Chapter 7

How to Identify Local Knowledge

The key characteristics of local knowledge on disaster preparedness are presented in detail in Figure 2. This framework can be employed to identify the four pillars of local knowledge on disaster preparedness. It focuses on the instrumental use of local knowledge and can be used as a checklist for the key dimensions of local knowledge during project planning and implementation. The objective is to identify and document local knowledge, not to conserve it but to learn from it in order to create new concepts, methods, or strategies for improved disaster preparedness.

Observation

Local knowledge on disaster preparedness relates to people's observations of natural hazards through their experience of their local surroundings. Many people have direct experience of natural hazards (i.e., they have witnessed natural hazards) and/or indirect experience (i.e., they have been told stories of past natural hazards). Daily observation of local surroundings over generations gives communities localised knowledge of the history and nature of natural hazards as well as knowledge about changes in their own social and physical vulnerabilities to natural hazards over time. Historical knowledge may include knowledge of the location, time, duration, frequency, intensity, and predictability of previous hazards. Environmental knowledge can include knowledge of the characteristics of natural hazards such as the onset, origin, velocity of water flow, and knowledge of different types of rain. Social knowledge may include knowledge of the impoverishment processes of households following recurrent natural hazards and other stresses and/or knowledge of the ability of some to take opportunities from previous natural hazards. Knowledge related to the observation of natural hazards over generations can be very useful to external organisations in complementing their understanding of localised natural hazards and how they are perceived. It can help them to adjust their information and capacity-building activities to local perceptions of localised hazards and trends – that is the associated perceived changes related to their location, frequency, and impacts (i.e., how they, and their impacts, are perceived by the communities themselves) which determine how people respond to the hazards.

Anticipation

Local knowledge about disaster preparedness also relates to people's anticipation of natural hazards by identifying, interpreting, and monitoring early warning signs in the local environment. This is especially true for resource- dependent communities

because their livelihoods are closely dependent on their ability to observe and read the environment. Indicators of imminent flood hazards can include, for example, the colour of the clouds, location, intensity, and frequency of rainfall and unusual sounds, and changes in water flow, water colour, wind direction, and vegetation. Some people are able to identify the unusual behaviour of wildlife (e.g., ants, birds, rats, mice, and snakes). Such local environmental indicators are reported widely in the literature. Schware (1982, p 214) reports in a case study from West Bengal, India, how local flood warning systems used by some elderly flood-plain inhabitants along the lower Damodar River, before the official system was introduced, varied from observing natural signs such as old flood markers inscribed on trees or ants moving their eggs to higher ground, to setting up a network of voluntary night watchmen for the river and embankment. On monitoring, Hall and Davies (1999, p 2) state that in the Karakoram:

"local communities [...] [rely] on a range of traditional risk reduction measures, such as [...] community warning systems to alert communities to landslides and rock-falls where in times of heavy rain villages would plant a 'sentry' who would shelter under a tree all night and on hearing the noise of a landslide high above the settlement on the mountain slope would raise the alarm."

Generally, people manage to anticipate natural hazards by making basic emergency plans and identifying time thresholds for saving key belongings and for moving out and to higher locations in the case of floods. People have knowledge of safe settlement areas also and from whom to seek advice and support within the community (Dekens 2007a, b).

However, this ability to observe and monitor environmental signals is weakening today in the Himalayas, as elsewhere, mainly due to changes in the social system and structure.

Did you know? Traditional weather forecasts

Traditional weather forecasts are based on multigenerational observations of change in the local environment, including knowledge about the movements of the sun, the moon, and the stars. In some cases, this knowledge was recorded in cultural and religious texts (Kanani 1999 in Gujarat, India). It has been used as a decision-making tool for agricultural practices (especially cropping patterns and timing) and, in some contexts, for livestock migration itineraries and timing (Battista and Baas 2004 in a case study on pastoralists' coping strategies during drought in Iran, Burkina Faso, and Niger). Akbar Khan (1996), a poet from Chitral District in Pakistan, has described how the long observation of astronomical bodies used to help people make decisions about farming activities:

"In a mountainous country, the sun rises over the hills and the rays of the sun coming out earlier through notches in the cliffs have been closely observed and marks made to record the advance of a season."

