
NDRCC

4

RIGHT INFORMATION, RIGHT PEOPLE, RIGHT TIME

CHAPTER 4 RIGHT INFORMATION, RIGHT PEOPLE, RIGHT TIME

"We must address gaps in our knowledge if we are to design policies to avert, or at least mitigate, the impact of this and future crises. We must obtain real-time data that can be easily analyzed across sectors and address the policy questions that need answering. We must further improve our methodologies....The voices of the vulnerable should compel us to act with urgency."

Voices of the Vulnerable, p.4.[1]

A critical part of disaster risk management is managing the flow of information. Getting the right information to the right people at the right time saves lives and reduces losses, while also strengthening people's resilience to disasters. Some Asia-Pacific countries now have state-of-the-art disaster information management systems, but others have major gaps in data and analysis.

This chapter presents the case for effective information management in two broad sections. The initial sections focus on 'soft' issues, including data, modelling and decision support. Subsequent sections cover emerging ICT technologies and the need to build critical 'hard' information infrastructure.

Right information

Nowadays for disaster risk management there are many more sources of information, with multiple global and local data sets, some free and some commercial. Often these originate in the developed countries. In the US, for example, the National Oceanic and Atmospheric Administration has made earth observation data more accessible to the public.[2] Other US organizations will also release data on request for purposes of disaster risk management.[3]

Nevertheless range and coverage of these data sets are limited and governments in many countries do not have access to good information at the national or regional level.[4] Even when they have access to the data, they may not be able to use it.[5]

Right people

Many people are involved in disaster management – at the international, regional, national and local levels, each with their own mandates, priorities and areas of interest. Organizations and governments have attempted to take stock of the various actors. In India, for example, the Government publishes a 'Directory of institutions and resource persons in disaster management', and in Indonesia, the Government publishes the 'Profile and directory: disaster risk reduction organisations in Indonesia'.[6] There are also directories at the international level, maintained, for example, at preventionweb.net.[7]

Some institutions are both users and producers of disaster risk knowledge and they differ greatly in knowledge and capacity.[8] Given their diversity, there are often problems of coordination. Disaster

management frameworks often assume that all actors need information in order to act and that there is coordination between them.[9]

Right time

Information on disasters should arrive at the appropriate time though that period will vary considerably. During or immediately after a disaster, for example, this could be within 12-48 hours, up to 72 hours, one week, two to three weeks, or four to six weeks.[10] For the post-disaster phase, for 'building back better' the information flow could take place over many years.[11] Again, however, there are considerable differences between developed and developing countries. In the US the Federal Emergency Management Agency can respond quickly using satellite imagery and geospatial information, along with mobile applications and innovative technologies.[12] In many Asia-Pacific developing countries, however, information is much scarcer and many communities do not know where to get timely information or know how to act on it.[13] For effective information management, it is important to improve 'situational awareness' – knowing what is going on in the immediate environment.[14]

Decision makers need precise disaster risk models and comprehensive impact profiles that are based on systematic and dependable data. They can get the basic information from global data sets and analysis and then combine these data with those from other sources, historical analysis, GIS mapping and local knowledge and foresight, to identify the timing and pathways of impact, and recommend action for businesses, citizens and communities.[15]

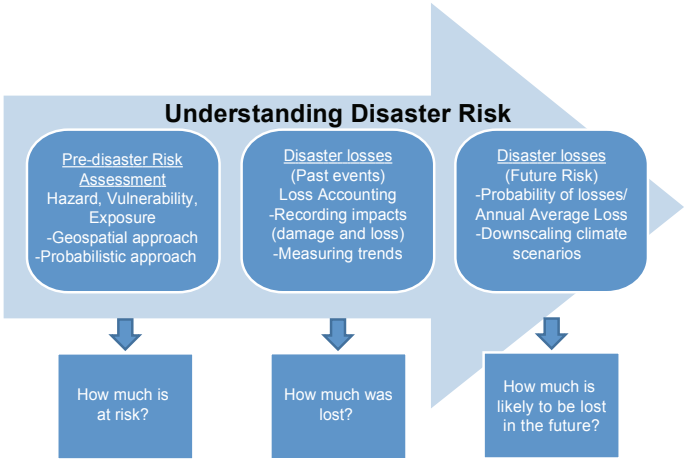
The Sendai Framework for Disaster Risk Reduction sets as one of its targets "Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030." The first priority action for the implementation of the Framework is "understanding disaster risk".

INFORMATION MANAGEMENT PRACTICES

Disaster information management practices in the region have evolved with the growing understanding of disaster 'risk' – which involves the interaction between hazard, vulnerability and exposure (Figure IV-1). In the pre-disaster phase

FIGURE IV-1

Information management practices for understanding disaster risk



technical staff can use probabilistic modelling and geospatial approaches. In the post-disaster phase, they can also use field-based methods to estimate damage and losses.

PRE-DISASTER RISK ASSESSMENT

It is important to prevent development investment and activities that exacerbate existing risks or create new risks. Pre-disaster risk assessment, or to be more precise, the use of information in 'normal' times, is thus needed to generate risk awareness for development planning purposes. This assessment can guide DRR policies, strategies and investment programmes.

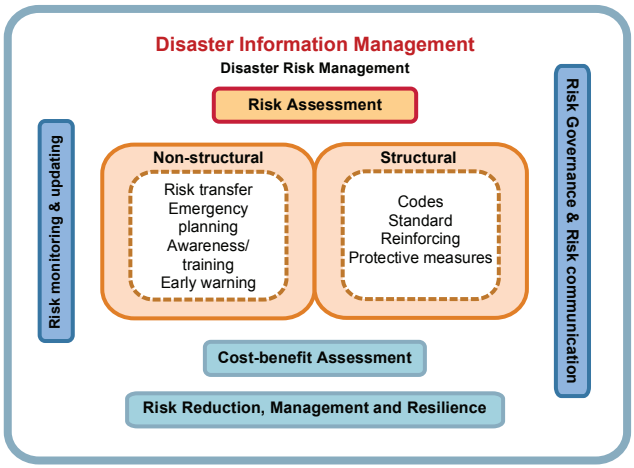
Pre-disaster assessments will involve both qualitative and quantitative methods. The qualitative approach is useful as an initial screening process. Typically this will combine hazard maps with qualitative judgments of vulnerability and exposure to build a simple risk matrix.

Quantitative methods combine data from multiple layers of geospatial data including satellite images, with socioeconomic indicators and detailed census and survey data to create a more comprehensive assessment. This information can feed into a framework that takes account of structural and non-structural factors (Figure IV-2). This can facilitate risk-sensitive decision-making and strengthen risk governance. It can also be used for cost-benefit assessments that can be embedded in comprehensive long-term planning processes.

A number of countries have carried out pre-disaster risk assessments. Vanuatu, for example, has combined data on earthquakes and tropical cyclones with information on exposure and vulnerability and then used a probabilistic risk assessment model to estimate total average annual losses (Figure IV-3). This was used to identify high-risk areas, for appropriate development plans and interventions.

FIGURE IV-2

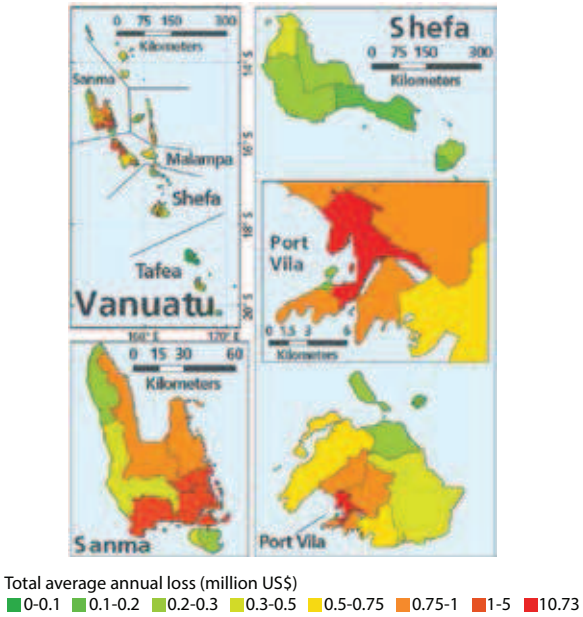
Conceptual framework for disaster information management



Source: Concept from Van Westen, 2013.

FIGURE IV-3

A multi-hazard risk map in Vanuatu



Source: Pacific Catastrophe Risk and Financing Initiative – Country Risk Profile Vanuatu. Available from http://pcrafi.sopac.org.

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The Philippines has also used multi-hazard risk information, in this case to make buildings more resistant to earthquakes and typhoons. For earthquakes the National Structural Code divides the country into four zones. Most land is in seismic zone 4, where high ground motion is expected. For typhoons, the country is divided into three zones according to expected wind speeds (Figure IV-4).

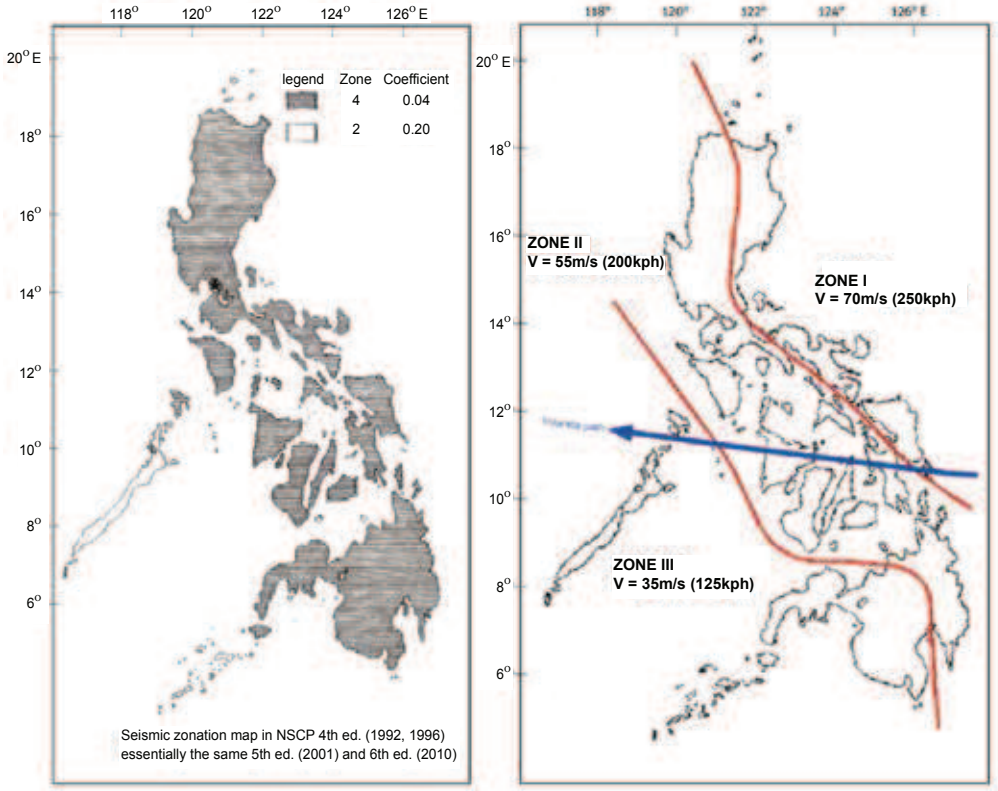
Customizing information

The production of risk information should be an interactive two-way process with an exchange of information between risk assessors, managers, interested groups and the general public. Each of these stakeholders, whether individuals, businesses, organizations or governments requires customized information. Thus the general public might need simple maps of neighbourhoods while technical staff in local government will need more detailed information and statistical data for specific purposes. The range of potential information is indicated in Table IV-1.

