three years, and four to five years (NPC, 2015).

Establishment of appropriate institutions

The GoN should establish a National Commission for DRM, National Authority for DRM, District Disaster Management Authorities, Municipal Authority for DRM, and Village Development Committee as stipulated in the NSDRM. This should involve strengthening these institutions by providing appropriate powers and functions through law and human, physical and financial resources. This will enable these institutions to prevent new and reduce existing disaster risk; develop and implement disaster risk informed policies and programs; tackle disaster risk drivers; prevent and control unsustainable use of natural resources; and promote ecosystem services and building back better and greener in post-disaster recovery, rehabilitation and reconstruction.

The NPC (2015) requires MoFSC and MoSTE to coordinate the recovery and reconstruction program for the forestry sector and for the environment sector, respectively. The deeper question, however, is how effective the coordination will be for MoSTE, particularly because MoSTE does not have a presence at district level and is not included in the Environment Protection Council. Establishing an institutional presence for MoSTE at district level is critical to ensuring appropriate scopes of work and representation for institutions such as the Environment Protection Council and Climate Change Council, to enable them to fulfill the objectives of different laws, policies and programs that they were established to administer and implement. This is particularly important as it is likely that most of the recovery and reconstruction programs of the production and infrastructure sectors enshrined in the PDNA Volumes A and B will be implemented at the expense of environmental and forest resources.

Amendment of environmental laws

It is also necessary to amend sectoral legislation, including the National Parks and Wildlife Conservation Act, Forest Act, and Environment Protection Act. This should address the ecological footprint of the people of Nepal; implement the precautionary approach; integrate environmental, social and economic objectives; promote public participation in the environmental decision making process; and promote good governance. Amendments should also address prevention/mitigation of adverse environmental impacts from recovery and reconstruction efforts, and include reasonable penalties commensurate with the commission or omission of an act and/or environmental requirements.

Improving governance

Risk governance assesses the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analyzed and communicated, and how management decisions are made (Renn, 2008). This also includes institutions, organizations, laws, regulations and contributions from civil society and private sector actors that influence risk management (Holley et al., 2011). Huge loss of life, and of natural, social and physical assets caused by the earthquake and driven by increases in exposure and vulnerability reveals shortcomings in current disaster governance in Nepal. Tackling this necessitates establishing accountability mechanisms for governance, which should prevent and control risk governance failures. In order to ensure that accountability for risk governance is

effective at the different stages of the disaster management cycle, the government should focus on institutionalizing public accountability, vertical accountability and shared accountability through the application of social accountability mechanisms.

The development of capacity in CSOs and government agencies, particularly at the district, municipality and VDC levels, is important for participatory monitoring of compliance with and enforcement of environmental requirements. Self-monitoring should precede participatory compliance monitoring and enforcement. Self-monitoring, and dissemination of the findings of the self-monitoring, should be mandatory to verify local level compliance with environmental requirements and programs and activities implemented by the government and other agencies, including the private sector. The foundation of participatory compliance monitoring should be constructive citizen and government engagement. It would be useful to undertake self-monitoring of recovery and reconstruction activities, and compliance with environmental requirements, once every 30 days.

Ensuring stringent enforcement where and when there is non-compliance with environmental and DRR regulatory measures is essential. At the same time the government needs to take appropriate accountability measures to promote public and vertical accountability of recovery and reconstruction programs. Application of social accountability mechanisms would make the organizations involved in conservation, DRR and recovery and reconstruction transparent and accountable, and ultimately improve disaster and environmental governance.

References

- Denier, L., Korwin, S., Leggett, M. and MacFarquhar, C. 2014. *The Little Book of Legal Frameworks for REDD+*, Global Canopy Programme: Oxford, UK.
- Disaster Preparedness Network Nepal. (2013). *Nepal Disaster Report, 2013*. Ministry of Home Affairs and DPNet-Nepal. Kathmandu, Nepal.
- Holley, C., Gunningham, N. and Shearing, C. 2011. *The New Environmental Governance*. Routledge. New York, USA.
- International Federation of Red Cross and Red Crescent Societies. (2011). *Analysis of Legislation Related to Disaster Risk Reduction in Nepal*. International Federation of Red Cross and Red Crescent Societies, Geneva, Switzerland.
- Ministry of Home Affairs. (2009). *National Strategy for Disaster Risk Management, 2009*. Ministry of Home Affairs, UNDP and the European Commission for Humanitarian Aid. Kathmandu, Nepal.
- MoFSC. 2014. *Nepal Biodiversity Strategy and Action Plan 2014*. Ministry of Forests and Soil Conservation. Kathmandu, Nepal.
- National Planning Commission. 2015. *Nepal Earthquake 2015: Post Disaster Needs Assessment, Vol. A, Key Findings and Vol. B, Sector Reports*. National Planning Commission, Kathmandu, Nepal.
- Partners for Resilience. 2014. *Policy Brief for Post-2015 Framework for Disaster Risk Reduction: Key Messages on Building Resilient Communities*. Partners for Resilience.

