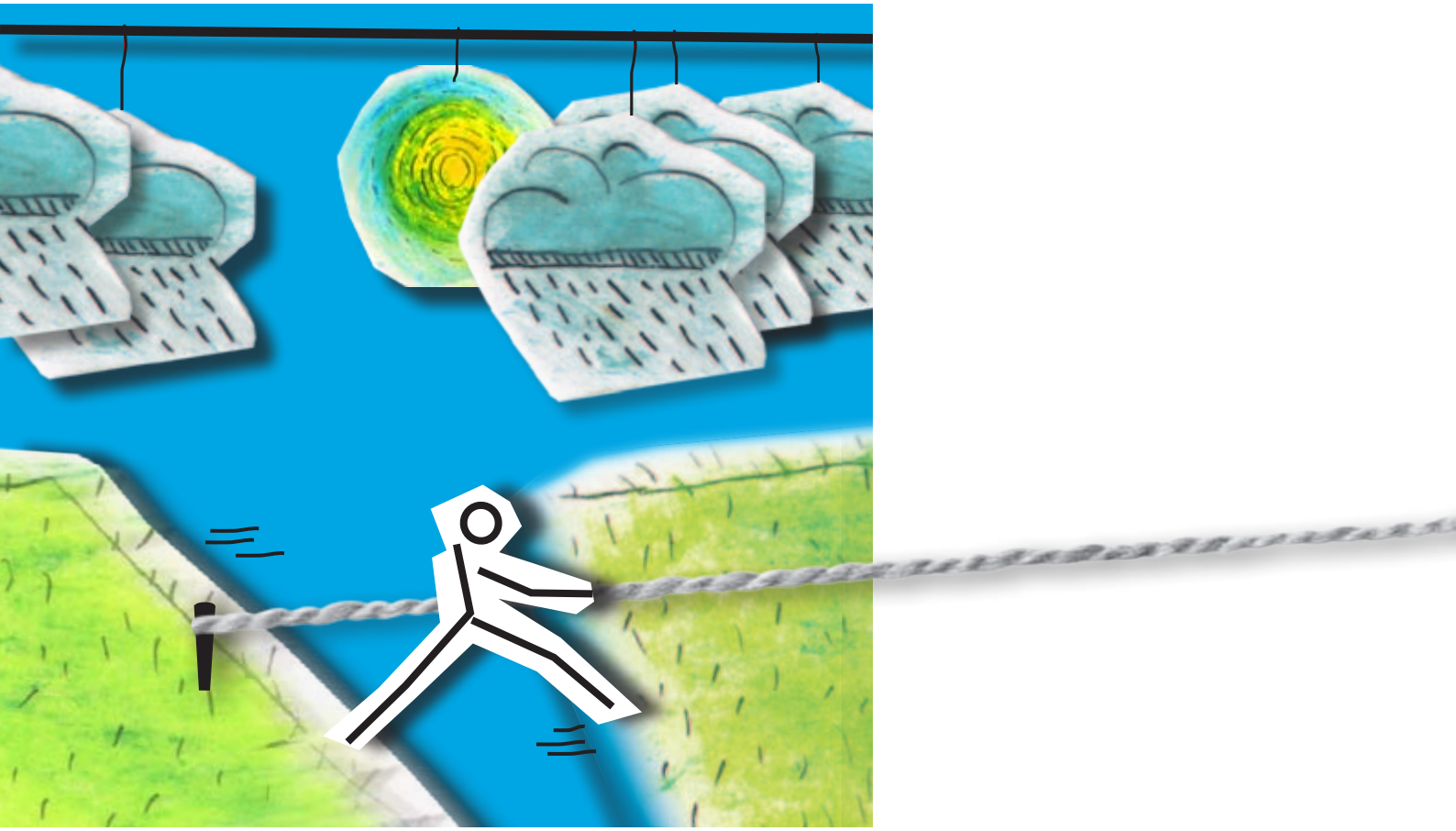

Adaptation to Climate Change

New findings, methods and solutions

giz Climate Protection Programme

On behalf of
Federal Ministry
for Economic Cooperation
