Environmental Assessment

Guidance Note 7

Tools for Mainstreaming Disaster Risk Reduction *is a series of 14 guidance notes for use by development organisations in adapting programming, project appraisal and evaluation tools to mainstream disaster risk reduction into their development work in hazard-prone countries. The series is also of relevance to stakeholders involved in climate change adaptation.*

This guidance note focuses on environmental assessment, the natural starting point in the design of a project to explore natural hazards and related risk. It provides guidance in analysing the disaster risk-related consequences of potential projects via their impact on the environment and also the potential threat to projects posed by natural hazards, both for development projects in hazard-prone areas and, more briefly, for post-disaster relief and rehabilitation operations. It is intended primarily for use by development organisations but is also relevant for personnel of governments and private organisations involved in the design of individual projects.

This guidance note has been jointly prepared by the ProVention Consortium and the Caribbean Development Bank (CDB). Section 2 of this guidance note is based on CDB and the Caribbean Community's (CARICOM) Sourcebook on the Integration of Natural Hazards into Environmental Impact Assessment (EIA): NHIA-EIA Sourcebook *(2004).*

1. Introduction

Environmental assessment of projects and programmes has emerged as established good practice. Most development organisations, as well as an increasing number of partner countries, now require all projects to undergo some form of environmental review as a key component of the appraisal process. The basic purpose is to examine the potential environmental consequences, both beneficial and adverse, of the proposed project and to ensure that they are adequately taken into account in the project's design.

It is essential that these environmental assessments cover natural hazards and related risk. The state of the environment is a major factor determining vulnerability to natural hazards. Environmental degradation is widely recognised as one of the key factors contributing to increasing human, physical and financial hazard-related losses. For instance, in many countries deforestation has disrupted watersheds and resulted in siltation of riverbeds, leading to more severe droughts and floods. Increased siltation of river deltas, bays and gulfs, together with the destruction of mangroves, reefs and other natural breakwaters, has also increased the exposure to storm surges and seawater intrusion. Poor land use management, unsustainable agricultural practices and more general land degradation have further contributed to increasing flood losses and the rising incidence of drought.

In order to help redress this rising trend in disaster losses, and also to help counter the anticipated rise in the frequency and intensity of climatological hazards associated with climate change, it is imperative not only that environmental degradation is reversed but also that the disaster-related consequences of potential projects are carefully spelt out as part of the environmental assessment process and taken into account in project design. For instance, clearing mangroves to make way for prawn farming or tourism development may generate substantial livelihood opportunities but it also increases exposure to storm surges and tsunamis. Similarly, environmental assessments should measure potential risk reduction benefits that projects supporting improved environmental management could encompass.

Natural hazards are themselves environmental phenomena which, as demonstrated time and time again, can potentially damage and disrupt projects and jeopardise the achievement of their aims and objectives. As such, the environmental assessment is also the natural place in the project appraisal process to collate data on natural hazards – that is, on types of hazard faced, magnitudes and probabilities of occurrence – in the project area to feed into other forms of appraisal and engineering design as relevant.

Box 1 **Ignoring hazards hurts**

Ignoring disaster-related issues in the design of projects can exacerbate the duration and severity of flood and drought events. It can also result in subsequent damage to the projects themselves, following the occurrence of a disaster. For instance:

- In the Vietnamese city of Hue, expansion of infrastructure, including bridges, railway lines and roads, has created a barrier across the valley within which the city is located. As a result, excess rainfall can no longer soak away quickly and problems of flooding have become more severe.[1] Similar problems have occurred in several villages in Gujarat, India, following the construction of a donor-funded highway.
- Following widespread devastation caused by Hurricane Hugo in 1989, a new aid-funded hospital was built at the foot of a volcano in the Caribbean island of Montserrat. This hospital was subsequently destroyed by pyroclastic flows after the volcano began eruptive activity again in mid-1995.
- Following the devastating 2004 Indian Ocean tsunami, some housing in Aceh, Indonesia, was reconstructed in flood-prone areas, leaving families vulnerable to future hazard events.