<http://www.climatecentre.org/downloads/files/PfR/PfR%20Policy%20brief%20HFAII%20May%202014.pdf> downloaded September 2015.

Renn, O., Klinke, A. and van Asselt, M. 2011. Coping with complexity, uncertainty and ambiguity in risk governance: a synthesis. **Ambio** 40: 231–246.

Annex 3: Summary of Field Visit Findings in Districts and Kathmandu

Compiled by Dr. Dinesh Bhuju from the inputs of the field team

The following tables present summaries of the field visit observations and findings in the six districts and in Kathmandu.

Dolakha District

SN	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Agriculture, Livestock and Livelihood	Agricultural land encroachment	Direct	Economic and social: loss of production in 2 ha of agricultural land in Dihi BM, as well as other parts of district	People will move soon	Risk of environmental impacts while moving to safer place	Provide credit for building reconstruction	Bauwa Lal Chaudhary (Senior Agricultural Officer)
		Yellowing of potatoes	Direct	Economic: NRs 3 million	Use of different chemicals	Persistent organic chemicals may have severe impacts	Ban harmful chemicals and provide subsidy for farmers for new potato seeds	Sambhu Dhakal (Director of TRTC)
		Dairy production	Direct	Economic: 20 Chauri (crosses of Yak) killed when shed damaged in Chauri farm; reduction in production of cheese in Jiri	New shed for production was immediately constructed	Impact on drain management	Provide soft loan to raise Chauri for dairy production	Nawaraj Dhakal (Livestock Development Officer)
		Impact on biodiversity in Gaurishankar	Direct	Biological: encroachment in GCA by 100 pigs	Try to re-establish new pig farm	Minimal impact while re-	Remove the landslide from	Aashish Lama (Local)

		Conservation Area in Singati as a result of damage to pig farming operations		Economic: Increase in unemployment		establishing the new farm	the Rolwaling Highway	
		Livestock loss	Direct	Economic: impact on milk production, loss of 27,886 livestock	DASO plans to provide farmers with new livestock	Dead livestock causing foul smell	Proper management of dead livestock	DLSO
		Seeds and harvested crops covered in demolished structures	Direct	Economic: about US\$ 4.4 million	Relief program implemented (rice, Chiura, instant noodles distributed)	Minimal environmental impact	Provide required seeds to affected households	DADO
2	Forests and Biodiversity	Loss of ecologically important forest	Direct	Biological	No remedial action		Planting of indigenous trees	Mukunda Pd. Adhikari (ADFO, District Forest Office)
		Encroachment on forest land	Direct	Biological: forest land area lost Social: conflict with forest officials	Patrolling of Nepal army to identify and regulate encroachment	Chance of further encroachment in community forests	Community should relocate to proper place	
		Deforestation	Direct	Biological: cutting down of various tree species for shelter	Community forest supply was limited, leading to encroachment of nearby forests		Tree plantation	
		Loss of forest land	Direct	Biological: loss of 50 ha forest land	Emphasis placed on forest management and information collection			
3	Landslides and soil erosion	Disturbance in transport	Direct	Economic: transportation disturbed in 35 km in 8 VDCs along Rasuwagadi Road	Removal of debris from the road	Chance of further landslides and siltation of the river	Apply bioengineering technique to enhance slope stabilization	Thakur Pd. Mugrati (DSCO)
		Biodiversity loss	Direct	Biological: Loss of more than 340 ha of forest that	-	-	-	Mukunda Pd. Adhikari

				included some 100 tree of <i>Taxus wallichiana</i> (Himalayan yew)				(Ass. FO, UFO)
		Damage to agricultural land	Direct	Economic: over 410 ha of agricultural land lost in 13 VDCs Social: Scarcity of food	-	-	-	Thakur Pd. Mugerati (DSCO)
		Foot trails	Direct	Social: Kalinchowk Bhagawati	Reconstruction of trail and installation of staircase	Chance of landslide	Focus on bioengineering	
4	Water resources	Drinking water supply tap (6,674)	Direct	Economic: NRs. 636,400	Repair and reconstruction of pipelines and tanks	Soil erosion and vulnerability to landslide; supply of unhygienic water	Rebuilding reservoir, tap, latrines	Hari Bd. Basnet (Technica, DWSS)
		Damage to reservoir tank (120)						
		Household latrine (53,584)						
		Institutional latrine (168)						
		Spring intake						
		Water sources drying up	Direct	Social: supply of drinking water to 170 households of Dhobikhola Khanepani in Dhaibung VDC	New sources of water are being used	Water quality deterioration	Focus on water quality and quantity	
		Irrigation	Direct	Economic: pipeline damaged and more than 12 irrigation canals damaged	Reconstruction of canals and pipelines	High probability of landslide	Focus on leakage of water into cracks	Naraj Dahal (DIO)