and Development

Adaptation to Climate Change

New findings, methods and solutions

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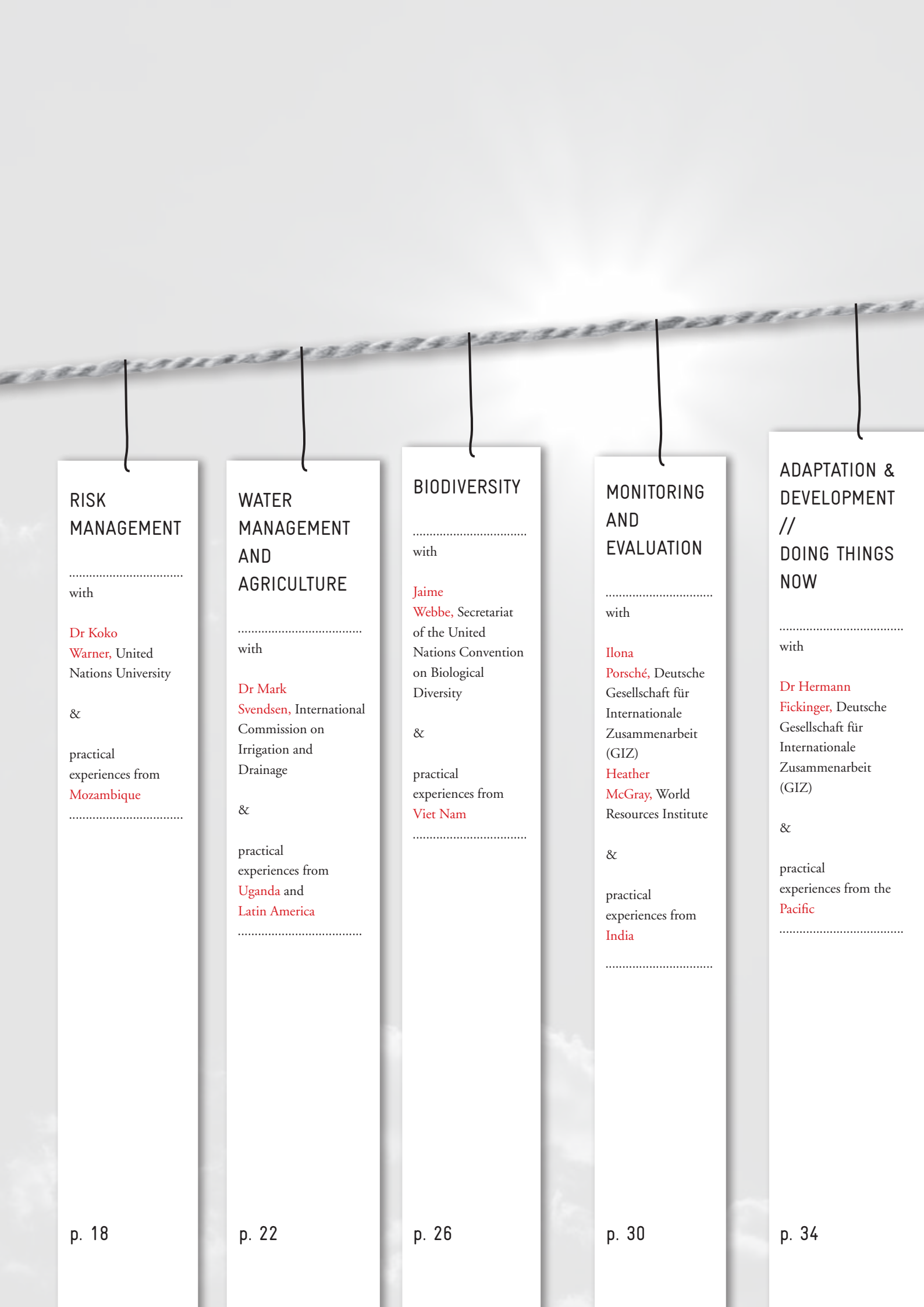