Current state of the art

Development organisations' existing environmental assessment guidelines vary considerably in the extent to which they consider natural hazards and related risk. Historically, there seems to have been relatively little attention to this issue. Even now, guidelines for a number of development organisations do not explicitly mention the disaster-related implications of particular environmental consequences of a project, such as the implications of any effects on forests and vegetation or the availability of surface- and groundwater. Moreover, environmental assessments of post-disaster relief and recovery interventions are often waived to help speed disbursement, despite the fact that they take place in blatantly hazard-prone areas.

However, a number of other development organisations are becoming increasingly aware of the importance of considering natural hazard-related factors in assessing the environmental impacts of proposed projects in hazard-prone areas, in both their environmental assessment policies (see, for example, Box 2) and their guidelines. Some guidelines now explicitly cover assessment of the vulnerability of projects to natural hazards. Others – notably, those for CDB and the United Kingdom's Department for International Development (DFID) – go that critical step further, providing guidance in assessing the vulnerability implications of a project's impact on the environment. Efforts are also under way to encourage greater consideration of environmental issues and future hazard events in the design of post-disaster operations, including by the United Nations Environment Programme (UNEP) and the Office of the United Nations High Commissioner for Refugees (UNHCR).

Box 2 **The African Development Bank's policy on the environment: Placing disaster management at the fore**

The African Development Bank's environment policy[2] identifies a number of key environmental issues that have to be addressed in all the Bank's lending operations. These issues were based on the findings of a review of the major constraints and opportunities facing sustainable development in the region. They include enhancement of disaster management capabilities, such as the establishment of early warning systems and preparedness and coping mechanisms to reduce the hazard vulnerability of both people and economies; the maintenance of contingency plans to restore ecological resources; and functions to maintain livelihood

1 IFRC. *World Disasters Report: Focus on recovery*. Geneva: International Federation of Red Cross and Red Crescent Societies, 2001.
2 AfDB/ADF. *African Development Bank Group's Policy on the Environment*. Abijan: African Development Bank and African Development Fund, 2004. Available at: http://www.afdb.org/pls/portal/docs/PAGE/ADB_ADMIN_PG/DOCUMENTS/ENVIRONMENTALANDSOCIALASSESSMENTS/ENVIRONMENT%20POLICY_0.PDF

resources and ecological stability. Other key environmental issues to be addressed in all projects that should also play a key role in enhancing disaster risk management include, for example, the reversal of land degradation and desertification, protection of the coastal zone and protection of global public goods (such as regional climatic forecasting).

Advocated good practice

Three essential actions are required as part of the environmental assessment process to ensure that natural hazard-related factors are adequately assessed and managed:

- The environmental assessment process should include collation of data on natural hazards and related risks as a fundamental first step in broader project scoping and the findings used to determine if disaster risk should be examined in further detail in other components of the project appraisal process.
- Systematic analysis of the potential disaster risk-related consequences of a project via its impact on the environment should be included as a central component of the environmental assessment process in hazard-prone areas.
- Environmental issues should be carefully considered in the design and implementation of post-disaster relief and rehabilitation activities.

These actions are elaborated upon below.

2. Basic steps in merging disaster risk considerations into environmental assessment [3]

It is recommended that the following measures be taken when carrying out environmental assessments of projects in hazard-prone areas to help ensure that natural hazard-related factors are adequately examined and, where necessary, addressed. These measures, which are also summarised in Figure 1, add few additional requirements to the environmental assessment process and do not require any changes in the basic procedure.

Step 1. Define project and alternatives

In the initial project definition and description, include, at a minimum, information on the "design criteria of projects (e.g., building codes used), soils, geology, slopes and drainage, location relative to coasts and rivers, hazards or damage history" and project-related climate change scenarios to frame the environmental assessment. Where they exist, some of this information should already be contained in country environmental analyses (Box 3) and relevant strategic environmental assessments (Box 4).

Box 3 Country environmental analysis

Country environmental analysis (CEA) is a relatively new analytical tool that a number of multilateral and bilateral development organisations are beginning to apply, in particular to inform overall country programming (**see Guidance Note 4**).[4] CEA provides systematic analysis of key environmental issues most critical to the sustained development of a country and the achievement of the Millennium Development Goals (**see Guidance Note 3**) and opportunities for overcoming constraints; of the environmental implications of key development policies; and of a country's environmental management capacity and performance. The tool was developed in response to increasing focus on mainstreaming environmental issues into development policies and planning.