Some studies have tested the accuracy of those traditional weather forecasts. For example, the Gujarat Agricultural University undertook a project based on the systematic validation of farmers' traditional meteorological beliefs and principles over a period of eight years from 1990 to 2003. The observations taken have indicated that many of these beliefs are likely to provide reliable indicators of monsoon (Kanani 1999, 2001). Elsewhere, Orlove et al. (2000) have analysed the traditional weather forecasting of farmers in a drought-

Local knowledge on disaster preparedness is based on the following

(1) Observation

People's experience of the local surroundings

History of natural hazards
Examples: knowledge on the location, time, duration, frequency, intensity, predictability of previous hazards

Nature of natural hazards
Examples: knowledge on the onset, origin, velocity of water flow; knowledge of different types of rain

Evolution of social and physical vulnerabilities to natural hazards
Example: life stories explaining the impoverishment processes of households following recurrent natural hazards and other stresses

(2) Anticipation

People's identification and monitoring of environmental indicators

Early warning signals
Examples: interpretational knowledge of changes in animal behaviours, vegetation patterns; knowledge of local weather forecast

Time thresholds
Examples: knowledge of when it is time to buy and store food in advance, leave the house, move the cattle, and remove important belongings

Escape route and safe places for humans and cattle
Examples: knowledge of the safest and fastest routes

Key actors and skills
Examples: knowledge of who knows what, who does what and when, who stays behind, who goes first

(3) Adaptation

People's access to assets and their ability to learn, self-organise, re-organise, innovate etc.

Human assets
Examples: specific skills such as traditional carpenters and masons

Sociocultural assets
Examples: knowledge of different social groups depending on occupational, physical ability, ethnicity, gender, caste, class, & age characteristics

Institutional assets
Examples: knowledge generated by local institutions and cross-scale linkages

Financial assets
Examples: micro-finance arrangements such as credits and savings

Natural assets
Examples: natural resource management strategies such as intercropping and agroforestry that conserve biodiversity and protect soil erosion and can contribute to reducing the impacts of natural hazards

Physical assets
Examples: infrastructural safety arrangements such as boats, housing, embankments

(4) Communication

People's ability to transfer knowledge among themselves and between generations

Oral & written communication
Examples: local songs, poems, proverbs which help the younger generation and outsiders to learn about previous hazards; stories of previous hazards encoded in the name of specific places

Early warning systems
Examples: use of visual signals such as mirrors, fire or audio signals such as drums; having dreams of natural hazards in advance

Other practices
Examples: taboos which prevent people from going to certain hazard-prone areas; ceremonies, local art which helps the community to understand, remember past natural hazards, and relieve the anxiety related to the threat of future hazards

prone region of Andean South America against 'scientific methods'. Local farmers make their forecast based on observations of changes in the apparent brightness of stars in the Pleiades around the time of the southern winter solstice in order to forecast inter-annual variations in summer rainfall and in autumn harvests. They moderate the effect of reduced rainfall by adjusting the planting dates of potatoes, their most important crop. Their results suggest that this ancient method of forecasting seasonal rainfall may be based on a simple indicator of El Nino variability. They found that:

"poor visibility of the Pleiades in June – caused by an increase in subvisual high cirrus clouds – is indicative of an El Nino year, which is usually linked to reduced rainfall during the growing season several months later." (Orlove et al. 2000, p 68) It has been suggested that using traditional and modern prediction techniques could be quite effective. For instance, local astrological knowledge could be combined with rainfall gauges, information records, and growth plots (Battista and Baas 2004, p 23). Indeed, in many cases, and as Jaarsma et al. (2001) argue:

"often official weather forecasts have not been able to achieve the credibility of the ants" – that is the local forecasting system.

This lack of credibility of official weather forecasts can be partially attributed to technical limitations related to the lack of real-time data and the centralised or distant nature of official weather forecasts without involving the locals.

Did you know? Integrated warning systems

Local early warning systems are a critical component of preparedness. They are characterised by the inclusion of local environmental cues and the reliance on informal personal networks to assist with designing the systems and carrying and interpreting the message and decision-making. They are designed over time, through need, trial, and error; or emerge, as required, using pre-existing networks. They are easily visible and simply disseminated among rural people without any special equipment (Howell 2003, p 7). One of the major disadvantages of the local, early warning systems is that they are limited by the personal experience of members of the relevant network (Parker and Handmer 1998). Various studies have reported that often people resist or neglect the official warning (Jaarsma et al. 2001, p 97) – especially in the context of rapid onset disasters which give a very short time for central agencies to notice early warning signs. A growing interest has emerged concerning the advantages of combining local early warnings with official ones. As Howell (2003, p 6) suggests:

"it is certainly possible that if a particular combination of two or three of these [local environmental] indicators were used to give extra validation to the official warning signals, then more accurate (and more believable) early warning could be achieved."