5	Tourism	Cracks across and landslides over trekking routes	Direct	Economic: tourists stopped visiting GCA Social: religious tour of Kalinchowk Bhagwati, Dolakha Bhimsen disturbed	Alternative route to Kalinchowk foot trail through Deurali was used	Cracks are very vulnerable to monsoon rains	Tourism and sustainability	Sita Neupane (Local)
		Hotels and Restaurants	Direct	Economic: 25 hotels damaged	Reconstruction of hotels and restaurants	Increase in deforestation in nearby forest	Ecotourism	Sadib Babu Shrestha (Local Tourism Entrepreneur)
6	Energy and Transportation	Charnawati, hydropower (3.45MW) production affected	Direct	Economic: penstock damage Impact on dam transmission line Social: load shedding	Repair the penstock pipe and dam	-	Hydropower and energy	Krishna Thapa (Watchman, Charnawati HPP)
		Landslide affects the road to 8 VDCs in southern part of the district	Direct	Economic / Social	Attempted to remove the landslide from road	Sedimentation problem in the Tamakoshi river	Transportation	Ajay Thapa (DSP)
		More than 95% of ICS damaged	Indirect / Direct	Social/ Economic	-	-	Rebuild ICS in temporary shelter	Ganga Adhikari (Local ICS User)
7	GESI	Inequality in distribution of relief (WASH kit, safety kit) especially for	Indirect / Direct	Social	-	-	Distributing relief to single and lower caste women; maintaining	Suraja Dahal (DCWDO, Inspector)

		single women and lower caste women					safety while providing the relief	
		Disagreement with GoN employee						
8	Waste management	Solid waste debris management in Biruwa (dumping site of municipal waste)	Direct / Indirect	Social: conflict with solid waste management Charnawati river water pollution Health problems for waste segregator	No remedial action applied	-	Sanitary landfill	Muna Basnet (affected community member)

Gorkha District

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Agriculture, livestock and livelihood	a. Crop damage b. Livestock loss c. Agri-machinery d. Agri-infrastructure e. Fisheries f. Loss of land	Direct	Economic a. NRs 476,163,000 b. NRs 92,977,250 c. NRs 15,825,000 d. NRs 66,850,000 e. NRs 5000000 f. 3,915 ha	<ul style="list-style-type: none"> 8 different types of paddy seeds distributed Planning to distribute varieties of fruit plants Proper management of carcasses Animal health camp Animal fodder distribution 	<ul style="list-style-type: none"> With the new varieties of paddy, new pests may appear To control the new pests; stronger pesticides may be used, which can ultimately harm the environment 		Krishna (planning officer) Dr. Indra Bhatta (Head)
2	Forests and biodiversity	a. 10% forest loss b. Wild animal death	Direct / Indirect	Economic, biological, social	<ul style="list-style-type: none"> Deforestation may occur for construction materials 			Hom Bdr. Balchaudi (Assistant Forest Officer)
3	Landslides and watershed	More than 11 VDCs (2,214 households) are vulnerable to landslide	Direct	Economic and Social	<ul style="list-style-type: none"> Ministry of Home Affairs assembled committee for action but due to technical problems it is pending in some VDCs 	<ul style="list-style-type: none"> Forest encroachment Grazing land encroachment Chance of disease spreading due to poor sanitation 	Proper sanitation for relocated people	Raju Dahal (DSC Officer)
4	Water resources	a. Change in water quality b. Drying of water sources	(Direct / Indirect)	Economic, social <ul style="list-style-type: none"> 75 fully damaged and 516 partially damaged 	<ul style="list-style-type: none"> Water quality test Formation of WASH cluster Hygiene kit distribution 			Narayan Prasad Acharya (Head) Madhav Shrestha (Engineer), Lok

