

## Chapter 6

# Adapting to Floods: Non-structural Strategies

**N**on-structural strategies include measures related to spatial and social mobility, food security, micro-finance arrangements, natural resource management, and beliefs and attitudes towards change. People who have no assets (land, livestock, and so on) have fewer options or strategies to rely upon than those who are wealthier. Most of these mechanisms have been established for people to cope with stress of all kinds and not just for flood preparedness. All of these coping mechanisms can add social and economic resilience.

## Spatial and social mobility and diversity

*“After the 1993 flood, people lost their land and had to work outside in foreign countries like India and Qatar to survive.”* (Sunita Pandit, Pipariya VDC, Sarlahi District)

*“Two years ago we did not expect that the rainy season would start so early, so all our belongings were washed away. Since that event, we shift all our belongings to safe places every year. Children and women move to safe places whereas men and elders stay at home to look after things until the flood comes.”* (Ram Ekbal, Dalit, Pipariya VDC, Sarlahi District)

*“As soon as heavy rain starts, we run away!”* (Belhi VDC, Sarlahi District)

*“The most vulnerable people (pregnant women, ill people, and elders) move out of the village during the rainy season.”* (Ram Ekwal Roy, village leader and big landowner, Shreepur VDC, Sarlahi District)

*“Pregnant women leave the place and they move all the expensive belongings away to their parent’s place or neighbours.”* (Chandrakula Thakur, Deuri VDC, Mahottari District)

*“Once we put our important belongings with one of our neighbours in a safe spot but they never returned them to us!”* (Chandrakula Thakur, Deuri VDC, Mahottari District)

*“No one allows us to stay at their place and wherever our relatives are they suffer from the same problem as us! [...] We are neglected by the government and within the village itself! Whenever any type of aid arrives in the village it is captured by the rich people in the village! There is no fight, no protest because we lack education.”* (Women group discussion, Bin community, Deuri VDC, Mahottari District)

Leaving the house together with children and elders just before the flood is the first basic measure that people follow. Few households can afford to move out of the village permanently. The most common or widespread response, however, is for men to seek jobs outside the village. Seasonal and permanent migration are common strategies to help people cope with different kinds of stress, including natural hazards, and thus provide social and economic resilience. Men go out to make money to advance their families economically and perhaps socially, and, in the process, thus may help buffer some of the effects of flooding. It enables households to compensate for the loss of income caused by flood damage to agricultural land. In this context, remittances (money sent back to the family in the village by those working outside) contribute to livelihood diversification and are a mechanism for (social and economic) risk sharing and providing insurance against floods. This is one

form of livelihood diversification, (defined here as a portfolio of activities together with social support capacities; Hussein and Nelson 1998).

Social safety nets also play a crucial role for temporary relocation as a flood coping mechanism. In some households, the most vulnerable members move out of the village to their relatives during the most critical months or weeks of the year. In other cases, people can also move to their neighbours because they are located in safer places than they are. However, the poorest of the poor may not be able to rely on their relatives as they too face economic constraints. This means that in general there



**Figure 22: Fisher community, Katarait VDC, Dhanusha District**

is less social and spatial mobility for poorer people than for the better off. Low-caste people may also not be accepted in the houses of people of higher caste regardless of economic status. 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 influenced by the caste system. Discussions with mostly lower caste poor people showed a lack of trust within some villages caused by the asymmetry of power and wealth between different social groups.

## Food security

### Collecting food for humans and livestock

*“We reserve dry fish for the rainy season because it is a difficult time. Before the rainy season we can obtain loans from others in the village to buy food in advance [such as mustard oil, salt, spices, beaten rice] from the market. The interest rate is 5% per month.”* (Women’s group discussion, Bin community, Deuri VDC, Mahottari District)

*“We start drying fish two to three months before the rainy season. We also dry vegetables and make ‘mustard’<sup>2</sup>.”* (Women group discussion, Bin community, Laxmipur, Sukchaina)

*“We start storing food in June/July. There is no fixed date; it depends when the continuous rain starts – looking at the*

<sup>2</sup> A mixture of pulses, potatoes, and rice, locally called ‘mustard’

*clouds or rainy season.”* (Chandrakula Thakur, Deuri VDC, Mahottari District)