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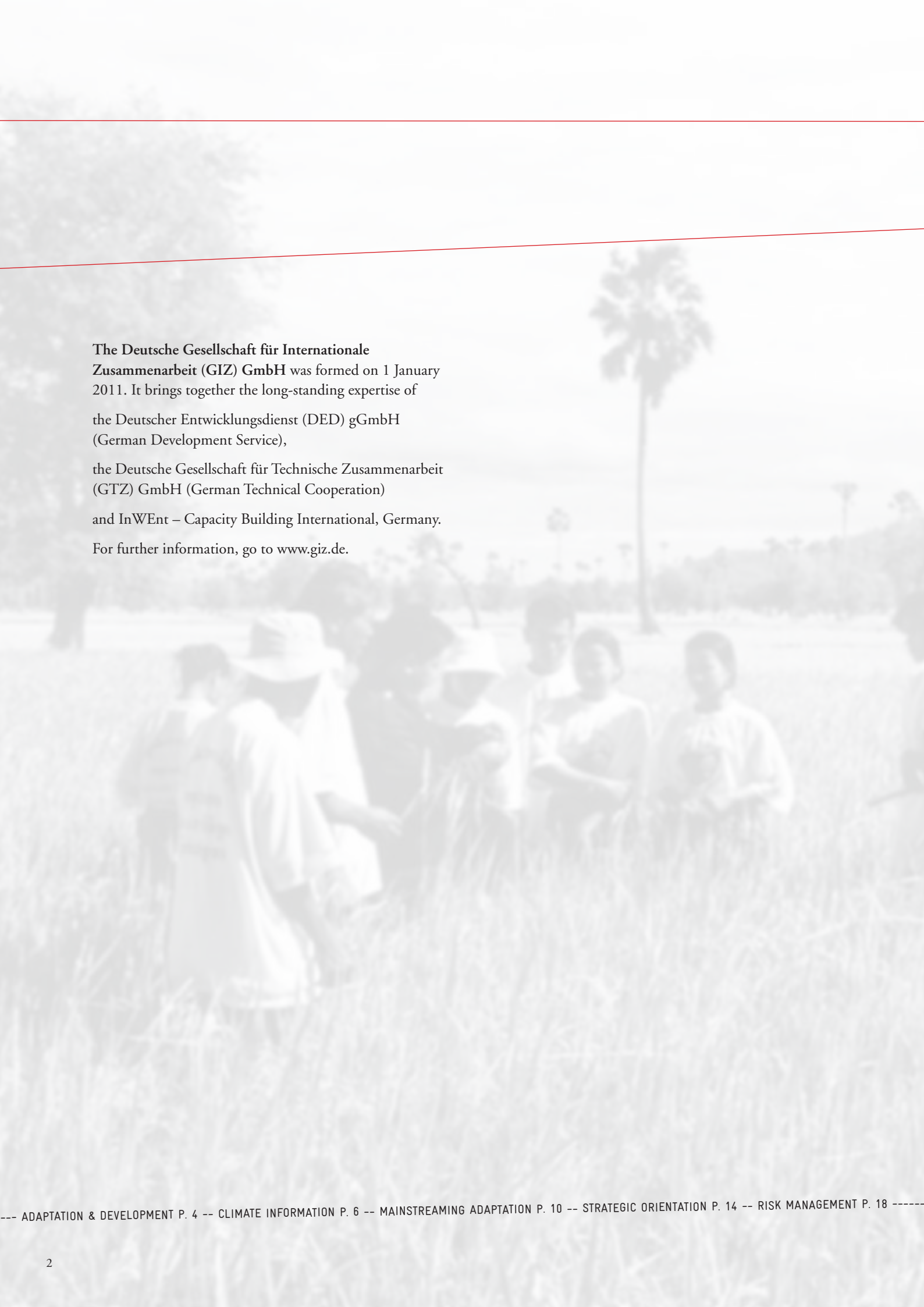

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH was formed on 1 January 2011. It brings together the long-standing expertise of

the Deutscher Entwicklungsdienst (DED) gGmbH (German Development Service),

the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German Technical Cooperation)

and InWEnt – Capacity Building International, Germany.