One important use for disaster risk information is insurance. The Japanese Government, for example, has since the 1960s provided earthquake insurance. These schemes have been operating jointly by the public sector and the private

FIGURE IV-4

Multi-hazard risk mapping in the Philippines



Earthquakes

Wind speed and the path of typhoon Haiyan

Source: DPWH (Philippines Department of Public Works and Highways and World Bank, 2014 – Field Investigation Report on the Impact of the Bahol Earthquake and Typhoon Yolanda on Building, Washington, DC, World Bank).

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TABLE IV-1

Information needs of different stakeholders

Stakeholder	Purpose	Information
General public	General information on risks over large areas	Basic WebGIS application on which they can overlay the location of major hazard types with high-resolution imagery or topographic maps
	Community-based DRR projects	Simple maps of neighbourhood with risk class, buildings, evacuation routes, and other features
Businesses	Investment policies and location planning	General information about hazards and risks in both graphical and map format
Technical staff of (local) authorities	Land use regulation / zoning	Maps and simple legends in three classes: construction restricted, construction allowed, further investigation required
	Building codes	Maps indicating the type of buildings allowed (building type, number of floors)
	Spatial planning	Hazard maps, with simple legends related to probabilities and possible consequences
	Environmental Impact Assessment	Maps and possible loss figures for future scenarios
	Disaster preparedness	Real time simple and concise Web based information in both maps and graphical forms
Decision makers / local authorities	Decision-making on risk reduction measures	Statistical information, loss exceedance curves, F-N curves, maps
	Investments	Economic losses, projected economic losses for future scenarios
	Strategic environmental assessment	General statistical information for administrative units
NGOs	Influence political decisions in favour of environment and sustainable development	This can vary from simple maps to web-based applications, depending on the objectives
Scientists / technical staff of hazard data producers	Hazard information exchange to public and other agencies	WebGIS applications where they can access the basic information
	Exchange of basic information for hazard and risk assessment	Spatial data infrastructure / clearing house for exchanging information
Insurance Industry	Development of insurance policies	Loss exceedance curves of economic losses
Media	Risk communication to public	Animations of hazard phenomena that clearly illustrate the problem

Source: Van Westen, 2013.

sector, under the "Law Concerning Earthquake Insurance". For this purpose they have evaluated the potential earthquake risk of specific regions using relevant data – which includes the potential magnitude of earthquakes, the place of occurrence, geometry of earthquake source faults, types of land cover, the structure and age of buildings, time of day and population density.[16]

This information has been used, for example, since 2009 to create the National Seismic Hazard Map. Figure IV-5 shows an earthquake hazard map with 3 per cent probability of exceedance of earthquake within a 30-year period indicating that the greatest risks are for the east coast. This information is used by insurance providers to calculate potential damage and to formulate insurance coverage, premiums and estimated claims.

FIGURE IV-5

National seismic map for Japan

Source: National Research Institute for Earth Science and Disaster Prevention, Japan, 2009.

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Insurance companies in a number of countries have developed proprietary software for catastrophe modelling, for different types of hazards, though these customized products are often not available in the public domain. The insurance company Munich Re, for example, has a database for natural catastrophes on material and human loss events worldwide (NatCatSERVICE). The insurance company Swiss Re has a similar database (SIGMA).

Multi-tier mapping

Risk information is often customized according to scale. At the regional/national levels of planning, 'actionable' risk information commonly uses a mapping scale smaller than 1:1,000,000, while at the community municipality or provincial levels the scale can vary from 1:1,000,000 to 1:5,000. For project implementation at the field level, actionable risk information can use a scale of more than 1:2,000 (Table IV-2).

A number of Asia-Pacific countries have these multi-tier disaster risk information systems. Indonesia, for example, has an actionable multi-tier information system at national, provincial and district levels (Box IV-1). Similarly, India has a National Database for Emergency Management which is a GIS-based repository of data at varying scales which uses core data, hazard-specific data, and dynamic data in spatial as well as temporal form. The database includes national-level core-geospatial data at 1:50,000

TABLE IV-2

Risk information scale for policy planning and project implementation

Regional/national level – mapping scale (1:1,000,000 or smaller)
- Formulation of national disaster risk management strategy
- Inventory of major hazards in the country
- Identification of areas affected or threatened for an entire country

Provincial level – mapping scale (up to 1:1,000,000)
- Draft regional development projects or large engineering projects
- Utilized more for spatial analysis at this scale (mostly qualitative)

District level – mapping scale (1:25,000 to 1:100,000)
- Conduct the feasibility study of developmental projects
- GIS analysis capabilities are used extensively for hazard zonation

Municipality or community level mapping scale (1:5,000 to 1:25,000)
- Formulate projects at feasibility levels
- Generate hazard and risk map for existing settlements and cities
- Planning disaster preparedness and disaster relief activities

Project level very high resolution large mapping scale (1:2,000 or larger site)
- Planning and design of engineering structure and in detail engineering measures to mitigate natural hazards
- Data management and 3D visualization

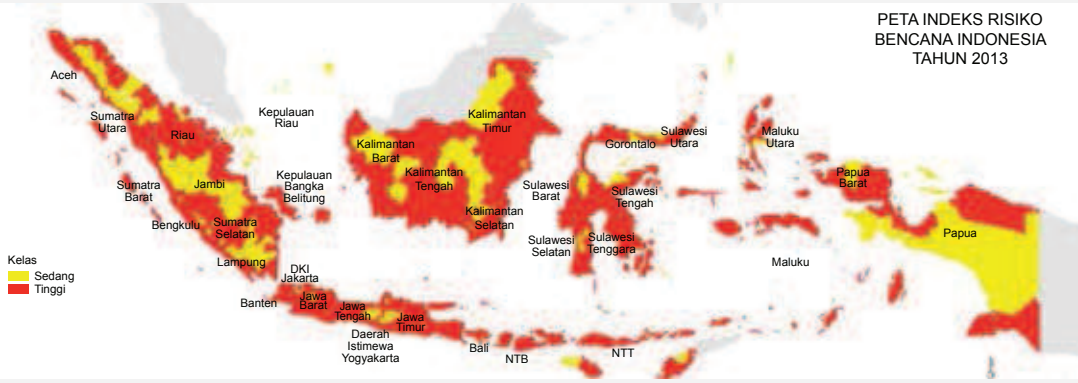
Policy Planning

Project Implementation

BOX IV-1

Indonesia disaster risk index

In 2011 to assess vulnerability in each region, Indonesia's national disaster mitigation agency (PNPB) developed the Indonesia disaster risk index (IRBI). This is based on an inventory of hazards and vulnerabilities, taking into account the frequency and intensity of hazards, including floods, landslides, earthquakes and tsunamis. Vulnerability is quantified using socio-cultural, economic, physical, and environmental parameters. It also takes into account the regulatory and institutional capacities of local governments, as well as the effectiveness of early warning systems, vocational education system, and mitigation and preparedness systems. The IRBI, which is updated every two years, categorizes 497 districts as being at high, medium or low risk (see map below). These data can then be used to derive a risk index at the provincial level. The index is used to inform the planning and allocation of public DRR funds.



Source: BNPB, 2015. Geospatial Application in Indonesia Disaster Management Authority (BNPB). World Conference on Disaster Risk Reduction, Sendai 2015.

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scale, hazard-specific data for multi-hazard prone districts at 1:50,000 scale, data for multi-hazard prone cities and towns at 1:10,000 scale and data for major cities at 1:2,000 scale (Box VI-2). It also provides support tools for real-time decision-making.[17]

Such information is valuable for assessing the risks to large-scale infrastructure development particularly in high-risk areas. China, for example, has built the world's longest high-altitude plateau railway, the 1,956-kilometre Qinghai-Tibet railway which cost approximately $5.3 billion to construct. Of this, some 960 kilometres is 4,000 metres above sea level, reaching a peak at 5,072 metres. As it traverses the Tibet Plateau, the railroad is exposed to earth crust movements and a severe climate (Figure IV-6).[18] The construction therefore took into account both seismic and climate risk.[19] Despite frequent earthquakes, the railway is still operating safely.[20]

BOX IV-2

India's National Database for Emergency Management

India has a National Database for Emergency Management. This is a multi-scale GIS database which combines raster and vector images linked with non-spatial information. These include core data, hazard-specific data, corresponding attribute data, and live data from remote national locations. Core data sets include base, thematic, and infrastructure layers. Disaster-specific information pertains to floods, cyclones, forest fires, earthquakes, landslides and droughts.

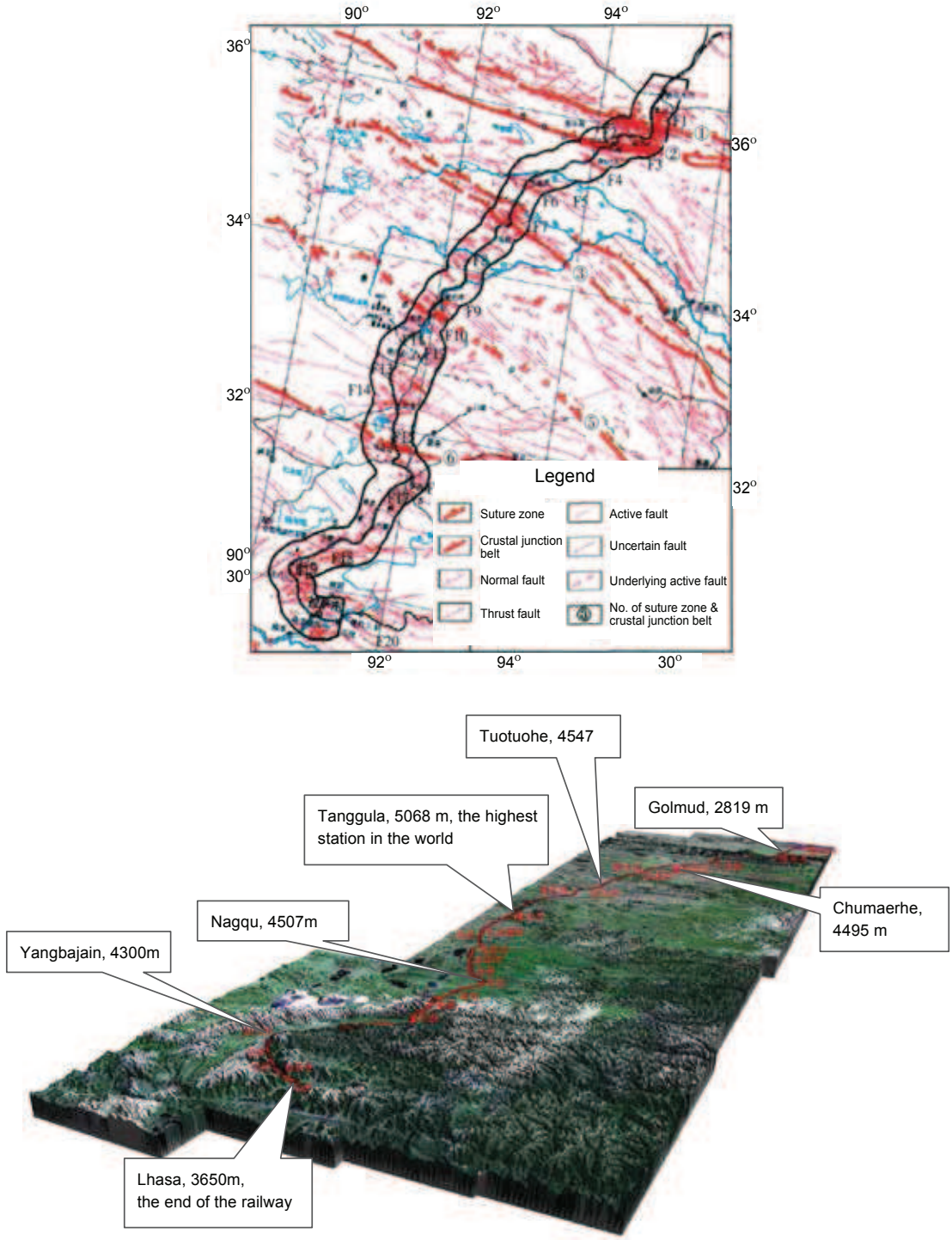
The database is organized and structured to provide the right information at the right time to the right people. For this purpose it has defined a series of standards covering such issues as coding, data management and dissemination.

