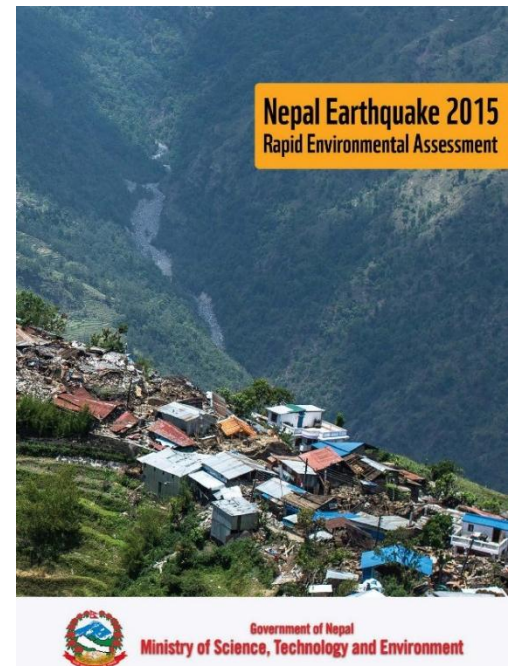


The Nepal earthquake in April 2015 and its aftershocks resulted in huge loss of life, injury, and economic damage. The estimated value of damage and loss was US\$7 billion¹, a large proportion of it housing. Other sectors that require significant reconstruction include agriculture, education, roads, energy, tourism, industry, water and sanitation, and forestry. A rapid environmental assessment of the earthquake² identified direct impacts, and also many potential risks to the environment from reconstruction. At the same time there is a great opportunity to build back not only 'better and safer' but also greener, ensuring healthy ecosystems for disaster risk reduction and natural resources for resilient livelihoods and economic development.



The Nepal earthquake had many direct impacts on the environment. These included: loss of forest and farm land due to landslides and avalanches; changes to water sources; increased sediment in rivers and risk of downstream flooding; impacts on protected area and community forest management; and death of wild animals. Many livelihoods that depend on natural resources were affected, including in the tourism industry. A huge amount of debris was generated from damaged buildings, some of which was dumped in rivers, wetlands and forests. Hazardous waste included medical and electrical wastes (e.g. mercury); laboratory and industrial chemicals; and petroleum products. Some toxic chemicals will have ended up in ground water or rivers; some are persistent pollutants. Dead bodies and livestock carcasses contaminated the environment after the earthquake. Much plastic waste generated in the relief phase was not properly disposed of.

While the direct impacts are serious, recovery and reconstruction could have much greater impacts. On the other hand, if the recovery effort is well managed the adverse impacts can be minimized and the environment can even be improved for the future benefit of Nepal's people and nature. Ways to do this are outlined below for major sectors, drawing on 10 environmental principles from a post-earthquake rapid environmental assessment² and the post-disaster needs assessment (PDNA)¹.

¹ 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.

² Ministry of Science, Technology and Environment. (2015). Nepal Earthquake 2015: Rapid Environmental Assessment. Ministry of Science, Technology and Environment, Kathmandu, Nepal.

Ensure land use planning that incorporates hazards and disaster risk reduction. Many areas are no longer safe for settlements or other activities, e.g. because of landslide risk. Use spatial planning that integrates disaster risk reduction (DRR) for resettling communities and relocating agriculture and infrastructure away from hazardous places. Ensure adequate land and resources for new settlements, and maintain or restore ecosystems so that they can provide protection and other services in the future.

Promote safe and green building materials and reuse disaster debris. Reconstruction of buildings and settlements will have significant environmental impacts from brick manufacturing, and extraction of timber, poles, rock, sand, gravel and clay. Reuse or recycle as much building material as possible from debris. Promote safe and green building materials including sustainably harvested timber and bamboo. Improve technologies in brick kilns as they are rebuilt. Design buildings to be energy and water efficient.



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Building debris after the earthquake in Kathmandu

Develop environmentally responsible solid and hazardous waste management plans.

Solid waste management and disposal of hazardous materials have been a major challenge for a while and the earthquake has greatly added to the problem, with materials being dumped haphazardly. Develop and implement sound waste management plans for all settlements and for facilities producing hazardous materials, and safely dispose of waste accumulated after the earthquake.

Ensure strategic road planning and reconstruction. Roads in rural areas were already causing severe environmental problems before the earthquake, including landslides and sediment in rivers. Reconstruction risks further environmental damage, for example in opening of new routes around damaged sections, and dumping of landslide debris. Take the opportunity to redesign networks of rural roads, focusing on strategic access, closing roads that are not viable, and ensuring sound planning and construction of new roads in the future.