For further information, go to www.giz.de.

PREFACE

Global climate change and the significant impacts it can have on people's lives are a major challenge for developing countries. Heavy floods, severe droughts and other weather extremes are examples of those impacts which call for building up capacity to adapt to the impacts of climate change.

While climate change will affect all regions of the world, people in developing countries are the most vulnerable. That is why adaptation is a priority for German development cooperation, with many programmes already addressing the challenge in partner countries. Now that the need for adaptation to climate change has been generally accepted as an immediate priority, it is time to bundle the knowledge and focus on *how* to adapt.

This publication addresses precisely this point. The chapters explore different dimensions of adaptive capacity that are needed to prevent or reduce negative impacts of climate change. These include, for example, access to climate information, capacity to mainstream and devise strategies on adaptation, and the ability to identify appropriate adaptation techniques in sectors where this is particularly urgent.

Adaptation is a knowledge-intensive task; it entails an analytical process of interpreting climate data and incorporating the knowledge gained into decision-making. Bringing together the required expertise is a major step in building capacity. For each of the main aspects of adaptation, this publication features an analysis by a renowned expert, an overview of responses from German development cooperation, and an on-the-ground example of implementation in a partner country.

With the recent merger of several organisations to form the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), a vast amount of expertise in building capacity for adaptation has been brought together. The German Federal Ministry for Economic Cooperation and Development considers adaptation an integral part of German development work and is looking forward to jointly stepping up efforts with partners to integrate climate resilience into their strategies for sustainable development.

DR MANFRED KONUKIEWITZ, Deputy Director General for Global and Sectoral Affairs and Commissioner for Climate Policy, German Federal Ministry for Economic Cooperation and Development (BMZ)

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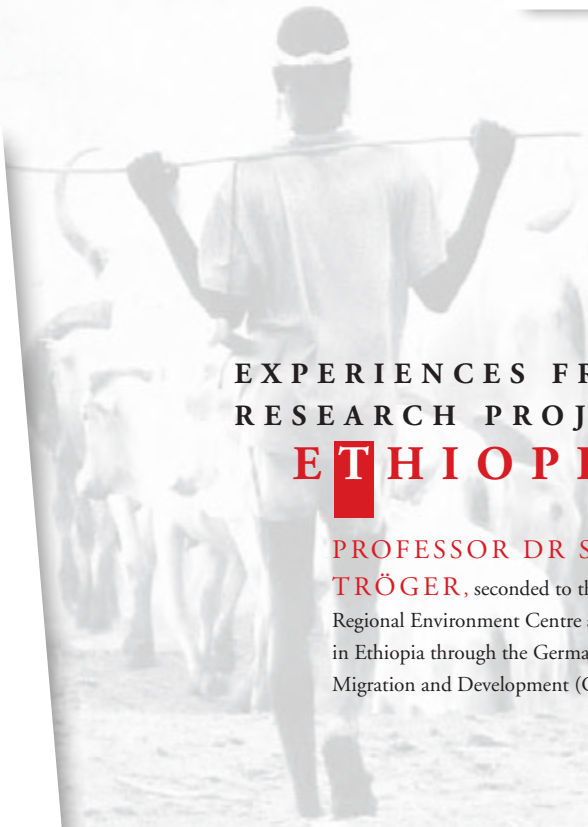
DOING THINGS **DIFFERENTLY**

BECAUSE OF CLIMATE CHANGE



KEY TERMINOLOGY

Adaptation to climate change

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive capacity

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Vulnerability

The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Source: Intergovernmental Panel on Climate Change (IPCC), 2001

EXPERIENCES FROM A FIELD RESEARCH PROJECT IN ETHIOPIA

PROFESSOR DR SABINE TRÖGER, seconded to the Horn of Africa Regional Environment Centre and Network in Ethiopia through the German Centre for International Migration and Development (CIM)

When people say: 'We want to change the names of the months, as the old names of our calendar no longer tell us what will happen in the environment', there is no denying the fact that climate change is happening. In 2009, teams of German geography students and Ethiopian field advisors conducted field research at 13 different sites in Ethiopia to discover how climate change is affecting people's lives and how they are coping and adapting to secure their livelihoods.