The database covers all of India at a 1:50,000 scale, multi-hazard prone districts at a 1:10,000 scale, and megacities at a 1:2,000 scale. The datasets are available to various end users through a virtual private network and geospatial web service providing services, data and visualizations.

Source: Bhanumurthy and others, 2014.

FIGURE IV-6

Qinghai-Tibet Railway seismic hazard map and 3D elevation, highlighting the risk scenarios



Source: Wang, 2006 and China, Centre for Resources Satellite Data and Application, 2009.

Crisis and operations centres allow dedicated monitoring and assessment of disaster situations.

POST-DISASTER ASSESSMENT

In the immediate aftermath of a disaster the international humanitarian community needs to coordinate many actors. For this it requires reliable, relevant and timely information. Disaster risk management activities that take place immediately after the onset of a disaster involve multiple agencies and are centred on emergency response and humanitarian relief. They are often sporadic and local responses which, over the course of hours and days after a disaster, evolve into more formal and structured responses. For example, from neighbours frantically clearing rubble to rescue those trapped, to people using lifting and digging tools from local construction sites, to heavy machinery brought in to clear rubble.

This type of response requires situation reports, also known as 'sitreps'. These operational documents may be created by a national disaster management authority, a UN agency, international or local NGOs, or regional institutions. Sitreps will include elements of rapid assessment and situation analysis – to establish what has happened, the nature of the existing response, and the people and areas in need of emergency aid and relief. OCHA, for example, generally starts with a daily situation report during the acute phase and subsequently moves as appropriate to weekly or monthly 'humanitarian bulletins'.[21]

Situation reports, can be combined with other sources of information to produce a multi-cluster initial rapid assessment (MIRA).[22] A MIRA can appraise the disaster situation, and consolidate information that is often scarce and incomplete. The MIRA, along with other situation reports and rapid impact assessments tools, can serve as the basis for quickly dispersing funds for relief and emergency responses. One example is a 'UN flash appeal', which is an initial inter-agency humanitarian response strategy and resource mobilization tool designed to cover

the first three to six months. If humanitarian responses extend more than six months this can be followed by a 'consolidated appeal process'.

Situation reports require multiple sources of information. One of the most valuable is satellite imagery, which can provide a clear picture of the situation before and after a disaster, at different time intervals and for specific areas (Figure IV-7). When cross-checked and cross-referenced with other information the analysis of such images can indicate the extent and location of damage. In Asia and the Pacific, ESCAP, through its Regional Space Applications Programme for sustainable development (RESAP) network, helps provide satellite imagery, at no cost, to disaster-affected countries (Box IV-3). For example, during the 2015 Nepal earthquakes, RESAP received multiple images of sites in and around Nepal from different satellites administered by the region's spacefaring member countries. The material included raw images that officials within the Ministry of Home Affairs and other relevant national institutions could use to perform their own analysis and create mapping products. Globally, the International Charter on Space and Major Disasters provides an agreement between space agencies, aimed at creating a unified system for accessing and delivering fast and free satellite imagery and space data to countries affected by disasters.

Larger Asia-Pacific countries now have their own sophisticated systems for information management. In India, for example, following cyclone Hudhud in 2014, the State Government of Andhra Pradesh used geographic information systems, global positioning systems, and remote sensing technologies to assess damage and upload information onto a satellite map using geo-tagging.

In the Republic of Korea, the National Disaster Management Institute has developed a smartphone-based damage assessment system that can gather data from user measurements and transmit these to a mobile server that classifies and organizes the data and feeds it into the National Damage Management System. The system automatically calculates the expected damage value and dramatically reduces the time for damage assessment.

FIGURE IV-7

Before and after images of Kathmandu for 2015 Nepal earthquakes

Source: Provided to ESCAP by UNITAR UNOSAT, CNES and AIRBUS, 2015.

BOX IV-3

The Regional Space Applications Programme for Sustainable Development

ESCAP promotes the application of space technology for disaster risk reduction and sustainable development through RESAP. This unique regional cooperative platform, which has been running for 20 years, calls on all national space agencies in the Asia-Pacific region to work together to help disaster-affected countries. RESAP provides support for the use of satellite-derived data, products and services and enables countries without their own space programmes to have cost-effective access to space-derived data, products and services for disaster risk management.

Upon receiving requests from disaster-affected countries or early-warning alerts, ESCAP, in collaboration with its RESAP member countries and strategic partner UNOSAT, facilitates access to space-based data. In 2013 and 2014, for example, RESAP mobilized more than 218 satellite images and damage maps that contributed to preparedness, response, relief and damage assessment. In 2015, RESAP mobilized 150 satellite images and maps including in the aftermath of the Nepal earthquakes and the typhoon that struck Vanuatu. These images were provided free of charge by RESAP members and UNOSAT, and had an estimated monetary value of more than $600,000 USD. This service is of particular benefit to LDCs, LLDCs and SIDS, which otherwise would not have access to such critical and timely information or advanced technological capabilities.

Unmanned aerial vehicles

Another technology increasingly used in the aftermath of disasters is unmanned aerial vehicles (UAVs), also known as drones. UAVs can reach areas that are inaccessible or difficult to fly over with manned aircraft. For example, in 2013 after typhoon Haiyan hit the Philippines a UAV was used to choose where to set up a base of operations, and then to check if roads were passable. The UAV was then flown up the coast to evaluate damage from storm surges and flooding and to identify the villages most affected. China has also been using UAVs for landslide and earthquake related damage and impact assessment. The use of UAVs has, however, raised serious practical and ethical issues that humanitarian organizations must address.

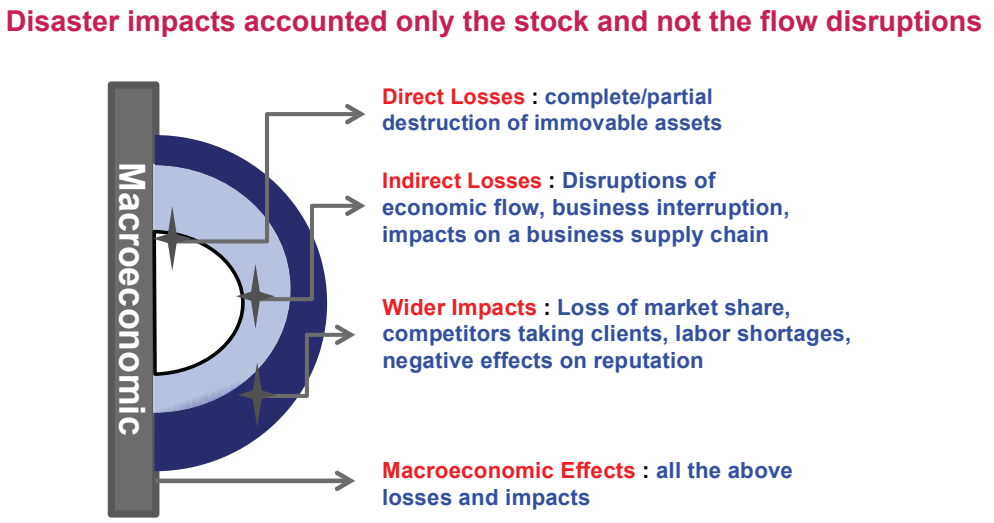
In response to the wealth of data coming from new technological sources, including UAVs, a group of non-governmental organizations have formed the Digital Humanitarian Network. This consortium aims to provide an interface between formal, professional humanitarian organizations and informal volunteer and technical networks. Following cyclone Pam in Vanuatu, for example, OCHA and the World Bank engaged the network for UAV imaging support.

DAMAGE AND LOSS ASSESSMENT

After disasters, governments as well as other institutions, public and private, need to estimate the damage. In the past such assessments have had a number of weaknesses. One is a lack of pre-disaster baseline information. Another is that the economic estimates cover only loss of stocks not flows. That is, they assess the destruction of assets but not the cost of flow disruptions such as the interruption of business and the shortages of labour, and other direct costs (Figure IV-8). As a result, according to the 2013 *Global Assessment Report*, close to 50 per cent of the economic impacts of disasters are not accounted for.

FIGURE IV-8

Economic losses from disasters



Source: UNISDR, adapted from PricewaterhouseCoopers.

To assist with a more complete overview of post-disaster needs, in 2013, the UN, the World Bank and the European Union produced guidelines for post-disaster needs assessment (PDNA). This has since been widely used – for the 2015 Nepal earthquakes, for example, and for the cyclone in Vanuatu. In March 2015 at the Sendai World Conference on Disaster Risk Reduction the World Bank, the GFDRR, the EU and UNDP jointly launched a guide to developing disaster recovery frameworks. This links the PDNA process with the 'building back better' approach.

The PDNA is a government-led exercise which covers economic damage and losses, and the recovery priorities, in a single consolidated report. This is used as a basis for developing a comprehensive immediate and long-term recovery framework and for mobilizing assistance from donors and development partners. One concern, however, is that the affected country may lack the capacity for institutionalizing the PDNA into the national disaster damage and loss assessment system.

Most disaster events in the Asia-Pacific region are small to medium scale, so may not require the deployment of international assessment teams, but instead can use home-grown methodologies. These can use the PDNA methodological framework, and retain a sound scientific base, but need to be downscaled to meet local needs. For this purpose countries at high risk and with low capacity will need a 'critical mass' of trained manpower.

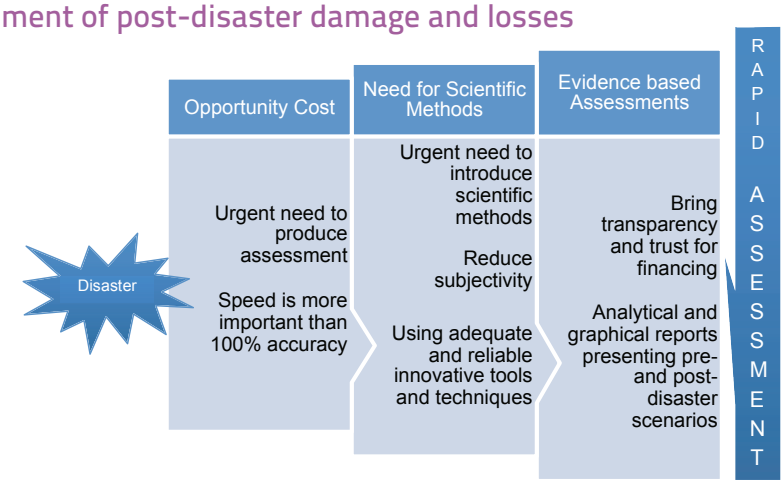
In recent years, to support the urgent political decisions on recovery and reconstruction, there has also been more emphasis on rapid assessments that are technology-based. These use satellite remote sensing, GIS, crowdsourcing and ICT applications. This was the case in the Uttarakhand flash floods in 2013, typhoon Haiyan in 2013, cyclones Phailin and Hudhud in 2014 and cyclone Pam and the Nepal earthquakes in 2015.

