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**IMPLEMENTATION OF ARTICLE 4, PARAGRAPHS 8 AND 9, OF THE CONVENTION**

**PROGRESS ON THE IMPLEMENTATION OF ARTICLE 4, PARAGRAPH 8**

**OTHER MATTERS**

**ANY OTHER MATTERS**

**Report of the workshop on local coping strategies and technologies for adaptation**

**Note by the secretariat**

**Summary**

A workshop on local coping strategies and technologies for adaptation to climate change was held in New Delhi in November 2003 as part of the Climate Change Bazaar and Conferences organized by the Government of India. The objective was to exchange information on regional and local coping strategies and indigenous technologies currently in use to address current climate, climate variability, extremes and long-term climate change.

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## I. INTRODUCTION

1. The Delhi Declaration, adopted at the eighth session of the Conference of the Parties (COP), calls on Parties to promote informal exchange of information on actions relating to adaptation, and emphasizes that “effective and result-based measures should be supported for the development of approaches at all levels on vulnerability and adaptation, as well as capacity-building for the integration of adaptation concerns into sustainable development strategies”. In response, the Government of India offered to host a workshop on local coping strategies and technologies for adaptation. The workshop was held in New Delhi on 12 and 13 November 2003.
2. The workshop also responds in part to the provisions of decision 5/CP.7, paragraph 32, which requests the secretariat to organize regional workshops in order to facilitate information exchange and integrated assessments, including for adaptation.
3. The objective of the workshop was to promote information exchange, with a regional focus, on indigenous technologies and local coping strategies currently in use for climate change related impacts, and to brainstorm on how current methodological approaches to adaptation can be expanded to effectively accommodate such community-level coping strategies.
4. Financial support for the organization of this workshop was provided by the Government of the United States of America.

## II. SUMMARY OF PROCEEDINGS

5. The workshop was chaired by Mr. Chirravuri Viswanath (India) and Mr. Daniel Reifsnyder (United States) on behalf of the chairs of the subsidiary bodies. It was attended by experts in the fields of vulnerability and adaptation assessment, disaster management, risk assessment and community action, representing Parties, international organizations, community non-governmental organizations (NGOs), disaster relief organizations, aid organizations, United Nations agencies, research institutions and networks, and the private sector.
6. The workshop focused on the following:
  - (a) Case studies of local coping strategies and indigenous technologies for adaptation;
  - (b) Perspectives on how the results of these local adaptation efforts can best be disseminated;
  - (c) Importance of the adaptation assessment process in the context of local coping strategies;
  - (d) Importance of local stakeholder participation in building partnerships to enhance the effectiveness of adaptation efforts, particularly in the context of overall sustainable development;
  - (e) Key factors influencing decisions at the local level;
  - (f) Integration of adaptation solutions across different sectors and hazards;
  - (g) How best to integrate local coping strategies into adaptation research and methodological work.
7. The workshop included two panel discussions: the first presented the outcome of the preceding workshop on adaptation research, organized by the United Nations Environment Programme (UNEP) and

the Stockholm Environment Institute (SEI) in New Delhi from 9 to 11 November 2003; and the second was on national experience in local coping strategies and technologies for adaptation.

### **III. CASE STUDIES OF LOCAL COPING STRATEGIES AND TECHNOLOGIES FOR ADAPTATION**

8. Local coping strategies and technologies for adaptation to climate-related events have evolved over a long period of time in many parts of the world. These are based mainly on indigenous knowledge, also referred to as 'traditional' or 'local' knowledge, which embodies a wide variety of skills that developed outside the formal education system, and is closely linked to community survival and subsistence. Indigenous knowledge is borne out of continuous experimentation, innovation and adaptation, blending many knowledge systems to solve local problems. A common disadvantage for local coping strategies is that they are often not documented, but rather handed down through oral history and local expertise. This workshop was an important first step at exploring local coping strategies insofar as they relate to climate change.

9. The workshop included a number of presentations on community-level experience in the application of local coping strategies in response to hazards such as floods, drought, and tropical storms. This chapter provides an overview of the various types of coping strategies that were discussed during the workshop.