ISDR (2004) points out the necessity of accounting for the human dimensions of early warnings (including the importance of community involvement in early warning systems) and not simply the scientific or technological issues related to hazard monitoring, forecasting, and telecommunications. This is because the ways that people generate, perceive, use, interpret, and respond to official warning systems are complex and are related to issues of trust, power relations, and experience. The human dimensions of early warnings imply that traditional systems are more likely to factor in attachment to the home environment, assets, belief systems, and traditional coping strategies (ISDR 2004, p 363).

Did you know? Early warning of earthquakes using snakes in Nepal

The history of Nepal shows that earthquakes of great magnitude occur every 75 to 100 years and a mild one every 50 years. The failure to implement building codes and the lack of suitable earthquake prediction mechanisms are reasons to investigate innovative prediction methods using local knowledge and resources for cost efficiency and ease of implementation. One possible option proposed by Professor Jiba Raj Pokharel (Nepal Centre for Disaster Management [NCDM] and Director, Centre for Disaster Studies, Nepal) is to use snakes. The observation of changes in snakes' behaviour as an early warning signal for earthquakes has already been used in China. It is based on the fact that snakes feel earth tremors before humans do and come out of their holes. So far, no consensus exists on the exact reason why snakes detect earthquakes first. Among possible reasons could be the unusually high temperature, gas erupting through cracks in the ground, and vibrations taking place before the earthquake. Professor Pokharel proposes to use diurnal and nocturnal snake yards to predict earthquakes based on the assumption that if the snakes come out during their hibernation period (mid-November to March), it is a sign that an earthquake might occur; the rest of the time, if the snakes come out in the nocturnal yard in daytime and the diurnal yard in the night time, then it also provides an early warning signal of earthquake (Pokharel 2006). To date, this proposal still has to be tested and could be used in combination with other indicators to give extra validation.

Adaptation

Analytical frameworks have been developed to focus specifically on community adaptation to natural hazards. One such example is the framework developed by Clarke-Guarnizo (1992) for mapping adjustment mechanisms based on categories of mechanisms (social organisation, economic relationships, technology use, and cultural arrangements) and how they relate to different phases in the disaster lifecycle (before, during and after). To quote Green et al. (2000), one of the most extreme forms of adaptation to natural hazards – and relatively well documented – is perhaps that found in the char lands[8] of Bangladesh. There, people have adapted to the constant change of river courses which erodes land and creates new land constantly. Local knowledge on disaster preparedness also relates to people's adjustment strategies through trial and error. Knowing how to respond to change may include how people cope, adapt, experiment, and innovate in the face of natural hazards and how they learn from previous hazards they have faced (e.g., which plant to conserve and protect for land and water management or where to find wood and water in times of crisis). Their capacity to adjust is based on their access to, and benefit from, assets (or people's strengths, or capital endowments which – as mentioned previously – are mediated by local institutions and influenced by external institutions and global factors and trends). Categories of assets include the human, sociocultural, institutional, financial, economic, political, physical, and natural.

With respect to human assets – Examples of skills that can contribute to natural hazard preparedness include knowing how to swim (in flood-prone areas), knowledge related to carpentry, masonry, and bamboo weaving (e.g., construction of elevated platforms to keep key belongings and small livestock safe from floods ('machhan' in Nepal and Bangladesh), earthquake resistant houses, communication skills (local

[8] See footnote 7

singers who used to raise awareness about past hazards in the community), ability to speak in public and convey messages, and others. The community also trusts some people more than others, because of their specific skills and ability to 'read' the landscape, the sky, and other elements of the environment, and their advice is followed. Nowadays, economic change (remittances for jobs outside the village) and changes in the education system (the young ones do not value the 'old' skills) result in the weakening of traditional skills.