Rapid assessments enable faster and more accurate decision making (Figure IV-9). The key requirement is quick action based on the highest possible levels of accuracy. It is therefore critical that the estimation of post-disaster damage should be made in an objective and reliable manner with evidence-based quantitative information.

To assist in this process, and increase the speed of evidence-based assessment, ESCAP has produced a rapid assessment manual. This combines PDNA sectoral assessment methodology with the use of real or near real-time satellite data including geospatial solutions (Box IV-4). The methodology was pilot tested in the response to the 2015 Nepal earthquakes, and then adopted for capacity development training as a smart PDNA module. In South Asia, ESCAP is partnering with SAARC to customize the manual which will subsequently be rolled out in other subregions.

FIGURE IV-9

Rapid assessment of post-disaster damage and losses



BOX IV-4

Rapid assessment for resilient recovery

The SAARC Disaster Management Centre has put in place the South Asia recovery framework. The framework is supported by an important PDNA tool – Rapid Assessment for Resilient Recovery. The rapid assessment takes into account the damage and losses for selected sectors such as housing, infrastructure and agriculture, with disaster risk reduction as a cross cutting sector. ESCAP and SAARC Disaster Management Centre are jointly developing this manual on rapid assessment. This will be a step-by-step guide on conducting rapid damage assessments for the selected sectors using space, geospatial modelling, crowdsourcing and other web-based technology. The manual was pilot tested following the PDNA for the 2015 Nepal earthquakes and the methodology was reviewed by experts.

The manual should help make assessments more timely and evidence based and help users monitor the recovery process. It is targeted at managers and practitioners from government agencies that are responsible for post-disaster relief, response, recovery and reconstruction.

Comparing actual damage with pre-disaster risk assessments

A rigorous pre-disaster risk assessment can be compared with the actual outcome should disaster strike. This exercise has been carried out, for example, for the 2015 Nepal earthquakes. The pre-disaster assessment was based on the SEismic Loss EstimatioN model (SELENA) which was piloted by ESCAP in Nepal.[23] The model was run for future earthquakes at magnitudes from 5 to 8. The GDP loss per capita was anticipated to be greatest in the central hill and eastern mountain districts – which was confirmed by the actual outcome (Figure IV-10). A similar exercise for Vanuatu found that the pre-disaster risk assessment corresponded well with actual damage and loss from cyclone Pam in 2015.[24]

ESTIMATING FUTURE DISASTER LOSSES

There are two main approaches for estimating future losses. The first is probabilistic risk modelling to estimate average annual loss and the second is based on potential climate scenarios.

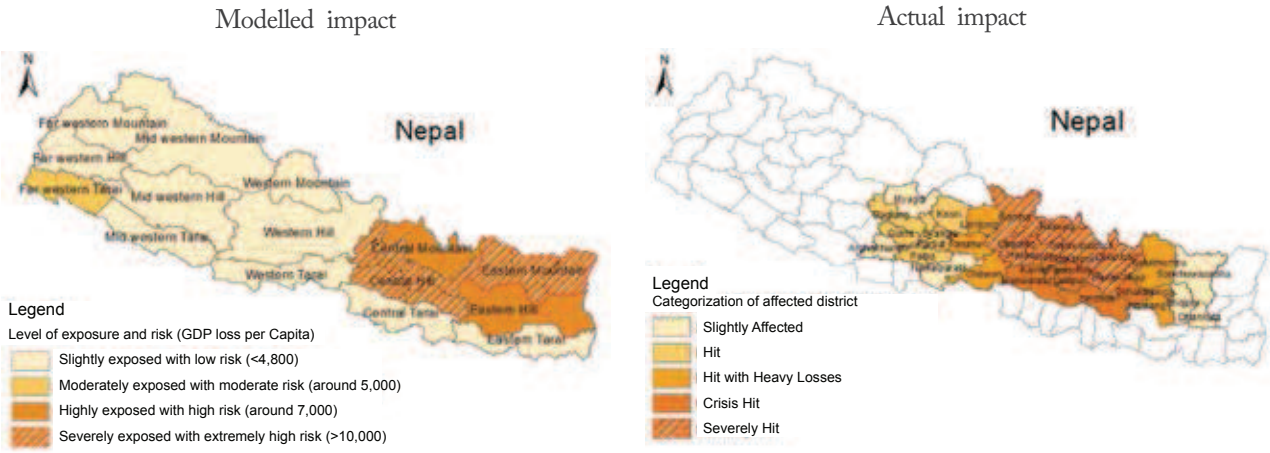
Average annual loss

The *Global Assessment Report 2015* introduced the probabilistic risk assessment method and used it to estimate future losses, from earthquakes, tsunamis, floods, cyclones/typhoons and landslides. The estimate is a weighted average of the expected loss from every disaster event, given its probability of occurrence – the average annual loss (AAL). An AAL calculation involves three components: hazard modelling; exposure and vulnerabilities; and risk estimations. It uses both historical experiences and modelled predictions to give a comprehensive picture of what can be expected.

The AAL is considered one of the most robust probabilistic risk indicators – offering a quantifiable, and comparable assessment of future disaster losses by type and economic sector. Policymakers can use this for DRR financing budgets, designing risk reduction schemes and carrying out cost-benefit analysis for specific intervention proposals.

FIGURE IV-10

Modelled and actual earthquake damage in Nepal, 2015



Source: Government of Nepal/Ministry of Home Affairs (accessed 21 May 2015).

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Disasters impact different countries in different ways, and the AAL can reflect this with detailed estimates at the national level. Figure IV-11 provides estimates for AAL for selected countries, by type of disaster and sector. This indicates that in large continental States including Bangladesh, China, Myanmar, Nepal and Pakistan, the main drivers of AAL are floods. It also shows that China, Nepal and Pakistan are at greater risk of losses from earthquakes, while Bangladesh is more exposed to cyclonic winds. For island countries like Vanuatu and the Philippines, the risks are much higher from storms and cyclonic winds.

The AAL also enables estimates by sector (Figure IV-11). For some countries, those worst affected are poor households – as in Myanmar, Pakistan and Fiji, where they experience around 40 per cent of the income loss. For others, the brunt of expected disaster losses, around 70 per cent, is felt in commercial and industrial sectors – as in Bangladesh, China, Nepal and Thailand.

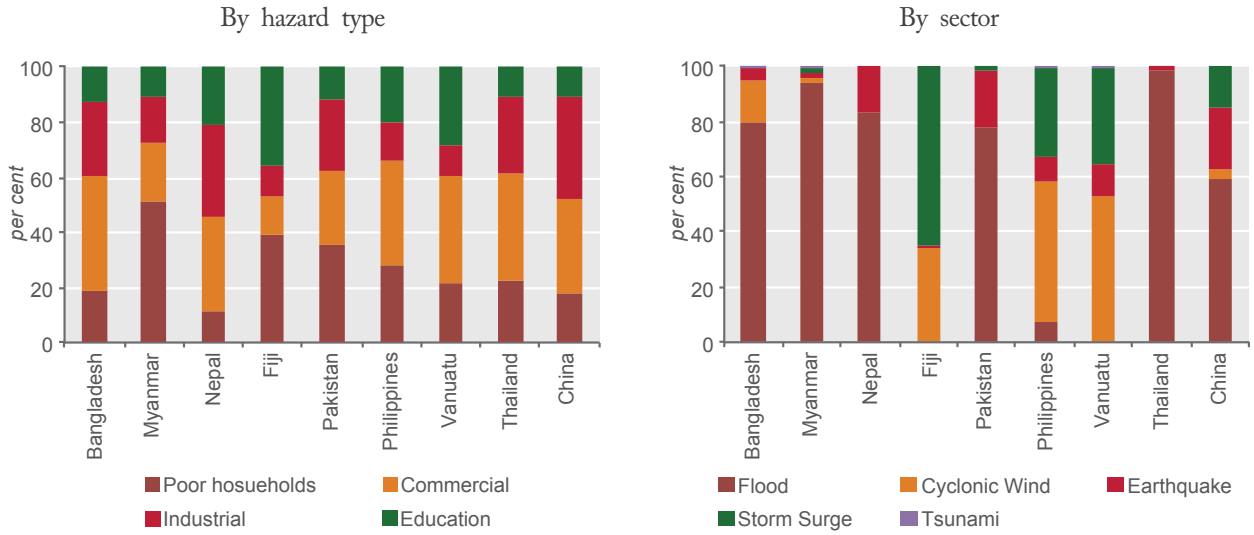
Climate risk assessment

Many countries in the region have been downscaling regional climate change scenarios to the national level, particularly for hydrometeorological hazards. The aim is to understand the scale and nature of the risks associated with climate change, as well as the impact on vulnerable sectors, along with the associated costs. This involves three steps: regional climate modelling, physical impact assessment and economic assessment.

The Asian Development Bank, for example, has examined the economic costs associated with climate change and adaptation in five countries: Bangladesh, Bhutan, India, the Maldives and Sri Lanka. This pioneering study predicts that climate change will cost these countries on average 1.8 per cent of their annual gross domestic products, rising by 2100 to around 8.8 per cent.[25]

FIGURE IV-11

Estimated average annual losses from disasters, selected countries



Source: UNISDR, 2015b.

A number of countries now have pilot programmes for comprehensive climate risk assessment – including Bangladesh, Cambodia, Nepal, Papua New Guinea, Samoa, Tajikistan and Tonga. These assessments are taken into account by climate investment funds/green climate funds for financing climate resilience projects. A number of innovative country-level initiatives have demonstrated the potential for climate risk assessment for resilient development planning (Box IV-5).

TRANSBOUNDARY CONCERNS

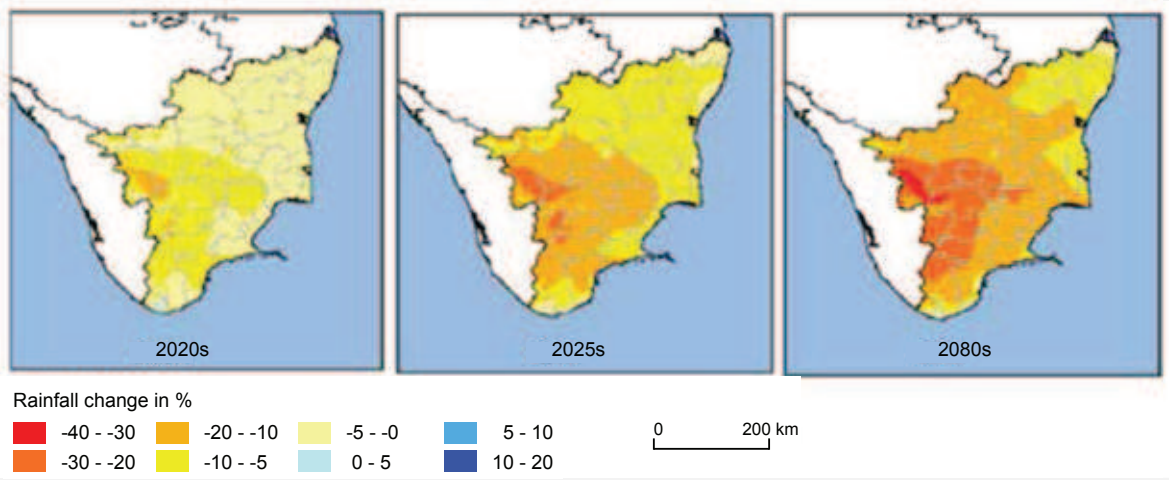
The impact of natural disasters often extends beyond the boundaries of a single country as weather and geographic topography do not stop at the boundaries of any one country, city or administrative boundary. Managing disaster risk thus also requires cooperation between neighbouring countries. The region's best practices in information sharing for disaster risk management include:

BOX IV-5

Climate risk assessment for resilient development planning – Tamil Nadu, India

Tamil Nadu in India is exposed to various climate-related risks including cyclones, heavy rainfall, floods, droughts and landslides. To ensure climate-sensitive planning and decision-making, government stakeholders have been encouraged to incorporate comprehensive climate risk management into development planning.