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
		c. Fully and partially damaged drinking water and irrigation project d. Drinking water pipeline damage		drinking water projects <ul style="list-style-type: none"> 215,000 fully damaged and 14,750 partially damaged pipelines 19 partially damaged irrigation canals 	<ul style="list-style-type: none"> Pipeline distribution in 5 VDCs Bleaching powder and water purification kit distribution 			Bdr. Thapa (Head)
5	GESI	a. Violence and security b. Child trafficking c. Maternity health	Indirect	Social <ul style="list-style-type: none"> 8 children lost in the district Sexual harassment Poor health 	<ul style="list-style-type: none"> Dignity kit and blanket distribution Women and children in secure area Psychological council Awareness program 		<ul style="list-style-type: none"> Strict security in check points and highways Women's and children's rights 	Kamal Shrestha (Child rights Officer), Sharada Dhakal

Kavre District

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Agriculture, livestock and livelihoods	• Plastic tunnel destruction	Direct	Economic: Loss of NRs 3.17 million	Repairs	Destruction of trees and forest	Debt relaxation	Mr. Krishna Prasad Dhital
		• Irrigation canal destruction	Direct	Economic: Loss of NRs 6.9 million Social: Conflict	Repairs	Repair of irrigation canal uses more natural resources		
		• Agricultural land lost due to landslide and cracks	Direct	Economic, social and biological	Filling the crack with soil from nearby region by local people	Extraction of soil from nearby land may encourage landslides there too	Recovery of destroyed agricultural land	
		• Poultry farm destruction	Indirect	Economic: Loss of 16,407 poultry livestock	Use of chemicals to dispose of carcasses	Impact of chemical on soil quality	Awareness of the impact of chemicals	
					Repair	Destruction of forest	Compensation for farmers	
2	Forests and biodiversity	a. Destruction of trees in community forest	Indirect	a) Ecological: loss of forest biodiversity	• No rules until now against forest destruction after earthquake		Reforestation	Mr. Binod Sapkota, President of FECOFUN
		b. Encroachment on forest by local people	Indirect	b) Ecological: disturbance of forest biodiversity, human	• Construction of temporary shelters for people		Awareness program on importance of forest and biodiversity	

Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
				wildlife conflict			
		c. Encroachment of community forest from Kavre to Sindhupalchok	Indirect	a) Social: conflict between people	<ul style="list-style-type: none"> Continuous inspection of forest by local communities 		Implementation of rules and regulations by CFUGs
3	Landslides and watershed						
4	Water resources	a. Drying of water spouts in different places in Kavre District	Direct	a) Ecological: less water for vegetation b) Social: conflict	<ul style="list-style-type: none"> No specific remedial action at organization level Communities sharing water resources across VDCs 	Social conflicts are arising due to caste discrimination in using water sources	Searching for new water spout resource Water efficient irrigation techniques
		b. Pollution of water due to disposal of dead bodies and debris	Indirect	a) Ecological: impact on aquatic biodiversity b) Social: Conflict due to bad odor	<ul style="list-style-type: none"> No specific plan from organizational level Excavator was used to bury dead bodies by local people 	Land vibration, soil erosion, cracks in land, Disturbance in aquatic ecology.	
							Mr Murari Sapkota, local people of Kavre and Community

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
						River channel shifting in the bank of river.		
					Spraying of disinfectant like phenyl or lime water to reduce the odor	Disturbance in aquatic ecology, water pollution		
5	Tourism	a. Decrease in number of tourists	Indirect	Economic: Decline in income for people from Dolalghat, Koshi Pari, Bhumlutar, Dhulikhel	<ul style="list-style-type: none">No specific plan until now at organizational level,Communities are maintaining the houses and roads	Use of resources like cement, pudding, and paint haphazardly is polluting the local environment		Ms Rashmi Giri, Dolalghat Bhumlutar
								Mr. Rabindra Tuladhar, Dhulikhel Resort
6	Energy and Transport	a. Destruction of numerous biogas plants, ICS	Direct	Ecological: impact on forest resources, use of more fuel-wood	Use of more fuel wood	Use of more fuel wood increases indoor air pollution	Biogas and ICS reconstruction	Ms Kunta Devi Parajuli, Jyamdi, Kavre
7	GESI	a. Safety of pregnant women and infants	Direct	Social: women and infants are unsafe in tents	Special tents, safety kits and children's food are being distributed		Women's' safety and women's work load	Mr. Jaya Ram Silawal