The field research was supported by the Ethiopian Ministry of Agriculture and Rural Development and German development cooperation. Its outcomes were intended to shed light on the concrete implications of climate change for the long-term development programme 'Sustainable Land Management'. The results highlight the close links between climate change and development, but also the fact that *what* development programmes offer and *how* development occurs determine to a great extent our ability to adapt to future impacts.

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A key finding of the research is that climate change is being felt and reacted to everywhere in Ethiopia. Yet it is only one of many challenges with which people are confronted in their daily lives. Ethiopia's mainly rural societies are rendered vulnerable by several factors, including its fast-growing population, deforestation, soil degradation, overstocking and large-scale agro-investment.

The field research identifies considerable variation in climate patterns between the western and eastern parts of the country. The western part is characterised by marked weather irregularities and unpredictabilities as well as a tendency towards shortened rain periods, which leave farmers increasingly unsure of when to plant and which crop to choose. In addition, people must contend with higher temperatures, additional and particularly heavy rains as well as frost and hail. In contrast, the eastern part of the country suffers mainly from the reduction, or in some places total failure, of the Belg rains – rain between February and May according to the 'old' calendar – on which most livelihood systems in this region depend. Several regions have not seen any Belg rains for four or even five successive years.

These climate phenomena are not unprecedented in Ethiopia, but they have recently increased in frequency and severity. As a result, the country has seen yields of food and fodder crops decline, while the incidence of disease has increased in plants, animals and humans. All 13 investigated sites had previously provided a food-secure livelihood base, but at least half of them have experienced increased hunger and poverty in recent years.

Farmers have always had to cope with stresses, but they now realise that merely coping – simply reacting to certain stresses on the basis of experience and past learning – is no longer sufficient. For example, cropping decisions must be reconsidered because agro-ecological zones are shifting to higher altitudes. In consequence, Ethiopian farmers now grow maize at altitudes which until recently were not favourable for this crop. This development is positive and broadens the range of choices and alternatives open to the people.

Farmers are seizing these opportunities – but some are already anticipating an excessive continuation of these upward shifts: 'Soon there will be dry and hot environments everywhere and we will no longer be able to grow either our traditional crops or alternative crops such as maize.' While this farmer's fears may be exaggerated, his words reflect the concerns of people who are witnessing the erosion of their traditional culture and social networks, held together as they are by societal rules that include customs of eating and sharing familiar foods in traditional ways. It is evident that climate change is triggering fundamental agricultural and societal transformations that cannot be ignored.

This transformation includes the changing attitudes of young men, who are increasingly likely to view cattle in economic terms rather than as an aspect of personal identity. As a young pastoralist[1] from the Nyangatom ethnic group puts it: 'Nyangatom culture means having cattle. If we lose our cattle, we also lose our culture. But now we have no other choice and even the elders understand it. If a man is intelligent he can manage with fewer cattle but still be respected.'

A transformation can also be seen in the young man who observes how pastures are dwindling and decides to abandon pastoral life. He resolves to relinquish his cattle, focus instead on smaller ruminants, and send his children to school instead of drawing on their help to tend the livestock.

These farmers and pastoralists are doing their best to cope and they do have adaptive capacities. But adaptation to climate change must go further. It involves recognising that the response to change cannot be based simply on familiar, socially acquired mechanisms. Problems and stresses call for proactive behaviour, new solutions and innovative strategies. Development practitioners can play an important role in helping farmers to consider changing conditions in their decision-making. Adaptation options in this case could include establishing a cattle market, or improving the schooling system so that education can prepare the young generation for the challenges of a changing environment and a new lifestyle.