This has been used to calculate the effect of climate change on the agriculture sector. The assessment was based on high, medium, and low emission IPCC scenarios, for the 2030s, 2050s, and 2080s.[26] This indicated the associated temperature increases and likely declines in precipitation, as in the maps below.

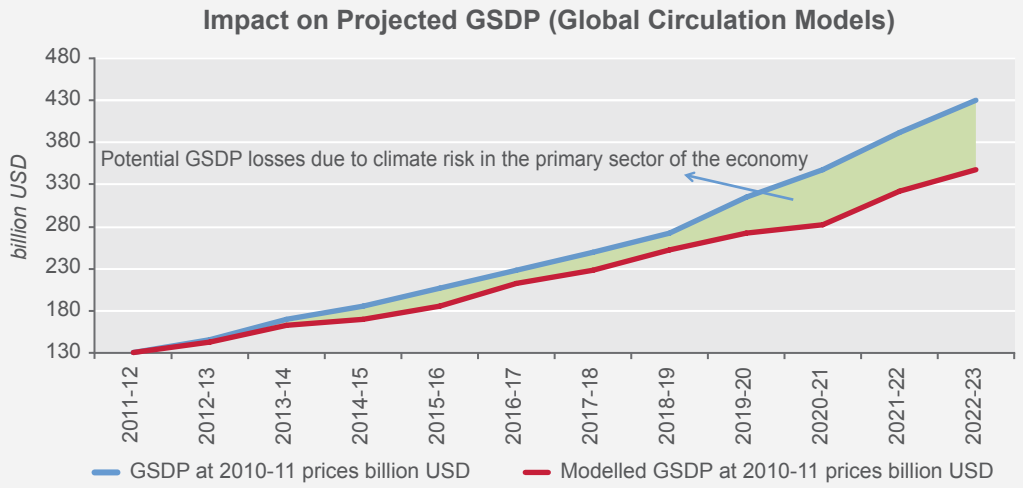


Source: UNDP, 2013b.

BOX IV-5 (continued)

Climate risk assessment for resilient development planning – Tamil Nadu, India

This was used to model the impact on the primary sector of the economy – on agriculture and on industry and service sectors linked to agriculture. The project impact on gross state domestic product (GSDP) is indicated below.



Source: UNDP, 2013b.

Flood management and mitigation in the Mekong river basin

The region's most established mechanism for managing a transboundary resource is the Mekong River Commission – which works directly with the governments of Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam on joint management of shared water resources in the Mekong river basin (MRB). The MRB has many potential flood areas and complex transboundary water relationships – particularly in the lower MRB – emanating from nature or human decisions and activities (Figure IV-12).[27]

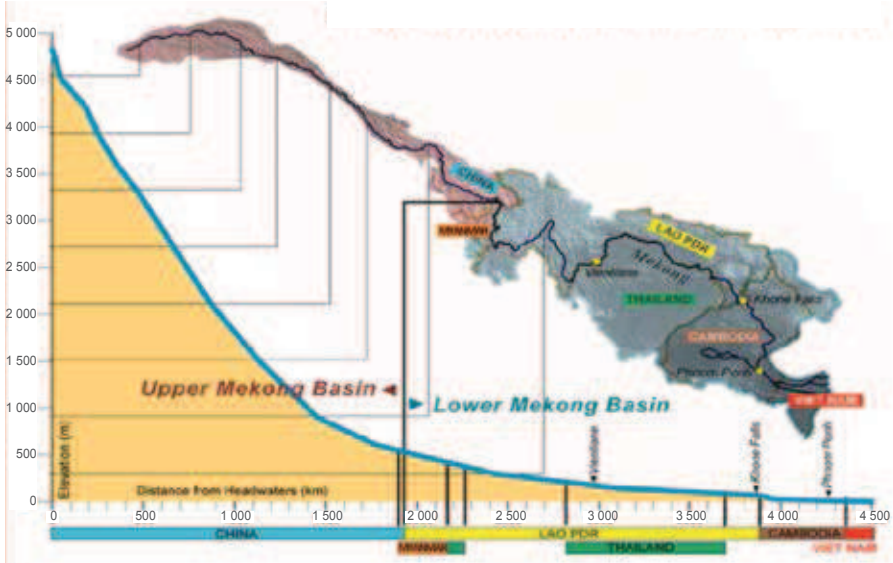
The Mekong has a predictable and regular pattern of seasonal flooding but the extent can vary significantly from year to year.[28] To address such issues the MRC has an Information and Knowledge Management Programme which makes flood forecasts via its Data Information Services Portal – keeping communities updated and helping them plan for crop irrigation, navigation accessibility and fisheries.[29]

Hindu Kush Himalaya regional flood information management system

The Hindu Kush – Himalayan region (HKH) comprises high mountains, valleys, and plateaus shared by Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. Rivers flowing through this region are vital for the survival and well-being of more than a billion people, most of whom live in the surrounding plains. The region is, however, vulnerable to geological and hydrometeorological disasters, particularly flooding.

FIGURE IV-12

The Mekong river profile from headwaters to mouth



Source: Mekong River Commission, 2011.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

To monitor these vital water flows, and ensure a timely exchange of flood data through an accessible and user-friendly platform, the International Centre for Integrated Mountain Development (ICIMOD), in collaboration with the World Meteorological Organization, has made efforts to establish the 'Regional Flood Information System in the HKH Region'.[30] This initiative has helped set up hydrometeorological stations across Bangladesh, Bhutan, Nepal and Pakistan. These stations collect real- or near-real-time data on river levels and rainfall and related issues – which is disseminated through a web-based platform. This Regional Flood Information System may now be integrated into the operational flood monitoring and early warning systems in the respective countries. For this purpose, there are two important enabling steps. The first is to fully understand the transboundary risk - from regional to local levels. The second is to establish a multi-stakeholder platform that will engage the disaster risk management community with other key stakeholders, including hydrologists and meteorologist. This twin-track strategy will ensure better linkages between the Regional Flood Information System and its operational applications so as efficiently support flood forecasting and early warning down the line.

Transboundary management of landslides

Landslides can also be transboundary. In 2014, for example, heavy precipitation in Tajikistan triggered a landslide that killed 431 people in the neighbouring region of Badakhshan in Afghanistan.[31] Due to the absence of a transboundary information sharing mechanism, it was not possible to issue an early warning.

If countries and communities are to mitigate the impacts of hydrometrological-related disasters they will need to scale up existing measures such as landslide hazard zonation, risk assessment and early warning. This requires a more in-depth

understanding of numerous risk factors: terrain characteristics; weather patterns and severe precipitation events; vulnerable populations; exposure of settlements; and key infrastructure. This should be complemented with a transboundary information management system to deliver data to government agencies. By cooperating in this way at the regional level and local level they can share the risk information and allow for timely evacuation. Such transboundary information management also needs to be more comprehensive – integrating river-basin hydrology with climate risk scenarios, seasonal weather forecasts, monsoon variability analysis, terrain characteristics and information on land use and cover.

ESCAP is supporting this transboundary information management in various ways, including the development of regional land cover maps for better understanding of disaster risk. In addition, one of ESCAP's specialized regional institutions, the Asian and Pacific Centre for development of disaster information management (APDIM), is helping countries address critical gaps and strengthening the region's capacity for pre- and post-disaster risk assessment. APDIM takes a multi-hazard approach – focusing on earthquakes, tsunamis, floods, cyclones/typhoons and droughts. In this way it can address information gaps and promote South-South and regional cooperation.

ADDING VALUE TO INFORMATION

Information should not just be accurate it should also be actionable – allowing countries to assess trends over time, and between regions, and to set quantifiable targets for disaster risk management. They should be able to employ the data in their risk models and vulnerability analyses and use these as a basis for decision-making. For this purpose disaster data systems should use standard socioeconomic indicators and harmonized methodologies so that they can be interlinked.[32]

Geospatial information

Geospatial information is valuable for assessing a number of hazards. One study that assessed ten major geospatial information products found that for humanitarian purposes the most valued products were those related to earthquakes and floods.[33] For economic purposes, however, those of greatest use were for urban land use classification along with flood and landslide risk assessments (Figure IV-13).

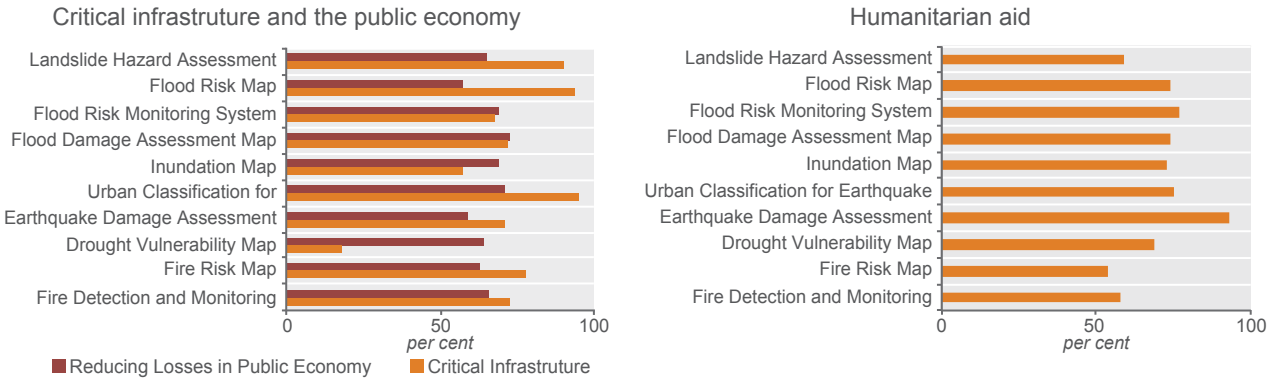
The study also considered the most useful mapping scales. Apart from drought vulnerability, where the data often need to be presented at a regional or global level, the most useful geospatial information should be on much smaller scales and at high resolution. Flood risk maps, and urban classification for earthquake risk mapping, for example, should be on scales of 1:2,000 to 1:10,000, with a spatial resolution of one to five metres per pixel.[34] Landslide hazard assessment mapping can be at a 1:50,000 scale, with a spatial resolution of 10 metres. Another issue is the frequency of updates which in both these cases might be every five years.

Geoportals

One of the most useful ways of sharing information is through web-based geoportals. These can collect information from diverse sources and offer customized presentation for specific types of user. Customization is organized according to 'access control' and 'workflow'. Access control means that different groups of users can be given privileged or limited access to certain areas of the system. Workflow involves

FIGURE IV-13

Views of the value of geospatial information



Source: UNOOSA, 2015.

Notes: Percentage of respondents rating the benefits as 'high'.

managing the flow of data between certain groups of users, depending on who needs to take action, who needs to stay informed, and who needs specific information. Another important issue is the aspect of time. Within geoportal systems timing can be managed through the use of alerts, notifications, and scheduled and automated updates and outputs.