*“People who have land in high places shift their cattle to those places.”* (Jeevan Roy, Deuri VDC)

*“During the flood we build machan near our livestock where we can put straw and by-products of rice or wheat for them to eat. We start collecting straw and rice and wheat by-products two months before the rainy season.”*

*Feed for livestock [straw, rice and wheat by-products] is stored in safe places [school etc]. We also bring the livestock to safe places.”* (Ram Kishan Giri, Sukchaina, Laxmipur VDC)



**Figure 23: Mango pickles**



**Figure 24: Dried pumpkin**



**Figure 25: Dried fish and 'mustard'**



**Figure 26: Fermented and dried green vegetables ('gundruk')**

*“We put some food on the roof of the school for a few days (4 to 5 days). Many people are doing this and there is no fighting for space.”* (Ram Chandra Sah, big landowner, Laxmipur VDC, Suckchaina)

*“We start storing food for cattle 2 to 3 months in advance. Large livestock [buffaloes, oxen] stay in the water; small livestock [goats, chickens] are kept inside.”* (Women’s group discussion, Bin community, Laxmipur, Sukchaina )

### Collecting and storing firewood

*“Women start collecting firewood from April and keep it inside their houses. They also start preparing cow dung in November and start collecting wood from their own land and dry leaves from coconuts.”* (Chandrakula Thakur, Deuri)

*“Thick wood is stored outside and small wood is kept inside on machan.”* (Sushila Mahto, 65, Shreepur VDC, Sarlahi District)

*“Two to three months before the rainy season, they start collecting more leaves and wood.”* (Sumitra Devi Yadav, wife of big landowner, Phoolparasi VDC, Sarlahi District)

*“We collect firewood one month in advance and keep it inside the house. We collect the wood in the jungle across the river. The alternatives to collecting firewood are to buy straw and to collect green grass and leaves [to dry]. Before the rainy*

*season, we also collect more sugar, salt, kerosene, and clothes from the big market across the river. How much we can buy in advance depends on each household’s income.”* (Sunita Pandit, Pipariya VDC, Sarlahi District)

### Comments on food security

People have learned to adjust their agricultural and food calendars to weather patterns, including to the flood season. Short-term strategies such as food buffers or stores, preservation techniques, and careful timing help people to prepare for and survive the floods. Women’s group discussions in the villages show that food commonly reserved for the rainy season, including the flood season, includes most of the following: dried vegetables, such as pumpkin, cauliflower, radishes, eggplant, potatoes, and green vegetables; dried fish (especially for the Bin community); and pickles (e.g., mango). Dried food is stored in plastic bottles or bags. Apart from drying food, most households collect or buy food for the family and feed for the cattle before the rainy season. Basic food items include: rice, flour, pulses, salt, sugar, spices, mustard oil, kerosene, and, more rarely (for the better-off) additional medicines for people and cattle. The poorest households have to borrow money from moneylenders in the village to buy food in advance. The willingness to create food buffers against crisis, including flood crisis, attests to people’s forward-looking capacity regarding food supplies.

## Natural resource management

### Restructuring cropping patterns and landholdings

*“We planted bananas after the flood because we can get short-term benefit out of it. We don’t plant trees because the flood can come anytime again and wash them away. Banana trees grow faster and we can benefit from them after one year already. Also bananas can be harvested all year around. Banana cultivation is new here. We don’t plant peanuts here because people think that they do not grow well, it is not very profitable and they are more difficult to keep safe from children and cattle.”* (Ram Prasad, big landowner, Phoolparasi VDC, Sarlahi District)



**Figure 27: Banana plantation (left) close to the river bed (right) in flood-damaged fields (front) which used to support rice cultivation, Shreepur VDC, Sarlahi District.**

*“If we plant sugarcane we can harvest it after one year and it will be able to produce for about two years. We sell it directly to the factory which was built about 20 years ago. Rice is mainly a subsistence crop. Banana cultivation is new here and bananas are sold to the local market.”* (Ram Ekwel Roy, village teacher and big landowner, Shreepur VDC, Sarlahi District)