Nuwakot District

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Agriculture, livestock and livelihood	Poultry farm	<ul style="list-style-type: none"> • Direct • Indirect 	<ul style="list-style-type: none"> • Economic • Social • Biological 	<ul style="list-style-type: none"> • Rebuilding • Repair 	<ul style="list-style-type: none"> • More resources used in rebuilding • Increase in chemical fertilizer use in absence of poultry manure 	<ul style="list-style-type: none"> • Debt relaxation • Addition of anti-odor materials • Safe disposal • Market management of poultry manure 	<ul style="list-style-type: none"> • Singh Narayan Chitrakar • Laxman Bajgai
		Fish farm	Direct	<ul style="list-style-type: none"> • Economic: Fish-NRs. 120,000 Fry- NRs. 200,000, Fish pond repair-NRs. 50,000 per pond 	<ul style="list-style-type: none"> • Repair • Transform fry to safe pond 	<ul style="list-style-type: none"> • More resources used in rebuilding 	<ul style="list-style-type: none"> • Reconstruction • Research safe place to establish fish farm 	<ul style="list-style-type: none"> • Daman Bahadur Lama
		Destruction of canals	Direct	<ul style="list-style-type: none"> • Social • Economic: affect on agricultural production, monetary loss 	<ul style="list-style-type: none"> • Rebuilding • Repair 	Possibility of high dependence on forest resources	Irrigation facility	<ul style="list-style-type: none"> • Krishna Prasad Pyakurel
		Labor not available for work in agricultural fields	Direct	<ul style="list-style-type: none"> • Economic • Social 	Human resources		Job facility	
		Effect on health of livestock	Direct	<ul style="list-style-type: none"> • Biological • Economic 		Death of livestock	<ul style="list-style-type: none"> • Provide health checkup facilities for livestock 	

2.	Forests and Biodiversity	Cracks in community forests	Direct Indirect	<ul style="list-style-type: none"> • Biological • Social • Economic 	<ul style="list-style-type: none"> • Safe channeling • Plantation • Build up engineering structure 	<ul style="list-style-type: none"> • Increase stress on forest resources 	Safe channeling during monsoon season	<ul style="list-style-type: none"> • Shree Krishna Pyakurel • Ram Chandra Bhujel
3.	Landslides and watershed	Active on old landslide areas and possibility of landslides in cracks in steep areas	Direct Indirect	<ul style="list-style-type: none"> • Biological • Social • Economic 	<ul style="list-style-type: none"> • Provide wire nets • Relocation • Construct gabion wall 	<ul style="list-style-type: none"> • Stress on forest resources • Agricultural land degradation 	<ul style="list-style-type: none"> • Safe channeling • Construction of gabion wall • Implication of bioengineering techniques • Plantation 	<ul style="list-style-type: none"> • Shree Krishna Pyakur • Tashi Syampo Tamang
		Dried watershed in community forest	Direct Indirect	<ul style="list-style-type: none"> • Biological • Social 	<ul style="list-style-type: none"> • Geological and hydrological studies were done by survey team of government. 	<ul style="list-style-type: none"> • Stress on remaining water sources in agricultural land downstream. 	<ul style="list-style-type: none"> • Forest conservation 	<ul style="list-style-type: none"> • Ram Chandra Bhujel
4.	Water resources	Decreased water level	Direct	<ul style="list-style-type: none"> • Biological • Social • Physical 	<ul style="list-style-type: none"> • Water collection • Change to areas with water available 	<ul style="list-style-type: none"> • Micro climatic effect • Stress on water sources for irrigation 	<ul style="list-style-type: none"> • Construction of water reservoir tanks and distribution system • Forest conservation 	<ul style="list-style-type: none"> • Dewaki Rai and Durga Dhulal
5	Energy and Transport	Disturbance in energy production	Direct	<ul style="list-style-type: none"> • Economic • Social 	<ul style="list-style-type: none"> • Reconstructi on of damaged infrastructure 		<ul style="list-style-type: none"> • Research on sediment flow • Afforestation • River control 	<ul style="list-style-type: none"> • Hari Pyakurel
6	Solid waste	Difficult to manage solid waste in temporary	Direct Indirect	<ul style="list-style-type: none"> • Biological • Social • Economic 	<ul style="list-style-type: none"> • Waste collection and disposal 		<ul style="list-style-type: none"> • Systematic management of waste by municipality 	<ul style="list-style-type: none"> • Bikram Narsingh Rana

		settlement areas, and waste was produced from destroyed houses			<ul style="list-style-type: none"> • Participation in training 		<ul style="list-style-type: none"> • Program, training provided for management 	
--	--	----------------------------------------------------------------	--	--	-------------------------------------------------------------------------------	--	-----------------------------------------------------------------------------------------------	--