3 This section is based on CDB and CARICOM, *Sourcebook on the Integration of Natural Hazards into Environmental Impact Assessment (EIA): NHIA-EIA Sourcebook.* Bridgetown, Barbados: Caribbean Development Bank, 2004. For a fuller discussion refer to this document, which systematically works through each stage of the EIA process providing generic guidance on where and how natural hazard and climate change adaptation issues should be considered. Text indicated in quotation marks in this guidance note is taken from page 3 of a four-page summary version of the CDB/CARICOM sourcebook, entitled *Integrating Natural Hazards into the Environmental Impact Assessment Process: Mainstreaming Disaster Risk Reduction into Development Project.*

4 Some development organisations use the term strategic environmental assessment (SEA) rather than CEA to describe environmental analysis undertaken to inform programming of country assistance (see Box 4).

CEA provides an important opportunity to highlight disaster risks, where significant, and helps ensure that they are adequately addressed. The Asian Development Bank's CEA for Tajikistan, for instance, identifies natural hazards, including drought, landslides and earthquakes, as one of the country's key environmental problems and highlights a related reduction in vulnerability as a major element in promoting environmental interventions to reduce poverty. In order to enhance resilience, it recommends support for activities that contribute to greater physical stability (e.g., prevention of soil erosion); the exploitation of opportunities for simultaneously reducing vulnerability and supporting livelihoods (e.g., drainage of lands prone to mudslides and use of the water collected for irrigation); careful attention to zoning of economic activities; and, more generally, a policy that favours risk reduction over emergency response and reconstruction.[5]

All CEAs should include collation of basic hazard data and background information on past disaster losses to give a preliminary overview of the significance of disaster risk in a country and to provide information that can be drawn upon both in undertaking environmental assessment of individual projects and in country programming. United Nations Development Programme (UNDP) environmental guidelines, for instance, already indicate that country environmental reviews should include baseline data on rainfall, climate, temperatures, seismic faults, cyclones and droughts.[6]

Box 4 Strategic environmental assessment

Strategic environmental assessment (SEA) is a tool for the integration of environmental considerations into policies, plans and programmes at the earliest stages of decision-making. SEA seeks to ensure that broad environmental considerations are integrated into these higher, strategic levels of decision-making taken prior to the identification and design of individual projects, ideally based in part on a participatory process. SEA is applied in some form by many multilateral and bilateral organisations and also by a number of governments. At the country programming level, it is sometimes referred to as CEA (see Box 3).