ESCAP has worked with Countries with Special Needs to establish cost-effective, easy-to-maintain portals for geo-referenced information systems for disaster risk management (Geo-DRM). For this purpose ESCAP has been collaborating with UNOSAT, the Asian Institute of Technology, and the Applied Geoscience and Technology Division of the Secretariat of the Pacific Community. These portals, which have now been established in Bangladesh, Cook Islands, Fiji, Kyrgyzstan, Mongolia and Nepal, combine socioeconomic data with satellite imagery and other disaster-related data – providing the right information to the right people, at the right time. Countries that wish to implement their own geoportal can take advantage of open-source options (Box IV-6).

BOX IV-6

Open-source geo-referenced information systems

ESCAP has helped countries share geo-referenced information over the internet using the open source tools GeoNode (http://geonode.org/) and GeoNetwork (http://geonetwork-opensource.org/). These provide a single platform for accessing location-based information, using archived and up-to-date infrastructure, socioeconomic, meteorological, disaster and satellite-derived data. Responding to an ESCAP survey, national authorities and agencies said that Geo-DRM portals are essential tools for taking advantage of satellite imagery received from national, regional and international providers.

To control access, manage data, and maintain the consistency and authenticity of information, it is important that such systems be centrally managed by a national focal point, preferably a national disaster management authority. The focal point can work closely with national survey departments,

BOX IV-6 (continued)

Open-source geo-referenced information systems

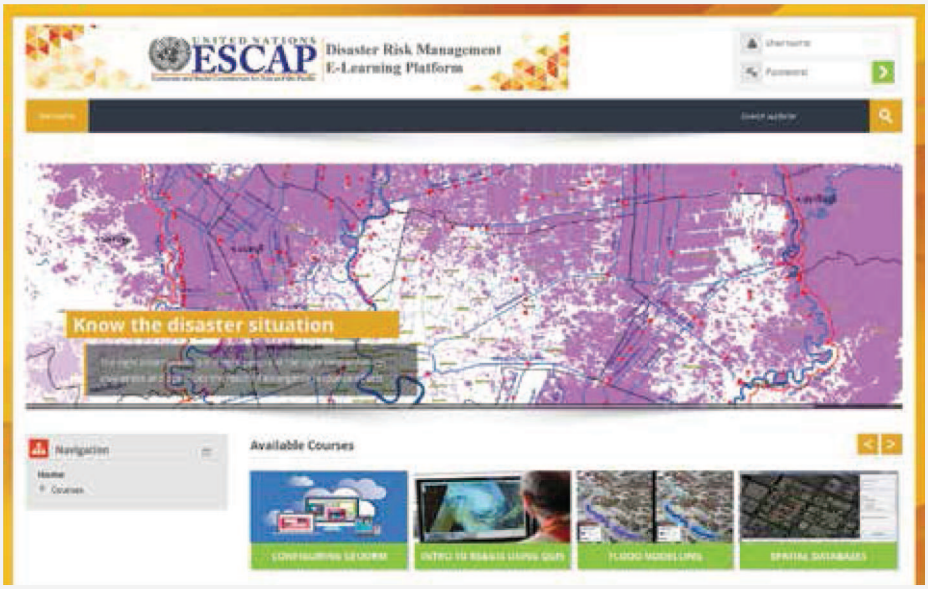
census departments and meteorological departments to upload and maintain data in their respective domains. For this reason, the Geo-DRMs have been positioned within the appropriate national authorities. During these tasks, ESCAP has also linked up with ministries and agencies working in similar fields and coordinated with on-going national efforts through existing United Nations and inter-agency initiatives.

- Cook Islands – the country has formed a taskforce consisting of GIS experts from various ministries. After fully mapping the island of Aitu, they officially launched the portal in August 2014.

- Mongolia – National Emergency Management Agency has established a Geo-DRM portal which is used for mapping resources, groundwater, land use, ecosystems, provincial borders, forests, soil, grasslands and special protected areas. Mongolia is currently utilizing natural and man-made disaster data and will connect the portal to the emergency operation and early warning centre.

- Nepal – The Ministry of Home Affairs has formally launched their portal and all stakeholders are using the system and continuously uploading disaster-related data. The geoportal was also used during the 2015 earthquakes as a repository for GIS and mapping data (http://drm.moha.gov.np/).

ESCAP has also launched an online learning platform for disaster risk management. The site provides instructions on how to set up and maintain such Geo-DRM portals, perform geospatial analysis and flood risk modelling. It also offers information on other disaster-related GIS skills and techniques (http://drmlearning.unescap.org/).



Source: ESCAP, available from http://drmlearning.unescap.org/.

CHAPTER 4

The Asia-Pacific region has access to a variety of advanced subregional, regional and global geoportals. They include those developed by: the Indian Space Research Organisation (http://bhuvan.nrsc.gov.in); the Pacific Disaster Center (http://www.pdc.org); the International Centre for Integrated Mountain Development (http://geoportal.icimod.org); the Global Disaster Alert and Coordination System (http://www.gdacs.org); and ReliefWeb (http://reliefweb.int), a specialized digital service of OCHA.

THE RIGHT INFORMATION TO THE RIGHT PEOPLE AT THE RIGHT TIME

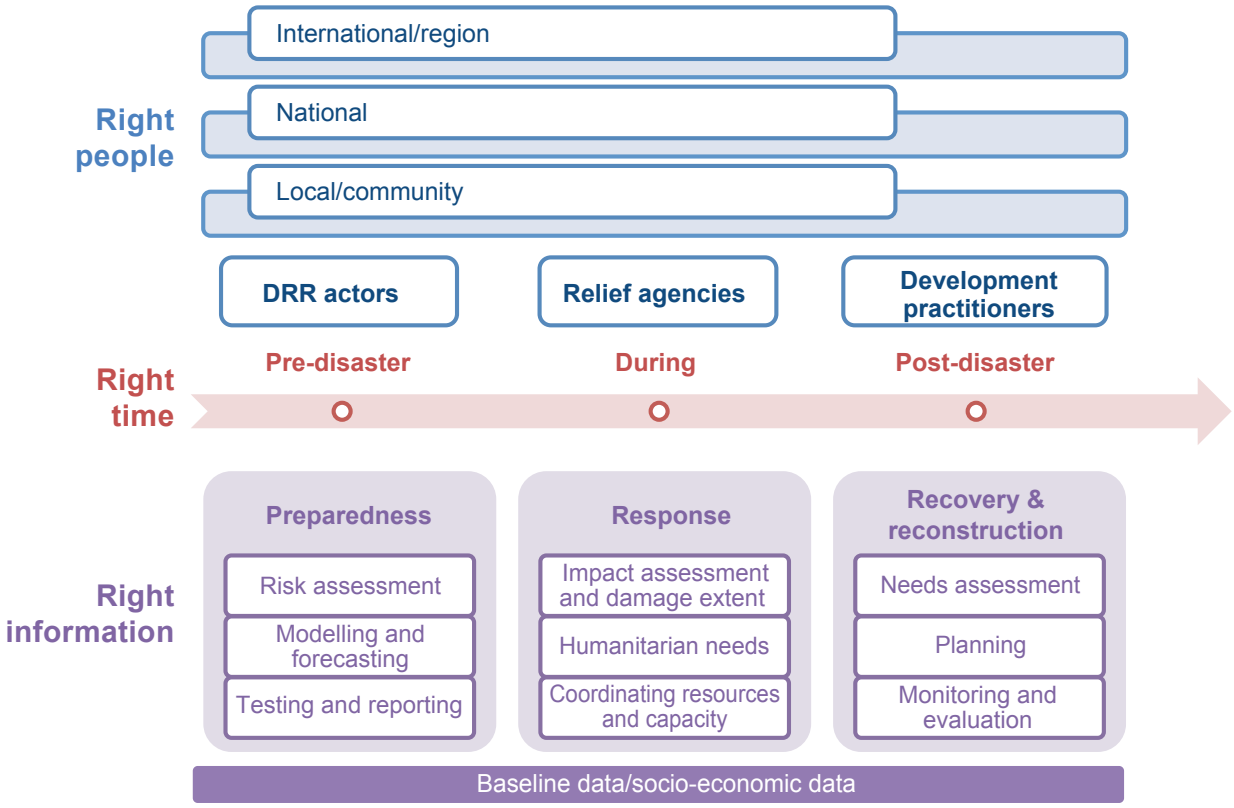
Effective information management provides the right information to the right people at the right time (Figure IV-14).

Right information – Each phase of the disaster cycle – preparedness, response and recovery and reconstruction has specific tasks. During the response period, for example, these include impact assessments, humanitarian needs assessments and the coordination of resources and capacity. Each has its own information requirements.

Right people – Each phase also has its own primary stakeholder groups. These include DRR actors, relief agencies and development practitioners who in turn may be operating at the international, regional, national and local levels. It is important to map these groups and understand their information needs and also the information they can generate to feed into the overall information management system.

FIGURE IV-14

Right information, right people and right time



Right time – There are windows of opportunity for providing information to each target audience and for collecting it from the various sources. This requires a degree of predictability through regular reporting structures, as well as elements of flexibility to fulfil ad-hoc information requests.

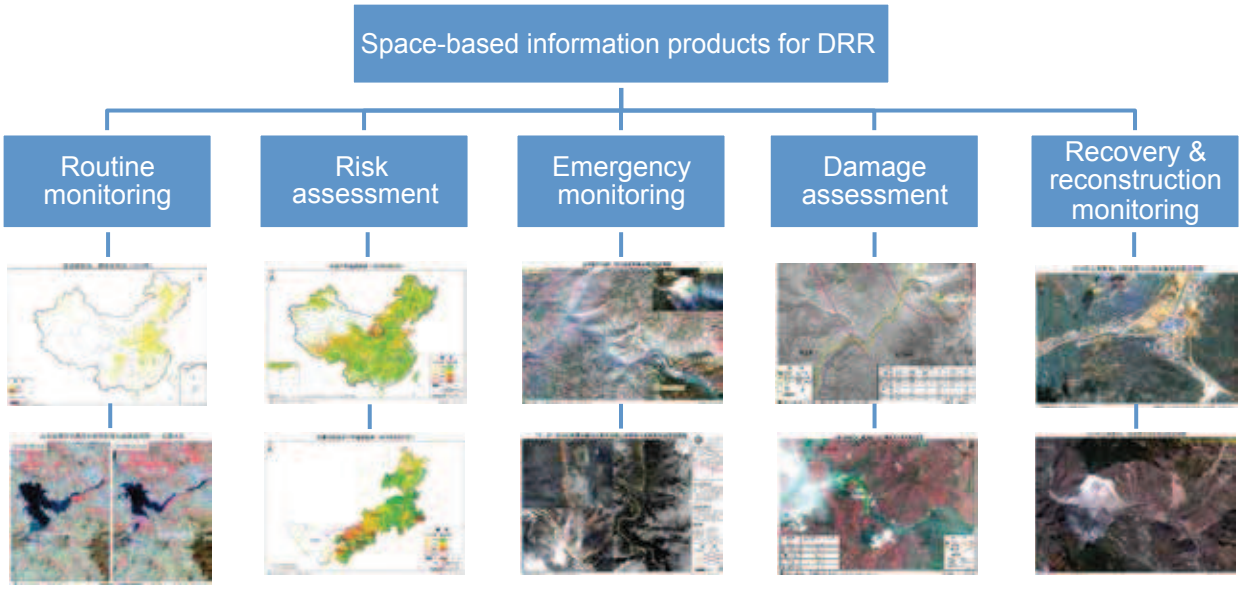
Each country will design its own information system. For example, the National Disaster Reduction Centre of China (NDRCC) has a range of operational information products (Figure IV-15). In this case, for example, the 'routine monitoring' and 'risk assessment' components correspond to the 'pre-disaster' right time period of Figure IV-14. While the 'Emergency monitoring' and 'Damage assessment' components correspond to the 'during' period. Pre-disaster products, for example, cover applications for providing advice and sending messages through mobile phones and other devices. During-disaster products include applications for disaster situation briefings, aerial imagery, geological hazard monitoring, flood inundation, monitoring structural integrity and monitoring damage to key roads, infrastructure and residential sites.