Rasuwa District

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Agriculture, Livestock and Livelihood	Agricultural land encroachment	Direct	Economic: loss of production in about 2 ha agricultural Land in Grang VDC	Monetary value of crop is assessed and budget is being allocated 2 metric tons of seed for paddy has been distributed	Impact on agro biodiversity	Credit for recovery	Madan Regmi, Assistant director, District Agriculture Development Office, Dhunche
		Tunnel agriculture	Indirect	Economic: 400 out of 600 tunnels have been used for settlement or have been damaged. About loss of NRs 800,000	Use of old materials while making tunnels		Agriculture and economy	
		Dairy production	Direct	Economic: reduction in production Before Earthquake: 24 kg per day After Earthquake : 18 kg per day	New shed for production was immediately constructed	Impact on drain management	Agriculture and tourism	Jay Ram Sapkota, Officer, District Livestock Office, Dhunche
		Impact on biodiversity of rangeland due to uncontrolled livestock grazing	Direct	Biological: loss of range land biodiversity	Cowshed in high altitude pasture land was reconstructed	High grazing impact in forest area and open grazing land	Agriculture and biodiversity	
		Livestock loss	Direct	Economic: impact on milk production Biological: Loss of 30,779 livestock	Priority is Haku and Langtang VDCs	Dead bodies polluting water bodies	Proper management of dead bodies	

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/ informant
		Trout farms destroyed (35 out of 55)	Direct	Economic: about Economic loss: NRs 130 million	Restoration of trout farms	Improper management of dead species and polluted water resources	Management of dead trout species	
2	Forests and Biodiversity	Loss of endangered species Loss of ecologically important forest	Direct	Biological: 57 dead bodies of Himalayan Thar, 2 of wild boar Old growth forest in Gobre Salla was destroyed	No remedial action taken		Conservation of biodiversity	Rabindra Prasad Niraula, DFO, District Forest Office, Dhunche Rasuwa
		Encroachment of forest land	Direct	Biological: forest land area lost Social: conflict with forest officials	Patrolling by Nepal army to check encroachment	Chance of further encroachment in community forest		
		Deforestation	Direct	Biological: cutting down of various tree species for shelter	Community forest supply was limited		Biodiversity conservation	
		Loss of forest land	Direct	Biological: loss of 50 ha forest land	Emphasis on forest management and information collection			
3	Landslides and soil erosion	Disturbance in transport	Direct	Economic: transportation disturbed in 24 km, with 56 landslides observed on Dhunche–Syafu-Rasuwegadi Road	Removal of debris from road	Chance of landslides and siltation in river	Bioengineering	Keshav Chandra Lal Das, Office Head, District Soil Conservation Office, Dhunche
		Biodiversity loss	Direct	Biological: more than 50 ha of forest	-	-	-	

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
		Agriculture land	Direct	Economic: loss of 260 ha of agricultural land in 10 VDC lost Social: scarcity of food	-	-	-	
		Foot trails	Direct	Social: access to Haku Dhunche, Thulogau and Dandagaun blocked	Reconstruction of Trail and Installation of staircase	Chance of landslide	Focus on bioengineering	
4	Water resources	Drinking water supply and pipelines	Direct	Economic: NRs 7,500 Physical: damage to 6,700 m of pipeline and 110 m ³ tank Social: people in the VDC have poor supply of water	Repair and reconstruction of pipelines and tanks	Soil erosion and vulnerability to landslide Supply of unhygienic water		Rabi Mohan Koirala, Office Head, Water and Sanitation Office, Dhunche
		Water sources drying up	Direct	Social: supply of drinking water to 170 households of Dhobikhola Khanepani project of Dhaibung VDC	New sources of water have been used	Water quality deterioration	Focus on water quality and quantity	
		Irrigation	Direct	Economic: damage of 41,400 m of pipeline damaged, with 4 pipes cracked and one tank destroyed	Reconstruction of canals and pipelines	High probability of landslide	Focus on leakage of water into cracks	Loknath Sapkota, Engineer, District Technical Office

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
5	Tourism	Cracks and landslide over trekking route	Direct	Economic: flow of tourists reduced Social: religious tour of Gosainkunda disturbed	Alternative route to Chandanbari through Thulo Bharkhu was used	Trekking route section from Dhunche to Deurali vulnerable to landslide	Tourism and Sustainability	Pramod Tamang, Program Coordinator, LaCCOS
		Hotels and restaurants	Direct	Economic: 15 hotels damaged	Reconstruction of hotels and restaurants	Deforestation increase in nearby forest	Ecotourism	Subba Lama, Owner, Red Panda Hotel, Chandanbari
6	Energy and Transport	Mailung hydropower (5MW) production effected	Direct	Economic: penstock damage; impact on dam; transmission line of tower no 2 and 5 damaged Social: load shedding	No remedial measure taken	Dam severely impacted High tension tower of hydropower collapsed	Hydropower and energy	Shiva Ratan Chaudary, Station Manager, Mailung Hydropower, Grang
7	GESI	Skin rashes among children and women	Indirect	Social: change in environment creates health impacts	Providing health facilities Focusing on sanitation	Waste impacting the environment	Health and sanitation	
8	Solid waste debris management	Waste management	Direct	Social: conflict with national park Waste generation increased after earthquake (56 kg/per day) Open pit burning Chance of wildfire	No remedial action applied			