#### **A. Indigenous forecasting and early warning systems**

10. Indigenous forecasting methods have long caught the eye of meteorologists, climatologists and anthropologists. Although little research has been conducted to validate these forecasting methods, many scientists have begun to recognize their usefulness. Examples of indigenous forecasting are observing the migratory patterns of different species, blooming of flowers and abnormal behaviour in animals. The Government of Australia has begun archiving this information as developed by Aborigines.

11. Comments during the workshop supported the view that indigenous methods may be more useful for forecasting approaching storms or floods, rather than providing long-term forecasts. One study in India found that only 10 per cent of indigenous forecasts are on the seasonal scale; the remaining 90 per cent are short-term forecasts, leaving little opportunity for the local community to prepare. For this reason, traditional forecasts often appear to have greater folkloric rather than commercial value. Farmers have been rather sceptical of all kinds of forecasts and are generally risk-averse because acting on wrong information can have devastating consequences for them. This underscores the importance of expanding the range of reliable options available to people.

#### **B. Coping with floods and drought**

12. There is great diversity in the impacts of floods, as a result of differences in intensity as well as local experience and historical adaptations to these events. For example, people living in flood plains in Bangladesh have developed livelihoods and adapted to the constant presence of water through building on raised ground or on stilts, and using boats for transport. In flood plains in southern Africa, where flooding is not common, people have not adapted their housing and transport systems to the constant presence and threat of flood waters. The difficulty in simple lateral transfer of these coping strategies is knowing whether regions experiencing increased flooding such as southern Africa can reliably anticipate more or less floods in future. However, according to the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC), extreme events are expected to increase and become more intense, so it would be useful to exchange local knowledge and experiences between regions.

13. A common response to droughts and erratic rains is to change the type of crop grown or to modify planting dates. Local communities have developed a knowledge base of what crops can succeed

in their location, including choice of species that would be suitable under drier or wetter conditions. Although scientific methods exist to predict what species would be suitable given a set of climatic and environmental conditions, the major source of uncertainty is not what crops to grow, but rather what the climatic conditions are likely to be for a given season and in the long term. Climate predictions have improved over the past decade, but it is unlikely that seasonal predictions will be given with enough confidence to enable local farmers to adjust crops without risk. An additional challenge is that of ensuring the transmission of this information to local communities. The decision-making process at the local level, taking into account the different sources of risk (climatic as well as economic, pests and disease, etc) and uncertainties, needs further study.

14. Water harvesting techniques are among the most successful of indigenous technologies in existence. The Qanat system in Iran is a series of water tunnels with vertical shafts for rural and urban distribution of underground water. It has been in use for thousands of years in more than 28 countries. Other water harvesting techniques have been developed and used in countries such as India, including techniques to replenish underground water using rain water that would normally drain away into rivers through soak ponds. Many of the more traditional technologies, such as the Qanat, are in danger of disappearing as modern wells take over. Modern wells, however, have a much shorter life time (30–50 years versus thousands of years for the Qanat system). There is need to share knowledge about these traditional technologies, and to critically evaluate modern solutions in terms of costs, environmental impact and long-term sustainability.

15. In the Cook Islands, drought was becoming a serious problem due to growing tourism and population growth. Initially, engineers put in pumps and taps, but these lasted only eight months before salinization set in. Finally, a solution was found by turning to something that had been done on the island for ages: traditional water harvesting. In another part of the world, nomads in Kazakhstan used to travel periodically to use distant grasslands, but this traditional way of livestock breeding was discarded, resulting in degradation of these distant pastures. This limits the nomads' options for coping with situations when they may need to move beyond their current lands, on a short- or long-term basis.

16. In the Philippines, people have used a type of hazard mapping in response to typhoons based on relief of the area. For example, villages are located between opposing hills or mountains to lessen the impact of strong winds. The housing designs themselves have tapered roofs and the windows are aligned with wind direction.

### **C. Mutual support at the community level**

17. Households often practice a form of insurance through reciprocity within the community. For example, families will rely on their friends and families to tide them through climate disasters. This is often assistance given in the form of rice, vegetables, labour to rebuild homes, or livestock. The challenge is to try to scale this up from the community level, which would help to spread the risk; many of these villages are quite small and isolated so that when one household is struck by disaster, the households around it will most likely also be facing the same disaster.