MAKING ICT SYSTEMS RESILIENT

During disaster events, information management systems are themselves vulnerable. It is important therefore that they are grounded within resilient infrastructure such that they can absorb shocks and maintain services when faced with limited connectivity or increased volume of traffic. Such resilience requires network diversity, redundancy and proactive investment. In an effort to understand how these considerations affect the communications networks in the region, ESCAP and ITU have partnered to create a regional map of the terrestrial fibre optic backbone. This map makes it easier to identify weaknesses in

FIGURE IV-15

Disaster information products in China



Source: Provided to ESCAP by NDRCC, 2015.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.


UNEP PHOTO/TAMAS DEZSO

the regional connectivity infrastructure and to target infrastructure investment opportunities.

ESCAP's Asia Pacific Information Superhighway[35] (APIS) initiative tackles these issues by addressing missing links at the national and subregional levels. APIS promotes resilient infrastructure backbones that have a balance of terrestrial and submarine fibre optic connectivity. Investments in this type of infrastructure, together with improvements in internet traffic management, and mechanisms for regional cooperation, will make networks more resilient to disruption by disaster events and easier to restore if damage occurs.

Japan, for example, has ensured that its disaster management communications are resilient by basing them on a decentralized 'mesh' architecture. Networks and relevant buildings each have their own receiving stations and radio masts, supplemented by mobile equipment, while all are linked to an overarching communications satellite (Figure IV-16).

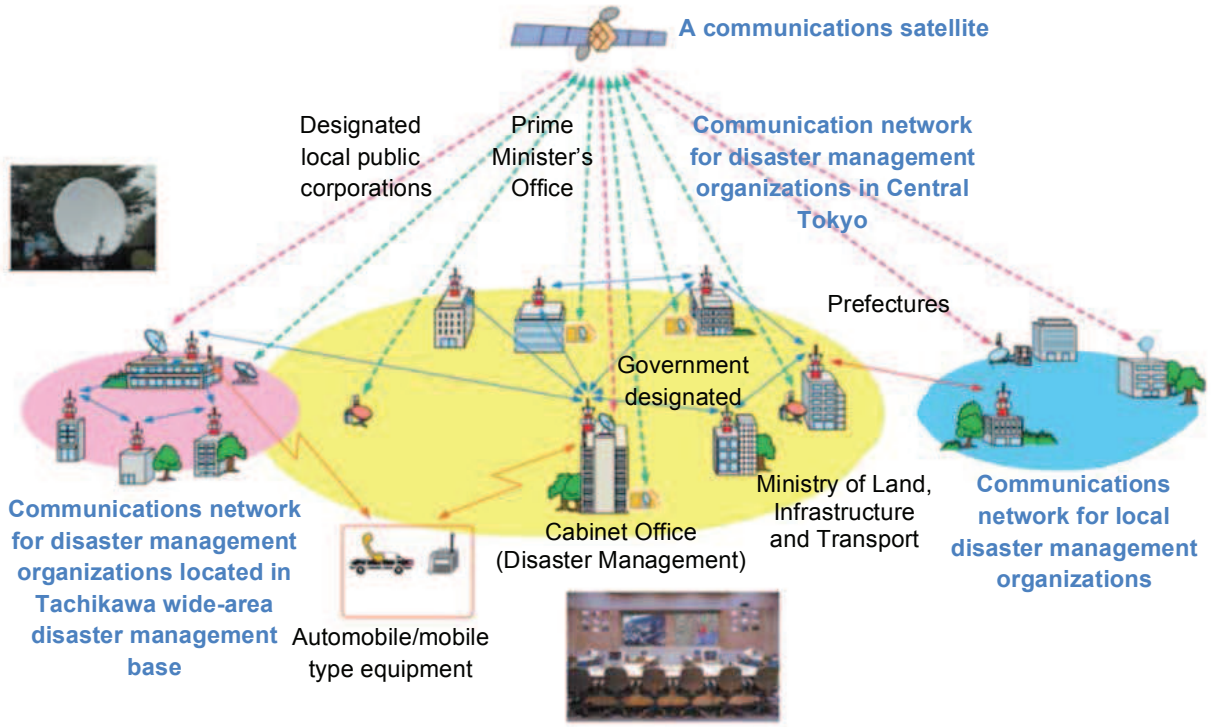
SCADA systems

Individual items of energy and transport infrastructure, such as bridges or electricity substations, are typically monitored remotely by centralized systems over communications networks – using SCADA (supervisory control and data acquisition) systems. Such systems generally work well, but from the perspective of disaster management have a number of limitations. One is that they are usually proprietary and differ from one application and enterprise to the next. Another is that these 'black box' systems are not interoperable or interconnected.

For example, Thailand's Flood Control Center, established in 1990, monitors 69 remote SCADA units that measure hydrological data such as

FIGURE IV-16

Central disaster management radio communications system in Japan



Source: Provided to ESCAP by Japan Aerospace Exploration Agency, 2014.

rainfall, water levels and quality, as well as flood damage for processing and analysis.[36] But the only way to collect the data is to physically visit the installations.

Nowadays due to increasing automation and integration of these technologies, it is necessary to view them as interconnected and interdependent parts of a critical network. For this purpose it will be important to move from proprietary systems to open standards. This helps promote systems integration, and empowers end users to identify problems and respond to them. Such systems should also be regularly tested. At the regional level stakeholders can create working groups to focus on specific activities, and collaborate on sharing information for disaster preparation and response.[37]

CELL PHONES

The latest smart-phones have embedded sensors that enable them to collect large amounts of incidental data, from electronic transactions, for example, and social media. Analysis of this 'big data' can, give immediate indications of population movements, for example, or other behaviour that can be useful before and after disaster events. Cell phones can also be valuable for general disaster management – receiving text messages and warnings of incoming disasters, and also transmitting crowd-sourced imagery of damage and impact.

The rapid advances in technology offer great opportunities. But taking full advantage of these is difficult for governments. While the technology

for standard cell phone calls and text messages has remained relatively unchanged for many years, user behaviour changes very quickly. A specific application might only have a lifespan of five to ten years. This is a reasonable period for consumer technology, but far shorter than that typically required for government investment programmes and products.

These applications depend on collecting large amounts of user data, so they rely on a resilient network that can withstand large-scale disasters. To make realistic use of these tools, governments should therefore focus primarily on maintaining the infrastructure – ensuring, for example, that commercial telecommunications networks can cope with disruptive events and handle high usage spikes.

At the same time governments need to remain sufficiently agile to identify and utilize emerging technologies – and be in as strong position to collect, curate and take action on this data. For developing countries in particular this is generally an expensive prospect so governments should carefully consider which aspects of the technology they can afford or sustain.

Relying on mobile phones as data conduits also confronts a classic problem in the use of ICT – the tendency, particularly in developing countries, to empower the connected and further disenfranchise the more marginalized communities. There can also be gender implications, as women in some poorer communities are less likely to have mobile phones. Even in these circumstances, however, disseminating disaster warnings by text message is likely to be effective since the news will be passed on rapidly through communities and households. Nevertheless, when promoting these tools governments should be more sensitive to issues of access and marginalization.

Hardening networks

During disasters, there are two major causes of communications disruption. One is physical damage or loss of power. The other is sudden network congestion as governments, emergency responders, and citizens all start using their handsets.[38] To reduce the probability of service outages, countries should frequently stress test their networks and where necessary take steps to 'harden' the weaker components.

Two indicators of the health of a national communications system are 'packet loss' (the percentage of information packets that are lost in transmission) and 'network latency' (the time it takes for a packet of data to get from one designated point to another). Based on information from around 90 countries, the mean rate of packet loss globally is 1.68 per cent and the mean latency globally is 107.31 milliseconds. In the Asia-Pacific region performance on these indicators varies greatly. Latency in Nepal, for example, is significantly higher than in Singapore (Table IV-3).

Ensuring that networks are sufficiently robust during disasters is made more difficult by continuing increases in consumer demand. Countries that are not increasing their network capacities accordingly risk having them falter during disaster events.

One way of extending networks through fibre optic cables at lower cost is to co-locate these with existing or new energy or transport infrastructure. It may also be possible to use untapped fibre capacity in existing SCADA systems.[39] Such co-location also makes it simpler to repair damaged infrastructure.

TABLE IV-3

Network reliability, selected Asia-Pacific countries

Country	Year	Mean packet loss (%)	Mean latency (milliseconds)
Azerbaijan	2013	0.32	83.96
Russian Federation	2014	0.83	72.09
Hong Kong, China	2014	1.00	72.13
Singapore	2014	1.40	64.49
Kazakhstan	2010	1.26	92.35
Nepal	2012	1.85	92.65

Source: Speedtest.net (retrieved June 2014) and analysis by ESCAP.

Recent disasters in the region have demonstrated that while a fibre optic backbone can be quite disaster resilient, it is more difficult to deliver reliable communications over the 'last kilometre'. In Nepal, for example, during the 2015 earthquakes the national core telecommunications backbone, which had benefitted from significant investment, stayed functional. But other components of the network, such as cell phone towers, suffered significant impacts, making it difficult to restore communications to hard-hit areas. This experience illustrates the value of investment, but also the need to consider the complete service delivery chain.

RESTORING COMMUNICATIONS AND E-RESILIENCE

The first 72 hours after a disaster are crucial.[40] During this period, the most critical response teams can be equipped with dedicated communications networks such as terrestrial trunked radio. However it is also vital to restore the communications infrastructure as a whole. Indeed it may need to be enhanced, given high data traffic following disasters – for sharing high-resolution GIS maps, for example, streaming video, or large amounts of voice communication.[41]

Resilience via internet protocols (TCP/IP)

Voice information on a telephone call is transmitted using a circuit-switched network which is prone to overload as multiple callers vie for the same communication pathways. The internet, however, operates on the principles of packet-switching in which individual packets of information that make up a message can take any one of multiple routes according to availability. This level of redundancy makes it inherently more flexible and resilient. In the wake of the Japan earthquake of 2011, for example, NTT DoCoMo, Japan's largest mobile phone operator, created an application called Disaster Kit. This allowed users to communicate with their friends and family via voice messages through a packet-switched data network rather than adding to the load on the circuit-switched voice network.[42]

Mobile base stations

Mobile networks can also offer a degree of redundancy. Should one cellular base station fail, some service to the affected area can be provided by a neighbouring node. And in the case of disaster it is also possible to quickly add mobile base stations or 'cells on wheels'.[43]

Even so, these will all need power supplies. One problem following the Japan earthquake of 2011, was insufficient power for base stations. In response, companies have introduced new designs featuring longer-lasting fuel cell technology.