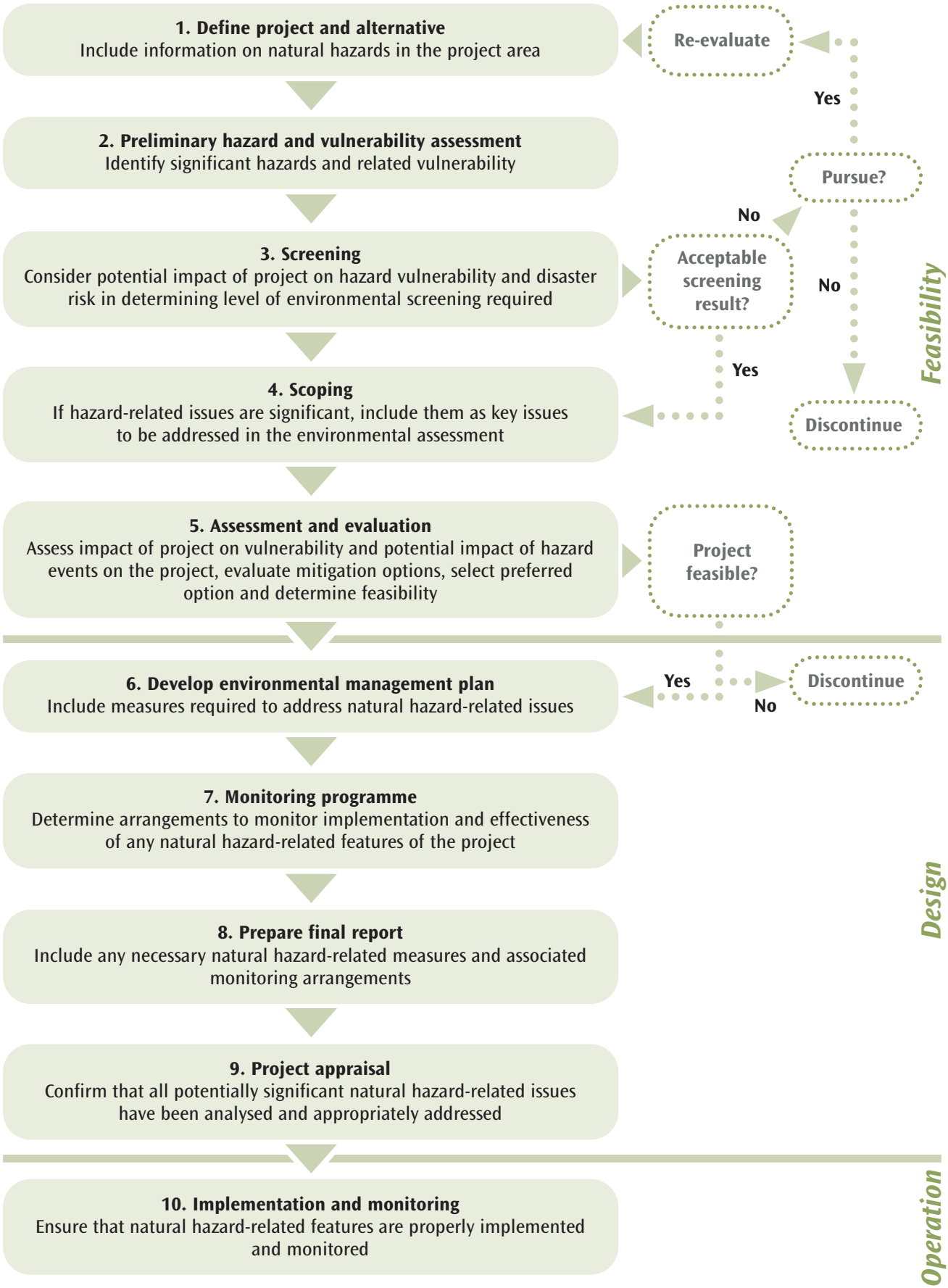
Like CEA, SEA can provide an important opportunity to highlight natural hazard-related issues, where relevant, and ensure that they are adequately addressed. For instance, environmental analysis by the Asian Development Bank (ADB) of some specific interventions to support the development of irrigation infrastructure in Cambodia found that these interventions could not be considered in isolation from other proposed government and donor irrigation projects and the potential cumulative environmental impacts collectively associated with these schemes. These impacts included those relating to the implications of large irrigation schemes and water withdrawal for the system of flooding (used to economic advantage in Cambodia in normal years) and water flows. In consequence it was proposed that future ADB investments in the irrigation sector should be conditional on integrated basin development planning, which was currently absent in many parts of Cambodia.[7]

SEA is also a potentially important tool in ensuring that adequate attention is paid to disaster risk in the design of policies, in particular since SEA should include the prioritisation of environmental issues in terms of their effect on economic development and poverty reduction. In hazard-prone countries, disaster and related risks can be a critical factor determining progress in both economic development and poverty reduction (**see Guidance Notes 3 and 8**).

5 ADB. *Tajikistan: Country Environmental Analysis.* Manila: Asian Development *Bank, 2004*. Available at: http://www.adb.org/Documents/Reports/CEA/taj-july-2004.pdf
6 UNDP (undated).
7 ADB. *Cambodia: Country Environmental Analysis.* Manila: Asian Development *Bank, 2004*. Available at: http://www.adb.org/Documents/Reports/CEA/cam-may-2004.pdf

Figure 1 Integration of disaster risk concerns into environmental assessment

(based on CDB and CARICOM, 2004 – see footnote 3)



Step 2. Preliminary hazard and vulnerability assessment

Undertake a preliminary identification of significant hazards and related vulnerability to inform environmental screening and scoping, "including an estimation of [the] frequency or probability of hazard events (initial hazard identification) and [related] severity of impacts on project components and zone of influence (initial assessment of vulnerability)". (**See Guidance Note 2**.) This assessment should take account of possible shifts in both vulnerability and, due to climate change, the frequency and intensity of hazard events over the life of the project.

Step 3. Screening

Include information from Step 2 in determining the level of both environmental screening and further hazard and vulnerability assessment required.