18. Participants from Thailand, Bangladesh and India noted that another form of insurance practised at household level is to sell livestock, which often constitute the family's savings. A study of climate vulnerability in the Mekong region found that the sale of one buffalo can provide enough money to buy enough rice to feed a family of four to five for one year. Usually, the family will start selling smaller animals such as chickens and pigs, and sell cattle only as a last resort or if they urgently need a large sum of money.

#### **D. Switching livelihood activities**

19. The most common coping strategy at the local level is to pursue alternative livelihood activities. For example, if a flood destroys a farmer's paddy fields, he will switch to fishing and hunting. Other alternatives include making equipment or household goods to sell, working in local industry, and foraging for vegetables. Opportunities for economic diversification are therefore an important factor in enhancing the adaptive capacity of local communities. In addition, farmers can sometimes adjust to climate hazards by changing their agricultural activities – changing their cropping patterns or planting different varieties.

#### **E. Evacuation and migration**

20. Evacuation and migration, as a coping strategy, is practised on a variety of levels. In the middle of a disaster, such as the 1999 floods in Mozambique, often the only response is to evacuate the area. Families will sometimes evacuate for a few days, or however long the flood lasts, and then return to life as usual. For various cultural reasons, people normally resist the idea of permanently migrating from their ancestral villages. In some areas, a form of migration is part of the cultural tradition. In one drought-prone country, pastoralism among some groups was a factor supporting their capacity to cope. This changed when paddy-field farming was introduced. Then, production of non-timber forest products (NTFPs) in that community became directly related to drought years. Other small land-based farm families are dependent on migration of the working members, with up to half of the household (the elderly, children, or disabled) remaining in their homes, relying on remittances.

### **IV. CHALLENGES FACING LOCAL COPING STRATEGIES**

#### **A. Limits of local coping strategies: thriving versus surviving**

21. Many of the coping strategies above do not support the long-term development of the communities, nor the households within them. In fact, most of the strategies presented during the workshop show how families can manage to stay alive and continue providing food until a crisis passes. At that point, families are often left without their most productive assets or deeply in debt. Once the family sells its land or livestock to buy food, they can be put into a cycle of poverty that can last for years until they are able to regain them. Issues of land rights and access to resources are paramount to ensure that vulnerable families have sustainable livelihood opportunities and resilience to cope with climate risks.

22. It is important to understand the process not only of coping, but also of recovery. For example, in those situations where people could not survive without international assistance, the process of recovery is closely linked to actions needed for sustainable development. They need water and shelter, among other things. In many cases, dramatic disasters draw in huge amounts of money, but little of it ends up in the community.

#### **B. Limits of local coping strategies: new risks from climate change**

23. Many experts caution against relying too much on indigenous coping strategies, because climate change may bring new risks that have not been dealt with before in communities, although other communities may already have coping strategies for those new risks. In the Mekong region, villagers do not feel that annual floods are a major problem and in fact, they recognize the benefits that floods bring. However, climatologists project that rainfall patterns of the future will bring about more frequent and intense floods, which may put communities beyond their traditional coping range. Communities have adapted according to the experienced frequency and magnitude of extreme climate events. They may be able to comfortably adapt to extreme events occurring once every two or three years, but it becomes more difficult with a shorter recovery period, or with stronger events. This is as much a concern for local

communities as for national infrastructure development. For example, Bhutan is concerned about glacial lake outburst floods (GLOFs), which is a rapidly growing risk as temperatures rise and glaciers melt. The country has several large hydropower development projects under way, and these catastrophic floods have already damaged hydropower plants in Bhutan and Nepal.

## V. THE ROLE OF RESEARCH AND METHODOLOGICAL TOOLS

24. There is currently a relatively small community studying climate change, but there are technical constraints in trying to model climate processes and build scenarios for decades into the future. In terms of climate variability, there is a somewhat better understanding. Up to now, this knowledge has also been concentrated in the developed countries. However, a new pattern is arising where South–South and South–North learning can take place regarding experiences with climate adaptation; community-level coping strategies could constitute an important component of such learning. This is because developing countries have already been dealing with many of the anticipated climate change impacts, such as floods, droughts, and storms. In Nigeria, one project recorded the names of the droughts over the years, including the “Year the men had to leave their families” and the “Year we ate flowers”. This is just one example of the indigenous understanding of past climate extremes and the community’s coping range.