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
				Leaching into water resources				

Sindhupalchok District

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/ informant
1	Agriculture, Livestock and Livelihood	• Cracks in agricultural land	Direct	Economic: decrease in crop production	Farming in area with large crack has stopped	Impact on food security	Identification of land for cultivation	Hem Sharma Tiwari, Chautara
		• Sudden and cascading death of livestock	Direct	Economic: livestock loss and fodder loss			Properly buried the dead livestock Motivate and facilitate commercial livestock farming	
		• Severe impact on livelihoods	Direct and Indirect	Economic: loss of income	Mass migration in search of livelihood opportunities	Unequal natural resource extraction	Managing new livelihood opportunities	
2	Forests and Biodiversity	• Encroachment on forest area	Direct	Biological: forest land used for temporary houses, affecting forest land ecosystem			Relocate local people to areas suitable for living	Lok Bahadur Shrestha
		• Deforestation	Direct	Biological: regeneration of forest weakened due to overcutting	Pole size tree haphazardly cut to make temporary houses		Reforestation and afforestation	
		• Loss of flora and fauna	Indirect	Biological: diversity decreased			Forest conservation	
3	Landslides and watershed	• Loss of agricultural land	Direct	Economic: about 20 ha land loss			Identification of new agricultural land	Ganesh Bahadur Khatri

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
				Biological: land use change				
		<ul style="list-style-type: none">• Standing crop loss	Direct	Economic: about 1 metric ton of maize lost	Distribution of seed by government	Loss of local varieties	Local varieties of seed should be distributed to farmers	
		<ul style="list-style-type: none">• Lose of settlement area	Direct	Economic: 27 homes (soil and stone) affected			Proper residential area should be identified for displaced people	
4	Water resources	<ul style="list-style-type: none">• Drop in supply of drinking water from proposed Melamchi Drinking Water Project from collapse of physical infrastructure and tunnels• Threat to the sustainability of the project from continuous rock falls• Drinking water problems in nearby community	Direct	Economic: burden arising from extension of project; damage to equipment and infrastructure Biological: aquatic system has been affected; imbalance in environment arising from instability of slopes Social: decline in water security	Entrance to the site has been restricted. Apart from that, no remedial response from any sector has been launched, there are no plans to do so.		Biodiversity, physical infrastructure, drinking water project	Nima Hyolmo, Timbu Bazaar
5	Tourism	<ul style="list-style-type: none">• Damage to trekking paths and trails in Helambu region	Direct and Indirect	Economic: Tourism activities disrupted due to damage to sections of	Nothing has been done in response to address the issue.		a. Reconstruction of tea houses and guesthouses along the	Suman Khadka, Timbu Bazaar

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
				trekking path. Kutumsang has suffered modest damage while Melamchigaun has sustained severe damages. Social: mass migration, mostly youth leaving the region			Helambu trekking path. b. Programs to attract tourists and boost confidence of local tourism entrepreneurs. c. Mitigating mass migration	
6	Energy and Transport	<ul style="list-style-type: none">Overconsumption of biomass fuel from treesTransport route blocked due to landslide	Indirect/Direct	Biological: increased forest degradation Social: movement of people was disturbed due to transport blockage	Excavators were used to remove blockage	Land vibrations from excavator contributing to more landslides	Alternative energy source promotion Mechanism to deal with transportation issues in landslide-prone area	
7	GESI	<ul style="list-style-type: none">Women and children traffickingDomestic violence	Direct	Social: Demographic imbalance Damage to social order Disruption in work division among men and women	a. Checking in borders beefed up b. Rehabilitation house for children in Melamchi Bazaar c. Relief materials prioritized for pregnant women	a. Extra resources required for rehabilitation of rescued children b. Freedom of movement of women breached	a. Women's rights awareness b. Women and children trafficking issues c. Restoration of social order d. Fair work and wage division among men and women	Nani Maiya Basnet, Thulo Sirubari

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
8	Solid waste management	<ul style="list-style-type: none"> Poor management of solid waste resulting from the destruction of physical infrastructure. 	Direct	<p>Economic: impact on public health from rising health care costs</p> <p>Biological: disposal in nearby community forest can have impact on productivity of the forest; possibility of land, water and air pollution</p> <p>Social: Possibility of spreading infectious diseases</p>	Temporary pits have been excavated in some places, but no long term plans have been made to treat dispose of waste safely	Temporary pits can invite other serious environmental problems with the onset of monsoon.	<p>a. Landfill site selection for long term solid waste management</p> <p>b. Incineration of hospital waste along with other hazardous waste</p> <p>c. Incentives for treatment of biodegradable household waste at household level</p>	Bode Bahadur Tamang, Chautara-8