[1] Pastoralism is a livestock-based production system practised in often harsh and fragile environments: herders migrate with their cattle and camels to distant pastures at times of seasonal drought, while their families remain at the settlement. Fifteen per cent of Ethiopia's population are pastoralists.

'EVERYTHING THAT IS HAPPENING NOW IS BEYOND OUR CAPACITY.'

Lokhuam Kapa,
a pastoralist
with 69 cattle and
about 280 goats and sheep

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KNOWING WHAT WILL HAPPEN

'THE GREATEST CHALLENGE OF ALL IS TO REDUCE THE EXISTING COMPLEXITY WITHOUT BECOMING TOO IMPRECISE.'

Anselm Duchrow,
Deutsche Gesellschaft für Internationale Zusammenarbeit, Tunisia

THE EXPERT'S VIEW

PROFESSOR MARTIN TODD, Professor in Climate Change, University of Sussex

Often the first question adaptation decision-makers ask is 'what is going to happen to the climate?' Climate science now provides information on the climate conditions and climate risks we may experience in coming decades. This represents a fantastic scientific achievement. Experience has shown that scientific information on future weather events and seasonal climate conditions is extremely valuable for decision-making in sectors such as agriculture and transport, or for the warning of hazard. The challenge is to utilise information on longer climate change timescales – lasting many decades – in a sensible way. Decision-makers need to understand the limitations of climate projections before integrating these data into adaptation processes.

One of the biggest challenges is the degree of uncertainty in climate change projections, which depends on the scale of analysis. Global averages are much more accurate than projections for particular locations. The degree of uncertainty also depends on the variable of interest. Projections of temperature are much more accurate than, for example, those for precipitation or tropical storm frequency. In some cases uncertainty can be so high as to make developing direct responses very difficult. With respect to precipitation, for most parts of the tropics even the direction of change is unclear. But uncertainty is not equivalent to 'no change'. It is highly unlikely that precipitation patterns in the tropics will not change at all. And uncertainty does not mean that adaptation is not possible. As

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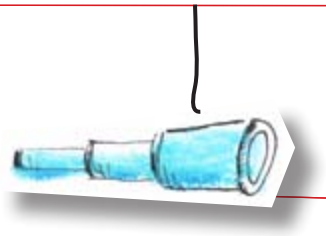


the community of climate information users has become more aware of uncertainty there has been a shift towards exploring those adaptation options that are robust in face of an uncertain future. In situations of high uncertainty an emphasis on reducing vulnerability to climate risk is most appropriate. By contrast, in cases of little uncertainty direct impact-related adaptation measures are feasible.

The communication of climate change information is another challenge. On the one hand adaptation practitioners prefer easy take-home messages. These may be over-simplified, e.g. they may fail to take sufficient account of degrees of uncertainty. On the other hand, scientific language is often not comprehensible to decision-makers. While decision-makers should have a basic understanding of climate change science and its terminology, scientists should also communicate their findings in simpler terms.

An important lesson to learn is that scientific information alone is an insufficient basis for adaptation processes. Scientists usually have a tendency to accept only information obtained through the application of scientific methods. In the adaptation process itself, though, scientifically derived information will frequently come up against the reality of people's experiences of the climate and the environment, and with a range of practical adaptation options that are often informed by past practices. Indeed, the 'bottom-up' approach often starts with an assessment of vulnerability to current climate and recent trends – a vulnerability which is best explored through the experiences of those whose daily lives are directly influenced by climate events. A merging in practice of top-down and bottom-up approaches can lead to a very valuable exchange of views. Scientists can become more aware of the particular aspects of climate that have the greatest impact on people's livelihoods. At the same time, however, human experience is very subjective, and issues such as the attribution of climate events to particular causes can only really be addressed scientifically.