Projects should be assigned to Category A (full environmental impact assessment (EIA) report) if their environmental impacts are highly likely to contribute to increased vulnerability to natural hazards. Projects should be assigned to Category B (focus EIA report) if their environmental impacts are likely to contribute to increased vulnerability but such impacts are expected to be less adverse than those experienced by Category A projects. These impacts would be site-specific, typically reversible and, in most cases, counteracting mitigation measures could be designed more readily than for Category A projects. Projects should be assigned to Category C it they are likely to have minimal or no adverse environmental impacts.

There may be some cases where a traditional Category A or even Category B environmental assessment, which explores the impact of a project on its surrounding environment, is not required but where a fuller hazards and vulnerability assessment, which explores the impact of the environment on the project, is necessary because natural hazard events could have potentially significant adverse social, economic, structural or environmental impacts on the project. For instance, the construction of schools may have little impact on the environment but hazard-related safety concerns are paramount in building schools in hazard-prone areas.

Step 4. Scoping

Consider natural hazard-related issues in identifying critical issues to be addressed in the environmental assessment (see Box 5). If disaster risks are significant or the proposed project is likely to have a significant impact on vulnerability to natural hazards (i.e., Category A or B projects), these topics should be included in the list of issues for investigation and relevant expertise built into the assessment team. Further information and any related analysis required to inform the environmental assessment – or, if required, a fuller stand-alone hazards and vulnerability assessment – and to provide baseline data for subsequent monitoring and evaluation should then be identified. Information needs include baseline hazard data on the project site, information on significant hazards and their potential impacts on the project, relevant legislation and institutions and climate change assessments.

Box 5 **Sectoral checklists**[8]

Many environmental assessment guidelines include checklists of environmental sustainability issues that could be relevant in assessing particular types of development intervention. The following list provides some examples pertaining to disaster risk that should be considered in undertaking environmental assessments of projects in hazard-prone areas:

- *Energy.* Impact of hydropower projects on natural water flow and flooding patterns.
- *Transport.* Impact of road construction and associated infrastructure on drainage systems and flooding patterns.
- *Urban development.* Impact of development on the capacity of services and utilities to prevent increased risk of flooding as could occur if, say, drainage systems are inadequate or refuse collection services are limited, resulting in dumping of garbage in drainage systems or waterways.
- *Mining.* Implications for droughts and floods of impact of mining operations on level of groundwater.
- *Agriculture.* Impact on soil erosion and consequences for levels of water retention, downstream siltation and flooding.[9] Resilience of proposed projects in the event of rainfall deficits. Impact of proposed projects on the capacity of the local population to spread disaster-related and other risks.

8 This box draws in part on DFID (2003) and Sida (2002).

9 For instance, a study of 1,804 farm plots in three Central American countries hit by Hurricane Mitch demonstrated that farms using agro-ecological methods to prevent soil and water run-off from hillsides lost far less topsoil as a consequence of the hurricane, retained more moisture and were much less vulnerable to surface erosion than plots farmed using more conventional methods. (Source: World Neighbors. *Reasons for Resiliency: Toward a Sustainable Recovery after Hurricane Mitch*. Oklahoma: World Neighbors, 2000. Available at: http://www.wn.org/Mitch.pdf)

- *Fisheries:* Disaster risk consequences of clearance of mangroves and other vegetation.
- *Forestry:* Risk reduction benefits of forestry projects (e.g., in providing protection against windstorms, landslides or tsunamis and reducing the risk of flash flooding).

Step 5. Assessment and evaluation

Consider the potential effects of the project (during construction, operation and, if relevant, decommissioning) on the frequency, intensity and consequences of significant natural hazards and the impact of these hazards, in turn, on the project. This assessment will help to determine if each of these effects is acceptable, extending the preliminary hazard and vulnerability assessment conducted in Step 2 both for Category A and B projects and for those requiring a stand-alone hazard and vulnerability assessment. If potential effects are not acceptable, appropriate management, mitigation and adaptation options must be identified to bring them into an acceptable range.

The assessment should begin with a detailed hazard assessment and mapping of significant hazards identified in the screening and scoping stages (**see Guidance Note 2**), also taking into account relevant climate change modelling (e.g., how a rise in sea level might affect storm surges or how changes in precipitation might affect drought and flooding). Where relevant, findings of existing mathematical and computer-based hazard modelling exercises in the project area (for instance, modelling of earthquake, flood or windstorm scenarios) should also be drawn upon. Such exercises, if lacking, should be undertaken for large projects in high-risk areas.