Mobile base stations were deployed, for example, in the US in 2005 in the aftermath of Hurricane Katrina in New Orleans to provide cellular connectivity for first responders. ViaSat and Qualcomm staff transported mobile base stations that allowed for communications both within and outside the network. For best coverage such stations should be located on high vantage points. In New Orleans, they could be placed on high-rise buildings.[44] But this may not always be possible, particularly in rural areas, or in urban settings affected by floods or earthquakes. In such cases, ground-based systems can be supplemented with airborne antennae.

Airborne base stations

Another option is to have the whole base station airborne on a UAV.[45] Individual UAVs, using miniaturized cell phone technology, might be able to service only a limited area, but connected with a base station they can also be linked in chains. These have the advantage of flexibility since they can be moved as required. They are also relatively inexpensive.

Internet services can also be offered from balloons. In 2013, the internet company Google announced Project Loon. This project has now reached the stage where a single balloon can stay aloft for more than six months and when linked with an upstream telecommunications network can provide cellular service for an area of around 3,000 square kilometres. While originally intended to extend services generally in developing countries this also has considerable potential for more specific use during disasters.[46] Motorola is also developing lighter-than-air platforms to deploy communications services rapidly when terrestrial infrastructure has been damaged.

A ROADMAP TO EFFECTIVE AND RESILIENT INFORMATION MANAGEMENT

Providing the right information to the right people at the right time, involves five principal steps. These are: 1) understanding risk; 2) having data and information sharing policies; 3) generating actionable information; 4) customizing information and reaching out to people at risk; and 5) using real-time information.[47]

Taking these steps depends on three key 'enablers': capitalizing on innovative technology, achieving international and regional cooperation, and developing capacity through South-South and Triangular cooperation to share knowledge and good practices[48]. These principal steps and key enablers all depend on critical ICT infrastructure which need to be protected to underpin their functioning.

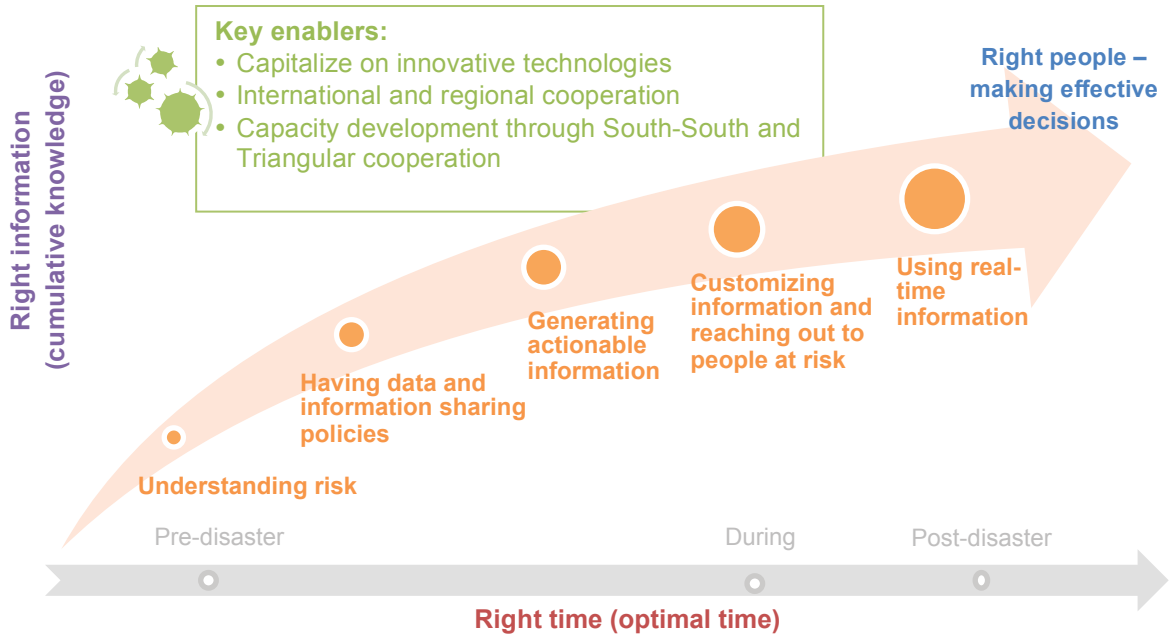
Step 1 – Understanding risk

Understanding risk is best addressed during the pre-disaster phase. This involves assessing risks in qualitative and quantitative terms, where possible modelling them with available data, while considering issues of financing and insurance. It also means taking into account the culture and psychology behind risk, and creating partnerships for building resilience (Box IV-7).

One issue is that information collected from various sources may not be in a standardized form. It may also have coverage biases: information

FIGURE IV-17

A roadmap to disaster information management



from insurance companies, for example, will largely refer to events that might be covered by insurance. Disaster information collected at the local level (e.g. DesInventar) is likely to be more complete for specific disaster – since it will include small magnitude and high-frequency events (Box IV-8). But it only covers those disasters that are entered into the system. Learning from the DesInventar experience, the Government of Indonesia has been working with UNDP to create Disaster Data and Information of Indonesia – a comprehensive disaster loss database that will guide the development of a national DRR plan and can be used to monitor the impact of disasters on poverty at the community level.

Step 2 - Data and information sharing policies

In many cases individuals and organizations create data for their own purposes, but it is not clear who is responsible for sharing it more widely. Everyone assumes that some responsible authority must be managing and coordinating information, but this may not be the case.[49] Data sharing may also be hampered by policies for data privacy and data protection.

It is imperative therefore that policies on data sharing are clearly established before disasters strike. Otherwise any sharing is likely to be ad hoc and sporadic based on personal relationships and informal networks.[50] Many countries have addressed this delicate policy balance through ministerial or parliamentary directives that override existing policies during emergencies. Or they may allow for exceptions where, under certain conditions, one policy takes precedence over another. Such policies can be broad, at the national and regional levels, or they can be specific or bilateral, between agencies and line ministries. Policies can also cover technical issues

BOX IV-7

Open-source risk assessment tools

Some tools for risk assessment have been developed by the private sector, usually by insurance companies for catastrophe modelling. However, there are also many open-source options developed by governments and international agencies.

One of the earliest, was the Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters (RADIUS).[51] This allows users to perform aggregated loss estimation using a mesh grid. Another is HAZUS ('Hazards US') which was developed using public domain software by the US Federal Emergency Management Agency for performing loss estimation. Several other countries have adapted the HAZUS methodology for their own needs.

The Central American Probabilistic Risk Assessment (CAPRA) initiative utilizes geographic information systems, Web-GIS and catastrophe models for disaster risk assessment within an open platform.[52] CAPRA's main product is the software tool CAPRA-SIG, which combines hazard scenarios, and exposure and vulnerability data to calculate loss exceedance curves. The RiskScape methodology for multi-hazard risk assessment is a comparable initiative in New Zealand.[53]

Additional methodologies and tools include Vulnerability and Capacity Assessment by the International Federation of the Red Cross and Red Crescent Societies, Community based disaster risk Management by the Asian Disaster Preparedness Center, and Natural Disaster Hotspots by the World Bank.

BOX IV-8

Databases and resources for understanding risk

The Emergency Events Database – Administered by the Centre for Research on the Epidemiology of Disasters, EM-DAT, records disasters based on threshold criteria: at least 10 fatalities; 100 or more people affected; a declaration of emergency; or a call for external assistance.[54]

GLIDEnumber – The Asian Disaster Reduction Center assigns each disaster a unique identifier and a number of relevant attributes.[55]

DesInventar – Disaster Information Management System. This is a disaster loss database that allows local authorities, communities, and NGOs to collect disaster information at the local level to feed into an online database.[56] It is an initiative of UNISDR, the European Commission and UNDP.

DisDAT – This is a service of the Global Risk Identification Program and the Centre for research in Epidemiology of Disasters. It brings together all publicly available disaster databases from different countries.[57]

INFORM – This is a global, open-source risk assessment for humanitarian crises and disasters. It is a collaboration of the Inter-Agency Standing Committee Task Team for Preparedness and Resilience and the European Commission. Available from http://www.inform-index.org.

such as standardization and formats, platforms, procedures and protocols, timeframes, naming conventions, authorization and classification.[58]

Integrating geospatial information in particular relies on robust spatial data infrastructure (SDI) – a framework for policies, resources and structures. At the global level the United Nations Spatial Data Infrastructure (UNSDI) promotes the development of a framework for sharing, processing, applying, and maintaining spatial data sets within an environment of agreed technologies, policies, and standards.

It is also important to combine global and national data infrastructure – to allow for the sharing of maps through inter-operable formats. For this purpose, the United Nations initiative on Global Geospatial Information Management (UN-GGIM) is setting the agenda for the development of global geospatial information, and monitors the SDI status for all countries.[59] Asia-Pacific countries that have their SDI details listed include Australia, China, India, Japan, Republic of Korea and Malaysia.

Step 3 - Generating actionable information

While it is relatively easy to generate vast amounts of data it is more difficult to ensure that this information is actionable. Earlier sections have indicated what this implies during the pre-disaster phase. But actionable information is needed throughout the disaster cycle. For this purpose, it is important to establish a classification system for information types, along with the implied actions. This system can then be used for information filtering. As information comes into a disaster risk management system it can be assigned to an appropriate action.

Step 4 – Customizing information and reaching people at risk

Information should be customized to the needs of stakeholders. This requires location-based information services and decision support tools that can reach out to people at risk. It also means establishing strong institutional links for coordination between developmental and planning actors so that risk reduction is integrated into development plans. Normally such integration should be carried out as part of their regular functions by planning ministries.

Step 5 - Using real-time information

A well-informed situation analysis requires real-time data. Nowadays this can come from local information complemented with satellite imagery, geospatial information, crowdsourcing and UAV images. However, to work smoothly this requires considerable coordination. For example, if a disaster has transboundary origins, then gaining access to real-time information requires regional and international cooperation. An important agreement in this respect is the International Charter on Space and Major Disasters (Box IV-9). At the regional level, in Asia-Pacific, access to satellite images is facilitated by ESCAP's RESAP network and Sentinel Asia.

Protecting ICT infrastructure

Disaster management planning depends on effective communications networks. Since these networks are also heavily embedded in a variety of other infrastructural components, such as management of the electrical grid, it is important to take an integrated approach.

BOX IV-9

The International Charter on Space and Major Disasters

The International Charter on Space and Major Disasters (International Charter) is a global agreement between space agencies, aimed at providing a unified system for accessing and delivering fast and free satellite imagery and space data to countries affected by natural or man-made disasters. Although the International Charter can only be activated by authorized members during emergencies, it can be activated for disasters in any country for acquisition and dissemination of space data to share with relevant national authorities.[60] For the Asia-Pacific region, the International Charter was activated on average for 14 per cent of disaster events – 15 times in 2012, 25 in 2013, and 20 in 2014 – more than half of global activations in those years.

Critical infrastructure should be planned and designed with disaster management in mind. This enhances the capacity to restore systems to functionality. By contrast, retrofitting such capabilities into existing systems is expensive and time-consuming.

In many developing countries, however, the commercial telecommunications network may not yet be sufficiently resilient – and thus can be unreliable for critical first-responder communications, especially in the initial hours after a disaster. Countries should therefore consider additional forms of connectivity. For example, first responders may be provided with subscriptions to terrestrial trunked radio networks, which are not connected with public networks and can accommodate sudden high-volume use.

ENDNOTES

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[47] Figure IV-17 can be adapted to create a more robust information management strategy, so that the five steps are cyclical and can be applied within each phase of the disaster cycle, in addition to different steps corresponding to different phases of the disaster cycle, as currently illustrated.

[48] Triangular cooperation typically involves a traditional donor, a donor from the South, and a beneficiary country in the South.

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