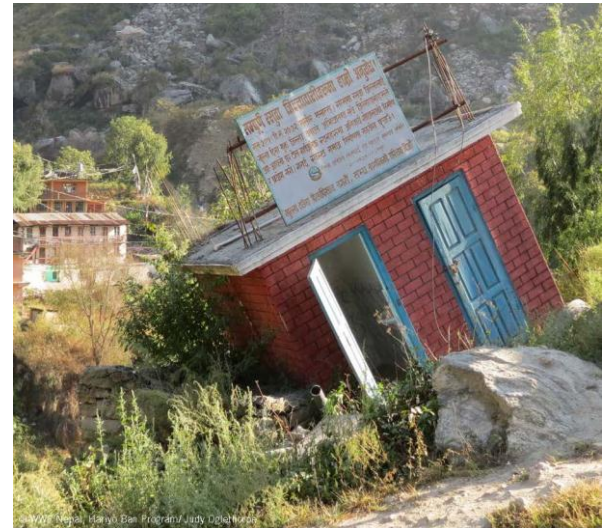
Promote alternative energy and energy efficiency. Damage to hydropower projects likely resulted in increased sediment in rivers from settling basins and debris, and their repair will

involve further extraction of building materials. Loss of energy from damaged biogas, improved cook stoves, hydropower and solar systems resulted in increased use of firewood from forests, and indoor smoke in shelters. Review hydropower for seismological safety as well as reducing environmental impacts. Promote extensive use of other forms of alternative energy in reconstruction.

Improve water supplies and sanitation and promote integrated watershed management. Environmental risks in water, sanitation, and hygiene include health risks from water contaminated by fecal matter and hazardous materials. With the changes to water sources, water extraction patterns will change, with possible impacts on wildlife and wetlands. Inventory water sources, and assess environmental impacts when reconstructing water supplies. Promote integrated watershed management, taking into account downstream needs; promote multiple use water systems for efficiency. Improve sanitation during reconstruction.

Support alternative livelihoods and environmentally responsible agriculture. Environmental risks from agriculture and livelihoods include: greater dependence on forest products until people can restore livelihoods; opening of new farms in forest land; loss of local crop landraces and breeds; spread of invasive species; and increased use of chemical fertilizer and pesticides. Support agricultural recovery including distribution of only tested crop varieties and animal breeds; promote labor saving technologies; promote cash-for-work programs to inject cash for household recovery; support to alternative sources of livelihoods; and restore nature-based tourism.

Promote reforestation and sustainably sourced timber for reconstruction. Possible impacts from recovery of the forest and conservation sector include spread of invasive species with tree planting; unaesthetic tourism development; and accelerated erosion from trails. Rebuild lost capacity for law enforcement and management of government and community forest groups. Provide sustainably sourced timber and poles for reconstruction, avoiding logging in hazardous places. Replant trees where feasible in damaged sites that pose a risk for settlements, agriculture and infrastructure.



Public toilet damaged by the earthquake in Rasuwa

Promote sound environmental practices through schools and other academic institutions. Reconstruction of school buildings can have environmental impacts. Follow good practices for rebuilding, and conserve school water sources. Mainstream disaster risk reduction and green recovery approaches in curricula of schools and colleges to improve natural resource management and raise disaster risk awareness for greater resilience. Involve students in green recovery activities in their schools, colleges, universities and communities.



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After the earthquake many schools faced severe challenges to remain open

Promote equity with particular attention to women and vulnerable groups. The earthquake had differential impacts on women, poor and marginalized people dependent on forests. It affected water supplies, energy sources, forest-based enterprises, land, and gender-based violence. Follow principles of human rights during recovery and reconstruction, with particular focus on ensuring equitable support; reducing gender-based violence; and restoring and promoting alternative energy and improved water supplies to reduce women and girls' work.

Incorporate climate change into recovery and reconstruction. Climate change is causing more extreme weather, e.g. heavier rain storms, more erratic monsoons, and higher average temperatures. Take these changing conditions into account during recovery and reconstruction in all sectors: e.g. make allowances for heavier rain, higher floods and longer droughts; diversify agriculture and livelihoods; allow for more extreme temperatures when planning infrastructure and settlements; and use ecosystem services to reduce climate-induced disasters.

In order to implement these recommendations, there is a need for policy action and capacity building.

Support policy implementation and enforcement mechanisms. Nepal in general has sound policies, but their implementation is often a challenge. During recovery and reconstruction there is a good opportunity to promote improved application of policies, laws and regulations, in order to build back better, safer and greener. This includes enforcing environmental impact assessment/initial environmental examination legislation, and speeding up the process. In some cases, legislation requires updating. There is an excellent opportunity to integrate green recovery aspects into earthquake recovery guidelines of different sectors.

Build capacity for green recovery and reconstruction and raise awareness about risk. In order to promote environmental responsibility in recovery and reconstruction there is an urgent need to build capacity in several sectors at national, district and local level, and to raise awareness in the general public about the issues and what can be done. There is a high demand for this.

Who should take action? Many people can play important roles at central, district and local level – in Government Ministries and Departments; the humanitarian and development sectors; donors; the forest and environment sectors; other civil society groups; the private sector including craftspeople like masons and carpenters; the media; and affected communities. Strong leadership is required to promote green practices, and the new National Reconstruction Authority can play an important role here.

Together, we can build a more resilient Nepal!

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