A detailed vulnerability assessment should then be undertaken. From an environmental perspective, the vulnerability assessment should pay particular regard to the expected impact of the project on environmental factors identified as key determinants of any rising or falling underlying trends in vulnerability to natural hazards in the project area. Certain other aspects of the vulnerability assessment may be undertaken in part under other forms of project appraisal, such as engineering design (**see Guidance Note 12**), social impact assessment (**see Guidance Note 11**) and economic analysis (**see Guidance Note 8**), as relevant. In such cases, the EIA team should be held responsible for undertaking the initial screening process to determine if an assessment is required and for providing relevant hazard information to the other appraisal teams. In other cases, vulnerability analysis from these other perspectives may be incorporated within the EIA process.

Consultation with stakeholders should also cover information on natural hazards and related vulnerability. Even from a purely environmental perspective, vulnerability can be highly localised and it is, therefore, essential to seek the views of the local community. Perceptions of risk can also influence behaviour, again making it important to consult different stakeholders.

Disaster risk management measures should then be "selected to reduce the identified risks to an acceptable level and the preferred project alternative identified", taking policy, legal and institutional factors into account as well as the findings of the vulnerability analysis and of other forms of project appraisal that have been undertaken. Risk reduction measures could entail, say, changes in project design or the addition of environmental protection measures (**see Guidance Note 8** for further discussion on analysis of alternatives). Remaining disaster risks should be considered in the broader assessment of risks and uncertainties associated with the project.

If it has been determined that a project is subject to the impact of climate change, a project climate change adaptation programme should be also developed to address significant impacts and define adaptation measures.[10]

Step 6. Develop environmental management and monitoring plans

Include the development of disaster risk management, mitigation and adaptation plans to address natural hazard-related vulnerabilities and risks identified in Step 5.

Step 7. Monitoring programme

"Develop appropriate monitoring programmes to ensure the implementation and effectiveness" of the project's features related to disaster risk management and climate change adaptation, including monitoring of the impact of the project on vulnerability to natural hazards and the impact of any hazard events on the project.

10 See also CARICOM's Adapting to Climate Change in the Caribbean Project (2004) for further information (http://www.caricom.org/jsp/projects/macc%20project/accc.jsp).

Step 8. Prepare final report

"Finalise a project document which incorporates the management, mitigation and adaptation measures necessary to address natural hazard vulnerabilities and risks identified" and ensure that the programme for monitoring project implementation and impacts covers the implementation and effectiveness of these measures. This final report should be available for public scrutiny.

Step 9. Project appraisal

"In determining the viability and acceptability of the project against established criteria confirm that

- all potentially significant hazards, as identified in Step 4 (scoping), have been analysed using appropriate methodologies;
- appropriate and sufficient management, mitigation and/or adaptation measures have been identified and incorporated into project design for all potentially significant impacts identified in the detailed hazard and vulnerability assessments (Step 5); and
- it is technically, financially and administratively feasible to implement the necessary (disaster) risk management measures in the proposed project."

Remaining risk should be clearly indicated.

Step 10. Implementation and monitoring

"Ensure that the specified mitigation/adaptation and monitoring measures are implemented in the project and that the selected measures are appropriate."

3. Post-disaster environmental assessment

Post-disaster environmental assessments similarly need to explore whether proposed relief, reconstruction and rehabilitation efforts will have acceptable environmental impacts (e.g., environmentally sound selection of sites for refugee camps and sourcing of reconstruction materials) and whether they will strengthen resilience to future natural hazards. In addition, they need to ensure that the response and recovery process addresses environmental problems caused by the disaster (e.g., contamination of water and soil).

Some donor organisation guidelines include checklists on environmental assessment of disaster relief and humanitarian assistance operations (e.g., ADB, DFID and Sida, the Swedish International Development Cooperation Agency) whilst UNHCR has developed a set of guidelines aimed specifically at building environmental considerations into refugee and returnee operations, including assessment of any potentially adverse environmental impacts of particular refugee and returnee situations.