25. Discussions on adaptation research encouraged “learning by doing” at the local level. Participants stressed the need to conduct inter-disciplinary work on examining coping strategies, and then relevant lessons would be taken from these experiences to be applied to global adaptation frameworks. One of the questions that arose during the workshop was whether researchers have the ability to separate climate variability from change. With the present urgency for local communities to first survive climate disasters, efforts to discover the incremental actions that target climate change as opposed to climate variability would take a back seat.

26. There is general agreement that understanding climate change processes helps users identify the information they need in decision-making, e.g. the number of rain days, timing of monsoon breaks, etc. Familiarity with decision structures will also help identify information needs. Effective climate information applications require enhanced interaction between climate information producers and users. This involves improved communication, including tailoring messages for different sectors. It was also recognized that capacity must be available in developing countries both to produce needed climate information and to use it. For example, the United States National Oceanic and Atmospheric Administration (NOAA) RaNet programme, distributes radios to receive forecast information from satellites. Key factors of the programme’s success are that the radios are hand powered and they receive other broadcasts.

27. Adaptation takes place at the local level, and place-based research has already been investigating this, resulting in many case studies. However, this research has often produced results that are difficult to compare across studies, due to the wide range of methodologies employed. Several tools can help facilitate this transfer of knowledge from the local to international level, such as the Sustainable Livelihoods Matrix, Action Impact Matrix, and others. Updating may be required to help document the experiences locally to raise awareness at the national level. This can help replicate those practices. Applying these methodologies across regions may also help to identify which coping strategies are successful, and under which circumstances, thereby giving a clearer idea of directions to pursue for adaptation. Effective adaptation depends on the extent to which the climate will change, in addition to the other non-climatic factors that act on society and communities. One area for future application of these tools is to move from collection of data and static indicators towards an understanding of the processes that are employed in effective adaptation (or maladaptation).

## VI. ELEMENTS OF SUCCESSFUL ADAPTATION

### A. Stakeholder participation

28. Stakeholder participation and local ownership are crucial factors in determining the success of efforts to adapt to climate risks. Working at the local level, it is important to communicate with the whole range of community-level stakeholders. This is true for both developing and developed countries. In the United Kingdom for example, London has the greatest amount of vulnerable assets, and not surprisingly, the most defences against climate change impacts lie along the Thames estuary. Maintaining these defences requires intersectoral action from water resources, agriculture, health, and local communities. The government is actively building local-level capacity by enhancing awareness of climate change and assessment capabilities. It is striving to forge links between stakeholders at the local, regional and national levels.

29. Involving stakeholders is very useful for mainstreaming climate change considerations in daily activities as well as in long-term planning, and helps motivate the effective delivery of relevant information from the climate change community to help inform the decision-making process. Stakeholder participation needs to be encouraged in all countries to ensure that climate change is properly incorporated into long-term planning as well as in the daily activities of ordinary citizens.

### B. Combining traditional and modern technologies

30. As new climatic risks appear, successful adaptation strategies will need to apply knowledge gained through traditional experiences in combination with new methods and technologies. The challenge will be to draw from the knowledge base that exists in local communities, while ensuring that policies do not distort this and lead to maladaptation. The above-mentioned effort in Australia to document indigenous forecasting methods shows how traditional knowledge can complement modern early-warning systems. This is particularly true in situations where scientific forecasts have not been used in an area. In this case, a combination of traditional and scientific forecasting will enhance credibility, and increase the chance that people will act on warnings. For example, in one flood-prone country, people did not heed official flood warnings; instead, they waited until they saw ants coming out of their nests, which was that community's traditional early warning signal.

31. A systematic review of coping strategies may also reveal the limits of current coping, and where longer term impacts might require new measures. As evidenced by those cases where people are only managing to survive rather than effectively cope with extreme events, it is clear that not all traditional techniques are appropriate for dealing with disasters.