With respect to sociocultural assets – Different people in the same community have different types of knowledge depending upon occupation, physical ability, ethnicity, gender, caste, class and age, as well as their family history, their skills, and/or specific gifts. Langill (1999, p 13) discusses women's subsistence activities in this context. Coping practices are often based on strong social networks and ties grounded in solidarity, sharing, and reciprocity, which help communities and households in the face of natural hazards and disasters (see box on 'social capital').

With respect to institutional assets – Institutional assets may include such things as local, informal conflict resolution mechanisms, informal land tenure and natural resource management rules, and various other institutions in and around the villages that fulfil religious, economic, and social purposes (See box on 'rules of the game'). These are critical for ensuring effective community monitoring of the local environment and the sustainable use of community resources.

With respect to financial assets – Financial assets include cash savings, equity in property and possessions, and access to credit. Such assets may help a community and its households to recover more quickly following a disaster. Often access to credit and savings is very limited for the most vulnerable groups in a community. Furthermore, only a few people might have the entrepreneurial skills to make good use of financial assets. This means that improving access to micro-credit and savings may not always transfer into improved benefits for those most in need. As suggested elsewhere (Dekens 2005), entrepreneurship may have to be taught.

With respect to economic assets – The most common or widespread response in the face of recurrent natural hazard risks is for men to seek jobs outside the village (remittances). Seasonal and permanent migration is a common strategy to help people cope with different kinds of stress, including natural hazards, and thus provide economic resilience. Men go out to make money to advance their families economically and, in the process, it may help buffer some of the effects of natural hazards. It enables households to compensate for the loss of income caused by damage to agricultural land from natural hazards. In this context, remittances contribute to economic diversification and are a mechanism for (social and economic) risk sharing and providing insurance against floods. (See also negative effects of economic diversification, Chapter 8, under 'Community resilience building'.)

With respect to political assets – Political assets can refer to the role of key local leaders and their personal and professional networks outside the village, in initiating

and influencing community initiatives in disaster preparedness, and in building linkages with external organisations to give voice to their issues, including the threats from natural hazards and mitigation measures.

With respect to physical assets – Physical assets refer to infrastructural safety arrangements such as boats, housing, embankments, food stores, terraces, and retaining walls to minimise the impacts of natural hazards.

With respect to natural assets – Natural assets include the natural resources available to the community and management strategies associated with them that can minimise the impact of natural hazards, especially in the long term (e.g., land arrangements, landscape management, slope management – see Zurick 1990, in a case study in Nepal – community regulations on grazing and deforestation, and seed management systems including methods of selection and storage, and water management). For example, intercropping and agroforestry that conserve biodiversity and help to prevent soil erosion can spread the risks from natural hazards and reduce crop damage. As Schilderman (2004, p 424) puts it:

"farmers often cultivate a mixed range of grains of which they know some will do well if there is not enough rain, although in normal circumstances they might be less productive."

Another strategy for spreading risks is to rely on dispersed landholdings. If a flood damages one field, for example, the landowner can still fall back on other fields located elsewhere. However, in most cases, only the richest people have dispersed landholdings. Zurick (1990) documented traditional knowledge on slope conservation in the Salyan district of Western Nepal. Local land-use systems maximise the diversity of micro-habitat conditions in order to avoid total crop failure by distributing farm fields across a broad range of micro-environments. Slope conservation strategies can also include planting vegetation barriers ('kanlo') between cultivated fields to break the slope during the monsoon season, restricting grazing, and cutting grass and shrub fodder on specific sites. The use of different types of traditional crops resistant to floods has been widely documented in Bangladesh. In the Jamuna flood plain, farmers have learned to adjust their agricultural rice cropping patterns to recurrent floods. The inter-culture of 'aman' and 'aus' is a risk-spreading strategy: the former variety can grow during abnormal floods while the latter resists drought (Paul 1984).

All these assets are inter-related. As such, this classification is only one option among others. For example, ensuring seed security raises questions of resources, land access, organisation (e.g., community seed banks), and seed storage technology (Berg et al. 2001 in a case study in Mozambique on community adaptation to drought). Or, natural insurance can also serve as financial insurance during crises (e.g., sale of wood and charcoal) and informal leaders can contribute or not to promoting these aspects through their networks outside of the village. Local institutions governing access to and use of land can contribute to tenure, (in) security, and (dis)incentives for investments in natural resource management. Adjustment strategies to natural hazards can be

more broadly classified into technical and non-structural measures, which often build upon a combination of the assets listed above. Ultimately, household and community adaptation are complex processes based on the ability to experiment, innovate, learn, and share the lessons learned. Investigating household and community assets can provide implementing organisations with an entry point for unfolding this complexity.