Kathmandu

	Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
1	Biomedical Waste	Bir Hospital	Indirect	-	Hazardous waste mixed with non-hazardous waste	Exposure of hazardous waste in the environment	-	Sarita Shakya,
		Bhaktapur Cancer Hospital	No significant effect observed	-	-	-	Provision of autoclave, provision of central waste treatment facility	Raja Ram Tajale
		Laligurans Hospital	Indirect	-	Hazardous waste mixed with non-hazardous waste for management	Exposure of hazardous waste in the environment	Government should have proper planning for early response in hospital waste management during disasters	Prakash Neupane
2	Toxic Chemicals	Nepal Hastakala Mahasangh	Direct	Biological	Cleaning damaged house with handicraft	Mercury exposure in the environment	Assessing damaged houses	Sanam Shakya
		DoFTQC, GoN	Direct	-	Spilled acid neutralized with lime and disposed of nearby.	Exposure of chemicals in the environment	Guidelines for proper laboratory design and proper disposal of expired (chemicals, waste chemicals and chemical bottles	Gajendra K. Paudyal

Thematic area	Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
	Berger Paints	Direct	Economic: worth NRs. 800,000 to 1,000,000	Damaged goods are kept to claim insurance	-	-	K. P. Kafle
	CTL Pharmaceuticals	No significant effect observed	-	-	-	-	Ravi Maharjan
	Varun Beverages Nepal Pvt. Ltd.	Direct	Economic: about NRs. 200,00-400,000	Broken glasses recycled	-	-	Prajwal Manandhar
	ENPHO	No significant effect observed	-	-	-	-	Padmaja Shrestha
	NAST	No significant effect observed	-	-	-	-	Sujen Shrestha
	Forensic Lab	No significant effect observed	-	-	-	-	Jeevan P. Rijal
	CDES, TU	Direct	-	Spilled chemicals and broken glasses dumped nearby	Exposure of toxic chemicals in the environment	Proper disposal of chemicals and broken glasses, as well as a proper rack system, should be maintained	Ramesh Basnet
	Deurali Janta Pharmaceuticals	Direct	Economic: about NRs. 120-150 million	Damaged medicine packed in plastic bags to claim insurance	-	Proper rack system for storing medicine should be maintained.	Min Prasad Panday
	Patan Multiple Campus	Direct	-	Spilled chemicals cleaned	Exposure of chemicals in the environment	Need to build a lab immediately	Binod Baniya

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
		Tri-Chandra Campus	Direct	-	No effort was made to clean the laboratory	-	Laboratory and chemicals should be properly and securely managed as soon as possible.	Siddhi Bhakta Shrestha
		NARC	No significant effect observed	-	-	-	-	Laxman Lakhe
		Nepal Craft Development Association	No significant effect observed	-	-	-	-	Santa B. Shakya
		Lalitpur Hastakala Sangh	No significant effect observed	-	-	-	-	Rajesh Awale
3	Solid Waste/Rubble	SWMTSC, MoUD/GoN	Direct	Social	Proposed that rubble be dumped in Chovar and used as foundation material for Ring Road extension	-	Recyclable and reusable materials from damaged houses should be used as much as possible to minimize the quantity of rubble	Dipendra B. Oli
4	Air Pollution	Santoshi Ita Udhog	Direct	Economic: loss of production of 40,000 bricks/day	The stack partially collapsed, but the kiln is still running.	Emission of air pollutants	Incentives provided for reconstruction of the kiln to meet the huge demand for bricks.	Subash Thapa

Thematic area		Issue after earthquake	Impact of earthquake (indirect/direct)	Impact (economic/social/biological)	Remedial response to the issue	Potential environmental impact of the response	Priority action	Reference/informant
		Tara Ita Udhyog	Direct	Economic: loss of production of 40,000 bricks/day	Brick production stopped	-	-	Prem Bhai Maharjan
		Siddhi Ita Udhyog	Direct	Economic	Brick production stopped	-	-	Buddhi R. Maharjan
		Shree Satya Narayan VSBK	No significant effect observed	-	-	-	-	Sanu Kaji Shrestha



Government of Nepal
Ministry of Science, Technology and Environment

Singha Durbar, Kathmandu, Nepal

Tel: +977-1-4211936, Fax: +977-1-4223868



USAID
FROM THE AMERICAN PEOPLE



WWF



care