### C. Understanding local decision-making processes and cultures

32. In addition to climate factors, it is also critical that local decision-making processes are taken into account. The causes of vulnerability and livelihood decisions that people make, based on their access to resources, are important in designing adaptation strategies. Other factors include institutional structures and cultural norms. For example, in some communities the cultural limitations governing the interaction of unmarried women with men determine who can access sources of water, and how it can be accessed. Similarly, conflicts between different groups can affect their vulnerability to drought. In Nigeria, pastoralists had only limited access to water pumps that were located in areas where sedentary farmers lived. Understanding these structures can help to identify constraints that would limit the effectiveness or sustainability of a strategy. In one case that failed, a team of scientists determined that the best site for a well was situated in the village graveyard. Understandably, no one wanted to draw water from that site.



33. There are many levels of decision-making (local, provincial, national, etc.), each with a set of different priorities and risks. These risks may be related to the climate, economy, or politics. It is important to consider the perception of risk at each of these levels, as that is what will determine how people act. In some cases, such as in the Mekong region, villagers did not feel that annual floods were a great threat. In the same way, floods in Bangladesh are categorized into “bursha” (normal floods) and “bonna” (damaging floods). Once local communities feel that they are confronted with unacceptable risks, they need local institutions to support adaptive measures. One project in Africa set up wells for communities for use during the dry season. Because women are responsible for gathering water, it was a priority for them to have a secure source of water nearby. The village women formed a committee to manage the well and the government provided the land. After funding ended, the wells continued to operate, and the women invested money back into their livelihoods. This is an example of a successful adaptation that had development benefits through improved livelihoods for the women and greater well-being.

#### **D. Integration into sustainable development planning**

34. It is important to look at the thresholds where people become vulnerable and to understand the “mediating factors” between climate risk and vulnerability. Participants noted that adaptation could potentially be most effective by focusing on development priorities and finding strategies that will produce benefits now and in the future. Supporting the well-being of community members requires that climate change adaptation take place in various sectors, including water, transport and health. This is already beginning in some countries such as Bangladesh where water and disaster management are urgent concerns. Understanding the likely climate change impacts is also well researched in Bangladesh, so it has been incorporated into development planning at the national level. Links between disaster management and climate change are strengthening as organizations recognize that both are key development issues that widely impact community livelihoods. The increase in severe impacts from drought and floods spurred disaster managers to look at root causes of vulnerability and the multi-sectoral solutions.

35. Previous disaster management focused on responding to events through relief efforts, but increasingly there is an evolution towards preparedness. Awareness of climate change reinforces the need for preparedness. Aside from disaster management, development programmes have also achieved some progress at the local level. Many development organizations have long been present in rural areas, working towards establishing water and infrastructure, and improving healthcare and education in the most vulnerable communities.

36. One of the key barriers to implementing multi-sectoral strategies, however, is the fact that institutions may have diverging agendas at the national level. Climate change adaptation is often a low priority. But research, and upward disaster trends, have begun to change attitudes as policy makers realize that it is a growing urgent problem. The process for integrating climate change into development exists through the Agenda 21, and now the national adaptation programmes of action (NAPAs) for the least developed countries, but policy implementation has yet to be sustained.

### **VII. LESSONS LEARNED**

37. First, it is very clear that traditional knowledge is important, and that we should seek to learn from it. But three examples in the presentations carried mixed messages:

(a) Reliance on traditional knowledge as an early warning system can be disastrous when other information is available sooner, as happened during floods in Mozambique;

(b) Failure to pay attention to traditional knowledge led to problems in land grazing in Kazakhstan – so much so that people are now returning to traditional methods, such as distant pasturing, to promote sustainability;

(c) In Iran, the Qanat system, which endured and proved reliable for centuries, has fallen victim to modernization; the tendency today is to dig a well rather than build a Qanat, because a well costs only a tenth as much. But wells last only 20–50 years, whereas the Qanat system has lasted for thousands of years.

38. The lesson from these experiences is that traditional knowledge is important, but every source of knowledge and every method must be evaluated in light of current conditions to determine whether to rely on it, or whether to rely on it exclusively. In some cases, reliance on traditional knowledge alone may be less desirable; in others, reliance on traditional methods may be preferable to seemingly “modern” alternatives; and in some cases, modern approaches, such as NOAA’s RaNet system in Africa, can supplement and enhance traditional knowledge and methods. In all cases, consideration should be given not only to near-term costs but also to long-term sustainability.