Did you know? Social capital and disaster preparedness

Social capital is the ability to rely on strong social and personal networks based on social cohesion, trust, and reciprocity. It refers to the ideas of unity, togetherness, the sense of shared identity and community, common association, neighbourhood, inter-household cooperation, and self-generated community action (e.g., in the form of sandbagging and dyke maintenance in flood-prone areas). The importance of social capital for providing resources during vulnerable times can be found in studies of drought and famine (Materer et al. 2001); in literature about early warning systems (ISDR 2004), in communities facing risks regularly (Bankoff 2004 on cyclones in the Philippines; Swift and Baas 1999 on herders' groups); and in natural resource management (Ostrom 1992 on traditional irrigation systems).

For most vulnerable groups (e.g., young children, elders, and pregnant women) in areas prone to natural hazards, leaving the house is the first thing they do. Few households can afford to move out of the village permanently. Therefore, social safety nets are a crucial means of temporary adjustment. In some households, the most vulnerable members move out of the village to their relatives during the most critical times of the year. In other cases, people can also move to their neighbours because they are located in safer places than they are. Relatives and neighbours often provide social and psychological insurance before, during, and after natural hazards. For example, women may go back to their parents' homes during the flood season.

Households can have strong family or clan ties and social support networks that help reduce their sense of helplessness. Most villagers are embedded in more than one network (e.g., social networks such as the network formed by the family; cultural networks such as being a member of a cultural association; spatial networks such as the network formed by village boundaries; professional networks; and political networks). Some people have access to influential networks outside the community boundaries, and these sometimes help the community to adjust to natural hazards. It might be important to investigate how people are embedded in various networks and how they can be best used in the face of hazards and disasters. Brouwer and Nhassengo (2006, p 241), in a case study on community adaptation to floods in Mozambique, describe exchange relationships as part of people's livelihood strategies; e.g., keeping livestock in somebody else's home ('kuvekissa'); moving temporarily to another area to work for food ('kuthekela'); sharing means of production, principally ploughs and draught animals (kukashela); working on someone's land in exchange for ploughing (kurimela); and providing a herdsman or boy in exchange for cattle (kulusela). Brower and Nhassengo record that 'kuvekissa' can be interpreted as a risk reduction strategy: if one's own herd is struck by a disaster, including a drought or flood, there is still the chance that the animals that one has entrusted to a relative or friend will survive. At the same time, a strong sense of place and family ties can lead to underestimation or disregard of the possibility of future hazards. Despite knowing about the danger, some people affected by floods may still prefer to resettle in the same vulnerable area to maintain, and still benefit from, family support as reported in a case study on the Chitral District (Dekens 2007b). The poorest of the poor may also not be able to rely on their relatives as they too face economic constraints. This

means there is less social and spatial mobility for the poor than for the rich. Low caste people may also not be accepted in the house of people of high caste and vice versa. Overall, physical mobility (within the village and outside the village and the country) is often strongly dependent upon social mobility (family, friends, and neighbours), which is itself determined or influenced by sociocultural relations (e.g., caste system).

The extent to which risks of natural hazards increase social capital or, on the contrary, increase individualism is not always clear: the sense of solidarity in the face of threat may weaken as men start to work outside the villages to earn cash, therefore increasing individualism. Economic changes tend to favour profit maximisation strategies instead of 'traditional' risk minimisation strategies. Battista and Bass (2004), in the context of Iran and Niger, report a decrease of reciprocity mechanisms between farmers and herders due to privatisation of wells.