The Benfield Hazard Research Centre and CARE International have developed a more detailed and comprehensive set of guidelines on rapid environmental assessment (REA) in disasters.[11] These guidelines focus on assessment of the general context of a disaster; disaster-related factors that may have an immediate impact on the environment; possible immediate environmental impacts of disaster agents; unmet basic needs of disaster survivors that could lead to adverse impacts on the environment; and potential negative environmental consequences of relief operations. The methodology is based on qualitative assessment, drawing heavily on perceptions and often incomplete data, helping to facilitate rapid assessment under difficult circumstances (see Box 6).

11 Kelly (2005).

Box 6 REA applications

The Benfield Hazard Research Centre and CARE International's REA guidelines have been applied a number of times, including in several REAs undertaken by United Nations (UN) agencies. For instance, an REA carried out by UNEP and the UN Office for the Coordination of Humanitarian Affairs (OCHA) of Sri Lanka following the December 2004 Indian Ocean tsunami highlighted urgent environmental concerns relating to the management of tsunami debris and to sewage and sanitation issues in emergency shelter locations.[12]

Recommendations of a UNEP/OCHA REA of the impact of Hurricanes Ivan and Jeanne in Haiti, Grenada and the Dominican Republic in 2004 included the need to address risks to surface- and groundwater in Grenada and immediate and longer-term increased flooding and landslide risks in all three countries.[13]

4. Critical factors for success

- *Sufficient information.* Sufficient information must be available to permit full and accurate assessment of natural hazard-related factors. Particular attention needs to be paid to the fact that there can be highly localized variations in vulnerability, reflecting local environmental and socio-economic conditions. As such, information on site-specific circumstances is required.
- *Early assessment.* It is essential that the environmental assessment process begin at a very early stage in the appraisal process to ensure that its findings can be fully taken into account in the project's design, including via the integration of any necessary disaster risk reduction features.
- *Adequate monitoring.* Strong, effective monitoring arrangements are important to ensure that any required environmental management and mitigation measures specified in project documents are implemented.
- *Awareness of the benefits of assessing disaster risk as part of the environmental assessment process.* Environmental assessment is a costly exercise and disaster risk may be ignored if resources are limited. Strong understanding and awareness of the potential importance of addressing disaster risk is therefore required to make appropriate judgements on its likely significance. CEAs and SEAs offer important tools in this regard, potentially reducing time required for collation of information on natural hazards and providing some indication of the importance of related risks (see Boxes 3 and 4). Pooling of information by different development organizations would also help.
- *Supportive environmental policy.* Finally, but by no means least, environmental policies and related safeguard compliance policies should require satisfactory analysis and related management of disaster risk as part of the environmental assessment process (see Box 2). They should also require environmental assessment of post-disaster relief and recovery interventions.

Box 7 Hazard and disaster terminology

It is widely acknowledged within the disaster community that hazard and disaster terminology are used inconsistently across the sector, reflecting the involvement of practitioners and researchers from a wide range of disciplines. Key terms are used as follows for the purpose of this guidance note series:

A *natural hazard* is a geophysical, atmospheric or hydrological event (e.g., earthquake, landslide, tsunami, windstorm, wave or surge, flood or drought) that has the potential to cause harm or loss.

Vulnerability is the potential to suffer harm or loss, related to the capacity to anticipate a hazard, cope with it, resist it and recover from its impact. Both vulnerability and its antithesis, *resilience*, are determined by physical, environmental, social, economic, political, cultural and institutional factors.

12 UNEP/OCHA. *Indian Ocean Tsunami Disaster of December 2004: UNDAC Rapid Environmental Assessment in the Democratic Socialist Republic of Sri Lanka.* Geneva: Joint United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs Environment Unit, 2005. Available at: http://www.benfieldhrc.org/disaster_studies/rea/environmental_assessment_rapid_ocha_unep_sri_lanka_indian_ocean_tsunami_disaster_december2004.pdf

13 UNEP/OCHA. *Hurricanes Ivan and Jeanne in Haiti, Grenada and the Dominican Republic: A Rapid Environmental Impact Assessment.* Geneva: Joint United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs Environment Unit, 2004. Available at: http://www.benfieldhrc.org/disaster_studies/rea/Caribbean_REA.pdf

A *disaster* is the occurrence of an extreme hazard event that impacts on vulnerable communities causing substantial damage, disruption and possible casualties, and leaving the affected communities unable to function normally without outside assistance.