39. Second, baselines are important in adaptation. However, baselines are necessarily established retrospectively, in light of past experience – they may not reliably forecast situations that could be faced in the future.

40. Third, information is vital – having access to it, providing it to those who need it, and ensuring that people understand it, and will use it. Many examples were presented in the workshop of the important role that information plays in adaptation efforts, particularly that many different actors in different sectors are involved in adaptation efforts and that they often need different kinds of information for different purposes. These diverse actors, who often face different problems or decisions, cannot be expected to be able to take advantage of information that is not tailored to their particular needs and cast in terms that are understandable to them.

41. There is also a concern that information from models may be used incorrectly, particularly where it is the only information available. The danger here is that, if modelling information is used incorrectly and inappropriate actions are taken on this basis, the information may later be questioned or challenged, and the models themselves may become suspect, even though they were never designed for such purposes.

42. Fourth, creating ownership is critical. It is not enough for local officials to plan; it is critical to involve local people at every step in developing these plans for them to be implemented. Only if people feel ownership are they likely to accept and implement them. In addition, assigning responsibility is also critical; it must be clear who should take what action at what time.

43. Fifth, in adaptation efforts, practice must drive theory, and not the other way around. Each year in India an elaborate manual is prepared in different areas before the flood season, detailing what actions must be taken, by whom, and when. These manuals are then revised and updated annually based on the experience of the previous season. This evolution of knowledge based on experience is vital and should be replicated in many other areas.

44. Sixth, there was much discussion about climate variability versus climate change and the relative importance of specific attribution. The two often reinforce each other. The question that remains is: how important is it to distinguish between climate variability and climate change in efforts to increase adaptive resilience, and why?

45. Seventh, what we mean by “adaptation” seems to differ widely based on geography and the prevailing conditions in the area. In the Mekong Delta floods are a natural part of life for the local

residents who, on average, experience a major flood about every five years (although this rate has been increasing in recent years). For them, floods are not the “disaster” that they may be for others; they have long experience in coping with floods and have adopted many adaptive responses. But floods are not normal in Mozambique. When flooding occurred there, dealing with it was a matter of survival. So, the same phenomenon can have widely disparate impacts on populations in different parts of the world, based partly on whether residents have any experience in coping with that phenomenon.

## **VIII. ISSUES FOR FURTHER CONSIDERATION**

### **A. Documenting and exchanging local experiences**

46. Experience in coping with impacts of climate change already exists; many communities around the world possess knowledge for coping with extreme events and different ranges of climate variability. One of the key messages from this workshop is that researchers, international agencies, and organizations working towards sustainable development can greatly benefit from these experiences at the local level. There is a need to learn from successful adaptation in the past, as well as to avoid maladaptation. In addition to the examples of actions undertaken that support livelihoods, there are also cases where decisions have increased vulnerability through limiting flexibility or the local capacity.

47. There is need to document local coping strategies and technologies and to evaluate their effectiveness. Exchange of experiences between regions facing similar climatic threats and risks would help broaden the knowledge base on adaptation. Sharing of experiences between regions along gradients on threat would be very useful. For example, experiences from river basins that have historically been flooded such as those in Bangladesh, would offer useful insights to those say in southern Africa where major floods are a new phenomenon, but one that can be expected to increase under climate change.

48. Some indigenous technologies are fast disappearing as modern solutions are promoted. There is need to document and evaluate effectiveness of all available solutions to ensure sustainability. Traditional methods that have worked for centuries are usually robust in the long term, despite higher start-up costs in some cases. It is important that proper evaluation of adaptation interventions is carried out, taking into account the expected lifetime of the solutions, and sensitivity to multiple climate risks.

49. Communicating risks to stakeholders, including those in rural areas, is an important step in coping with climate-related disasters. Some examples of successful approaches to communicate threats to rural communities, such as using solar radios, are available and can be explored for wider use in other regions.

50. Coping strategies are largely local processes and actions taken by those directly at risk. However, many assessments have shown that they are very similar across communities, so it may be possible to begin developing a framework for adaptation based on strategies that have generally been successful. A broader awareness of coping strategies beyond the community can also contribute to the policy process and facilitate the replication of good practices. To accomplish this, it would be useful to draw out the lessons learned and the context of each coping strategy. This synthesis could then be used to transfer successful coping between regions and to different parts of the development community.