Did you know? Housing

The first step in disaster preparedness in mountain regions is for people to locate their houses in safe places, away from debris flows, flash floods, and snow avalanches. The location of houses relatively safe from hazards has been documented in the Himalayas (in Pakistan: Davis 1984a,b,c; Coburn et al. 1984; Hughes 1984; D'Souza 1984; Moughtin 1982; De Scally and Gardner 1994; Iturrizaga 1997; and in India: Rautela 2005). Iturrizaga (1997) in a case study in the Shimshal Valley, Pakistan, describes how houses are placed one behind another down slope, thereby diminishing the risk of destruction by mass movements or rock falls which represent a permanent threat in the region. Aside from house location, construction materials and techniques can decrease the impacts of natural hazards. Traditional earthquake-resistant houses have also been documented in the Himalayas (Rautela 2005 [Narwhal Himalaya, India]; Dekens 2007b [Chitral District, Pakistan]; Ranjitkar 2000 [Nepal]; Jigyasu 2002 [India and Nepal]). In the Yamuna Valley, Garhwal Himalayas, India, traditional earthquake-resistant structures still remain. These multi-storeyed houses are made of a combination of long, thick wooden logs, stones, slates, and clay. According to the tradition, the foundation had to witness seven monsoons before construction to ensure the structure's stability (Rautela 2005). That said, Jigyasu (2002) states, from a case study in Nepal and India, that despite traditional building qualities most of these structures at present are weak and highly vulnerable to earthquakes, and this is due to maintenance problems, economic pressures forcing householders and builders to cut costs by excluding some of the traditional reinforcement details (e.g., use of timber in the walls to strengthen and stabilise stonework and for its capacity to absorb shocks throughout the entire structure), unavailability of certain materials (e.g., due to restrictions upon traditional rights to forests for timber and stone in the name of environmental protection and increasing cost of timber due to growing demand and ease of transportation), import of reinforced concrete building technologies causing a loss of traditional knowhow, social status attached to concrete buildings, and local artisans switching to concrete construction because of lack of work. Still, many lessons can be learned from traditional buildings to improve current ones. The National Society for Earthquake Technology – Nepal (NSET) is currently carrying out a study in the Himalayas to identify earthquake-resistant elements in traditional buildings.

Communication

Local knowledge on disaster preparedness also includes the way people communicate among their peers and between generations. In traditional rural communities, knowledge is usually, but not exclusively, transferred orally. Understanding local knowledge about disaster preparedness requires us to pay attention to informal education and internal learning processes. How is local knowledge used in a specific context and who uses it? How is local knowledge transmitted within the community and between generations and who is transmitting it? How is local knowledge used at household and community levels? Who has access to local knowledge, how, and under what conditions?

The process of knowledge creation itself is complex and includes aspects of internalisation, socialisation, and externalisation of knowledge, as well as the combination of one type of knowledge with other types (Nonaka 1991). In many societies with oral traditions, past events, including flood events, are embedded in individual and collective memory through stories, songs, poems, proverbs, worship, ceremonies, and rituals. These activities serve as a way of communicating in time (between different generations) and in space (from place to place). Various studies in anthropology and human ecology (Folke et al. 2002; Berkes 1999) have shown how rituals and taboo are the transformation of social memory into practical resource and ecosystem management. Worship, stories, songs, and proverbs not only help people to remember past events but also help them to convey messages in an attractive and convincing manner. Local songs and proverbs also help to turn abstract events into something more vivid and concrete. The younger generation may not have faced a major flood, and it is difficult for them to understand what it means and to consider it possible in the future. Today, local singers are disappearing from the villages due to modernisation of media, globalisation processes (i.e., access to radio and for the better-off television), and livelihood diversification (getting jobs outside the village).

Did you know? Songs that saved lives

Following the 2004 tsunami in South Asia, the media reported how some communities managed to save lives and property using local knowledge. In some cases, people managed to identify early warning signals of the tsunami through change in animal behaviour and through local songs. One such example is the 'smong' song in Simeulue Island, west of Aceh, which had been composed after the 1907 tsunami and helped locals to interpret signals of the 2004 tsunami (McAdoo et al. 2006). Another example comes from a case study in the Eastern Terai of Nepal (Dekens 2007a). Some of the songs collected focus entirely on floods, whereas others mention floods among other important issues the villagers are facing. In some cases, songs and proverbs become the repository (as much as the relay) of past flood events and can help stimulate people's learning, memory, and creativity. They contribute to the transmission of flood-coping strategies (e.g., 'machhan'), create common knowledge, and share a common understanding of change related to frequent and infrequent flood events. As such, songs and proverbs can also help to build a sense of community and solidarity within the village and/or within the different groups affected. They serve as a way of communicating in time (between different generations) and in space (from place to place).