*“We know that bananas and peanuts are suitable for this soil but we don’t have the market for it. We cultivate sugarcane because the factory is very close by and we can sell it to them directly. Plus peanuts can be destroyed by a small amount of water.”* (Ram Ekdal Yadav, Bhaisarawa VDC, Sarlahi District)

*“Very few people here have to buy rice. Some have to because they only plant sugarcane.”* (Ramkailash Roy, Shreepur VDC, Sarlahi District)

*“After the flood 13 years ago, we noticed that in the place where bamboo was growing, there was very little damage so we decided to plant banana trees there because bamboo takes a little more time to grow than bananas.”* (Action Aid, Phoolparasi VDC, Sarlahi District)

*“I have bought land little by little in different places. When I buy land I pay attention to the soil fertility, the location of the land in relation to the river [it has to be safe from floods], and the price.”* (Ram Chandra Sah, big landowner, Laxmipur VDC, Sukchaina)

Due to recurrent floods and the deposition of sandy sediments on the fields, land use is progressively changing along the affected river beds. Paddy is destroyed if it gets overinundated. After the floods, most of the fields that used to be suitable for rice cultivation are now used for growing sweet potatoes, sugarcane, banana trees, peanuts, vegetables, or watermelons. Along the river bed, trees such as bamboo and mango are planted and in uncultivable areas, trees such as sisoo, simal, and khair. The cultivation of sugarcane and/or bananas depends on the village's access to markets. Banana cultivation is more recent than sugarcane cultivation in this area. By switching to sugarcane and/or banana cultivation, the wealthier people manage to turn change into opportunity. As landowners, they are flexible enough to adapt. The sediments deposited on fields by the floods also provide nutrients indispensable for cultivation. Rich landowners often manage to benefit from the floods, whereas those who do not have access to any assets cannot turn change into opportunity. Most landowners are progressively forced to switch from relying mainly on subsistence crops (rice, wheat, pulses, and millet) to cash crops in areas affected by floods. These changes increase their dependence on the market and they tend to be more short-term than long-term in focus, because uncertainty is high in these areas as new, devastating floods can happen every year. Highly uncertain environments, such as land close to the river bed, do not encourage people to take risks or to make long-term investments.

### Part 3 – The Case Study



**Figure 28: Riverbank farming with rahar, Deuri VDC, Mahottari District**

At the same time, cropping patterns are changing following floods, and access to and benefit from the land affected by floods are also changing. As mentioned previously, the poorest households might be forced to sell land. In the process and indirectly, some landowners may then be able to obtain and rely on dispersed landholdings. Relying on dispersed landholdings is an efficient risk-spreading strategy against floods (but also pests and landslides in other contexts). If floods damage some fields, the landowner can still rely on other fields located elsewhere.



**Figure 29: Trees planted on an embankment, Deuri VDC, Mahottari District**



**Figure 30: Mud on the base of young trees, Deuri VDC, Mahottari District**

## Regulating access to grazing land and firewood

*“I have a goat and if my goat enters somebody else’s field they will charge me 200 NRs. Lots of fights are happening all the time over the stealing of wood.”* (Dalit women, Deuri VDC, Dhanusha District)

Access to natural resources, including grazing land and firewood, is important because it will determine how a household can manage its cattle, whether they have to buy firewood from the market, or whether they have to travel long distances or not to get firewood. During the rainy season, in general, and during the flood season in particular, these informal rules will influence the level of preparedness of households to natural hazards.

## Adopting soil conservation strategies

Some farmers also adopt soil conservation strategies to reduce the impact of floods, for example planting pulses, (‘dal’ ‘rahar’ ‘rarahi’, ‘kurthi’) and vegetables at the top of embankments (and more generally around fields). Rahar (rarahi) is a multipurpose pulse. The grain is eaten and its roots (ca 2ft long) help conserve the soil. It is planted during the rainy season and harvested in February. Other approaches include planting trees (e.g., ‘behaya’, bamboo, ‘sissoo’, ‘vicks’) and raising the embankment by the sides of the fields and close to the river bed for soil conservation and protection. Mud is also put at the base of young trees to protect the roots from water.