### **B. Applied research**

51. As the research community develops a theory and formal description of adaptation, it might consider how indigenous knowledge would inform the process of adaptation, through exploration of how knowledge is created and assimilated into local communities to address new threats.

52. Applied research is most effective when it is driven by local-community needs, and when it builds on local capacity or seeks to build local capacity. Future research on adaptation should involve

stakeholders, while including traditional sectoral (such as agriculture and water) research communities to ensure proper integration into national/local activities and in national development efforts.

53. There is need to develop integrated assessment models that can inform proactive adaptation, building on the tremendous progress in climate and impacts modelling. Such tools should address local decision-making needs in terms of information content and the need to explore multiple factors beyond climate drivers alone.

54. Experiences with past climates are useful in conditioning communities to what they might expect under climate change. However, it is likely that future risks will be quite different, and so research is needed to better define the nature of future risks and communicate this information to local communities so they broaden their coping range.

### **C. Broad-based cooperation**

55. There are different scales of action, and local, national or regional development needs will require cooperation by different sets of actors. In the process of synthesizing local coping experiences, links between these scales should also be examined to encourage complementary measures. Community action is inextricably linked to national and international action. Vulnerability assessments have shown that many people prefer floods to droughts, not because floods have less impact, but rather because the international attention that follows a flood can assist communities in a faster recovery.

56. Considerable scope exists for cooperation between the disaster reduction/preparedness community and those planning adaptation to climate change at the national and local level, especially in those activities that enhance adaptive capacity and coping through removal of barriers such as poverty and institutional arrangements.

57. Regional networks are an effective way to reach management, policy and other stakeholders at the local and regional level. Research and outreach efforts will be greatly enriched through the involvement of these networks.

### **D. Capacity-building needs**

58. Local capacity to deal with climate variability is very limited, and that to deal with climate change is even less. Action at the national and international level can support building knowledge and adaptive capacity in communities. In developing countries, indigenous knowledge for coping with climate risks will necessarily evolve as new technologies are introduced and conditions change. Capacity-building for science and technology is essential for adaptation.

59. Achieving a deeper understanding of local coping strategies and their underlying processes is critical for understanding the adaptive capacity of a community. This can help to inform the international community of the resources available for adaptation, such as financial, technical and human resource capacities. Existing strategies to cope with current climate risk are directly related to climate change adaptation. As climate change progresses, it will be important to build upon this foundation to extend the coping range of communities to be able to face greater climate extremes and variability.

60. Experts and policy makers have a clear understanding of the decisions that must be taken at the national and international levels to support sustainable development. They are in a good position to understand how coping strategies will be hampered or helped by external policy environment. This is also an opportunity to identify how best to promote cooperation, resolve conflicts, and create an enabling environment for adaptation. For example, Bhutan, the Lao People's Democratic Republic, and other countries are embarking on a policy of decentralizing decision-making to the village level. This allows

villages to address their highest concerns and to design solutions that will involve the people who are directly affected, and therefore, committed to its success.

61. Communities are constantly dealing with urgent needs from all sides, and climate variability and change are often considered only after satisfying health, safety and food security needs. The action needed at the international and national level is to facilitate the channelling of funds to local organizations to address climate risks. Until then, coping strategies and adaptation may not be implemented or replicated. Additional financial resources will also work towards harmonizing climate change policies at the national level with sustainable development policy.

#### **E. Focus on development needs**

62. In climate change work so far, a large amount of research has been conducted on climate modelling, vulnerability and impacts. One of the key questions that came up during the workshop is whether the international community should design interventions by using science-based information or by attempting to take care of local communities' obvious current development needs. Perhaps what should be done is to look at local communities that are facing climate-related risks, then address their development needs while incorporating climate change concerns into these interventions. This brings the international community to where climate change is not the starting point, but rather a component of sustainable development planning. For example, communities are now vulnerable to floods. What contributes to this vulnerability (e.g. living and farming in flood plains due to pressure for land, dependence on subsistence rain-fed agriculture, population growth, lack of alternative livelihoods, and resource degradation), and how might a multi-sectoral solution be employed to strengthen their resilience to both current and future climate extremes? This approach provides greater sustainability because it uses existing structures and community concerns.

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