Disaster risk is a function of the characteristics and frequency of hazards experienced in a specified location, the nature of the elements at risk, and their inherent degree of vulnerability or resilience.[14]

Mitigation is any structural (physical) or non-structural (e.g., land use planning, public education) measure undertaken to minimise the adverse impact of potential natural hazard events.

Preparedness is activities and measures taken before hazard events occur to forecast and warn against them, evacuate people and property when they threaten and ensure effective response (e.g., stockpiling food supplies).

Relief, rehabilitation and *reconstruction* are any measures undertaken in the aftermath of a disaster to, respectively, save lives and address immediate humanitarian needs; restore normal activities; and restore physical infrastructure and services.

Climate change is a statistically significant change in measurements of either the mean state or variability of the climate for a place or region over an extended period of time, either directly or indirectly due to the impact of human activity on the composition of the global atmosphere or due to natural variability.

Further reading

Ahmed, K., Mercier, J. R. and Verheem R. 'Strategic Environmental Assessment—Concept and Practice', *Environment Strategy No 14*. Washington, DC: World Bank, 2005. Available at: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/0,,contentMDK:20687523~pagePK:210058~piPK:210062~theSitePK:244381,00.html

CDB and CARICOM Secretariat. *Sourcebook on the Integration of Natural Hazards into Environmental Impact Assessment (EIA): NHIA-EIA Sourcebook*. Bridgetown, Barbados: Caribbean Development Bank, 2004. Available at: http://www.caribank.org/Projects.nsf/NHIA/$File/NHIA-EIA_Newsletter.pdf?OpenElement

CARICOM. *Guide to the Integration of Climate Change Adaptation into the Environmental Impact Assessment Process*. Caribbean Community Secretariat, Adapting to Climate Change in the Caribbean Project, 2004.

DFID. *Environment Guide: A Guide to Environmental Screening*. London: Department for International Development (UK), 2003. Available at: http://www.dfid.gov.uk/pubs/files/environment-guide-2003.pdf

International Association of Impact Assessment: http://www.iaia.org

Kelly, C. *Guidelines for Rapid Environmental Impact Assessment in Disasters*. Version 4.04. London: Benfield Hazard Research Centre, 2005. Available at: http://www.benfieldhrc.org/rea_index.htm

Sida. *Guidelines for the Review of Environmental Impact Assessments: Sustainable Development?* Stockholm: Swedish International Development Cooperation Agency, Environment Policy Division, 2002. Available at: http://www.sida.se/shared/jsp/download.jsp?f=SIDA1983en.pdf&a=2532

UNDP. *UNDP's Handbook and Guidelines for Environmental Management and Sustainable Development*. New York: United Nations Development Programme, Sustainable Energy and Environment Division, undated.

UNHCR. *UNHCR Environmental Guidelines*. Geneva: Office of the United Nations High Commissioner for Refugees, 2005. Available at: http://www.unhcr.org/cgi-bin/texis/vtx/protect/opendoc.pdf?tbl=PROTECTION&id=3b03b2a04

14 The term 'disaster risk' is used in place of the more accurate term 'hazard risk' in this series of guidance notes because 'disaster risk' is the term favoured by the disaster reduction community.

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Tools for Mainstreaming Disaster Risk Reduction is a series of 14 guidance notes produced by the ProVention Consortium for use by development organisations in adapting project appraisal and evaluation tools to mainstream disaster risk reduction into their development work in hazard-prone countries. The series covers the following subjects: (1) Introduction; (2) Collecting and using information on natural hazards; (3) Poverty reduction strategies; (4) Country programming; (5) Project cycle management; (6) Logical and results-based frameworks; (7) Environmental assessment; (8) Economic analysis; (9) Vulnerability and capacity analysis; (10) Sustainable livelihoods approaches; (11) Social impact assessment; (12) Construction design, building standards and site selection; (13) Evaluating disaster risk reduction initiatives; and (14) Budget support. The full series, together with a background scoping study by Charlotte Benson and John Twigg on *Measuring Mitigation: Methodologies for assessing natural hazard risks and the net benefits of mitigation*, is available at http://www.proventionconsortium.org/mainstreaming_tools

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