The Snake and the River Don’t Run Straight

## Other strategies and attitudes

### Learning from past mistakes and events

*“We had a flood during the night a year ago. Everything got washed away. Now we are more alert [than before]! We learned that we should put our belongings in safe places. One person completely moved out of the village.”* (Ram Ekbal, 52, Dalit, Piparyia VDC, Sarlahi District)

*“We made a channel for irrigation purposes for the community. This channel progressively increased and now it is the current stream! We learned that we should take advice from specialists.”* (Sukchaina, Laxmipur VDC, Sarlahi District)

*“Fifty years ago, the river was flowing close to Naya Tole (in front of the current settlement) about two km from here. After constructing an irrigation channel in Naya Tole, the stream started to flow towards Shreepur Tole and we lost our land.”* (Ramkailash Roy, village teacher, Shreepur VDC, Sarlahi District)

### Building upon institutional linkages and community initiatives

*“We managed to get this embankment (large sand and stone embankment along the river bed) from ‘Jalutpanna prakop Niyantran’ in 2005 through a village request. One engineer from this village works in the organisation and that’s how we managed to build the embankment. The engineer still has a*

*house in the village and he comes here on a regular basis.”* (Shreepur VDC, Sarlahi District)

*“We build irrigation channels and embankments for the community using stones and mud. We collect the money among ourselves. One person per household has to participate; otherwise the household has to pay a fine. Now we are also thinking of planting trees alongside the river bed.”* (Jivachha Yadav and Pupal Yadav, Singyahi VDC, Mahottari District)

### Micro-finance arrangements

*“We don’t have much money so we don’t manage to stock food. During the floods, we can borrow food from others with no interest. If we borrow money we have to pay 3% interest per month.”* (Sushila Mahto, Shreepur VDC, Sarlahi District)

*“How can we save money? We can’t even pay for our food!”* (Women’s group discussion, Bin community, Deuri VDC, Dhanusha District)

### Comments on strategies and attitudes

Staying awake and alert is probably the most common strategy people adopt during the rainy season. (*“When it rains heavily and continuously, we stay awake all night.”* Ram Chandra Sah, landowner, Laxmipur VDC, Sukchaina) Other skills that need to be nurtured and encouraged include the capacity to learn from past mistakes made in flood events and to build upon existing institutional linkages. On the former point, learning is a key

aspect of community resilience to natural hazards. It can help households and communities adapt to floods through trial and error and continual readjustments. In a community, only a few persons might learn from past mistakes, but such people can be key message carriers within the community. These key actors (e.g., 'innovative farmers') need to be identified so that they can be used in the community to spread the lessons learned to others. On the latter point, 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 the village boundaries; professional networks; and political networks). A few people have access to influential networks outside the community boundaries. The quote here reveals how the professional network of a villager enabled the villagers to give voice to their flood issues better than would have been the case had there been no network. It might be important to investigate how people are embedded in various networks and how those networks can be best used. It is also essential to investigate people's attitudes towards money and business. In the study area, micro-finance arrangements, such as micro-credit and savings are limited, because of lack of assets. Furthermore, only a few people might have entrepreneurial skills in the community. This means that improving access to micro-credit and savings may not always transfer into actual improved benefits from micro-finance depending upon people's mentality, past experience, and history. As suggested elsewhere (e.g., Dekens 2005), entrepreneurship may need to be taught.

### **Box 5: Did you ask? Non-structural adaptation strategies**

**Spatial and social mobility** – What do people's social networks look like? What are their relationships with their relatives and their neighbours? Where are their relatives located? How do communities and households try to spread the impacts of floods among their assets (e.g., physical, economic, social assets)? Do they have different livelihood activities? Do they also rely on cash-earning activities?

**Food security** – Are people growing food that is specifically kept for emergency purposes? Do they have specific food storage or drying techniques?

**Natural resource management** – Do landownership disputes arise from the loss of land due to floods? What are the local adjustment strategies? Are they equitable? Do people have landholdings in different locations?

**Other attitudes and strategies** – What indicators are there that people learned from previous flood events? What are the various networks (e.g., family, social, professional, political) people are embedded in and how can villagers use them for disaster preparedness? What are people's attitudes to and backgrounds in business activities? Do they have micro-finance arrangements and entrepreneurial attitudes or backgrounds?