The collaboration between climate change and development cooperation is still in the learning phase. Climate change adaptation initiatives have been established fairly quickly and there is a need for adaptation professionals to acquire a greater understanding of climate science, and for climate scientists to learn more about work on the ground. Very few climate scientists have practical experience of development projects; they may not understand how climate information might be used in such projects or what barriers prevent insights being applied. The interchange between science and development cooperation could be improved if scientists were to engage more directly with development practitioners and vice versa. There is no doubt that climate change adaptation activities are stimulating much greater awareness in the scientific community. The development of seasonal climate forecast applications is another, more immediate, context in which this relationship can flourish.

METHODS

In planning, implementing and monitoring adaptation projects in the partner countries of development cooperation there is often a lack of information on the precise nature of the conditions that need to be adapted to. This is unsatisfactory for decision-makers. The desire for climate information that can be used to accurately predict future climatic conditions and the associated risks is met only by very rough – and sometimes contradictory – data from global and regional climate models and information on vulnerabilities that may be unreliable and incomplete.

This is where the advisory service of German development cooperation comes in. It endeavours, often in cooperation with scientists, to ensure that the climate information needed for decision-making is more readily available and more efficiently used in partner countries.
In this context GIZ undertakes the following tasks:

- Advising on ways of using climate information and on uncertainties in the information
- Commissioning and supporting climate forecasts, vulnerability studies and effectiveness analyses for selected sectors, regions and systems
- Collecting and collating local observations and experiences of climate change
- Setting up databases – such as the 'Climate impacts: global and regional adaptation platform' (ci:grasp) established jointly with the Potsdam Institute for Climate Impact Research (PIK)
- Advising on institutionalising climate information systems
- Advising on setting up observation systems for climate variables and establishing early warning systems

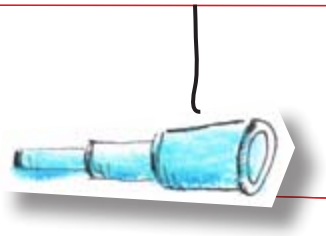
RESULTS ON-SITE
TUNISIA

TURNING INFORMATION INTO KNOW-HOW

A succession of extreme droughts between 1999 and 2002 provided forewarning of how climate change may affect life in Tunisia. Social conflict erupted over issues such as distribution of drinking water. The country's economic output, in which agriculture plays a major part, fell by around 20 per cent. Wheat production was cut by two thirds, while the olive crop was reduced by 80 per cent. The period of drought was followed by four years of excessively high rainfall in some areas. This resulted in widespread flooding and extensive damage to buildings and infrastructure as well as some loss of life.

Climate extremes in general are not unusual in this part of North Africa, but the conspicuous increase in their frequency prompted the Tunisian government to examine the expected impacts of climate change in more detail and improve its knowledge base in ways that would facilitate adaptation to climate change. German development cooperation has been supporting the Tunisian government in this work since 2005.

A study commissioned in 2006 provided the first reliable climate forecasts and helped identify Tunisia's most vulnerable sectors – namely agriculture, water, ecosystems, health and tourism. 'The study has revealed how complex the problem is and how urgent is the search for solutions', says Ammar Amri, whose advisory bureau, with the support of international experts, carried out the study on behalf of the Tunisian Ministry of Agriculture and German development cooperation.



With the help of the new climate information acquired by the study a national adaptation strategy for the agricultural sector has been developed. The strategy provides important guidelines for all the stakeholders in agriculture. Building on the experience gained, an adaptation strategy for the health sector has also been drawn up, and a similar one for tourism is currently in the pipeline. In the course of these activities it is repeatedly becoming clear that for certain regions and ecosystems more detailed information on climate change and its impacts is needed. A number of interdisciplinary teams are currently working on procuring and processing the required information.

Detailed studies that have already been completed are now being used in Tunisia as a basis for central investment and planning decisions. One such study was conducted by the national research institute for arid regions (Institut des Régions Arides – IRA), which investigated olive-growing in the south of the country with support from the Potsdam Institute for Climate Impact Research. The vulnerability maps produced by the study show the projected development of land suitable for olive-growing. 'Land that was previously well suited to olive-growing is disappearing at an alarming rate. The category of 'well suited' currently includes 44 per cent of land in the governorate of Médenine but this is likely to shrink to 16 per cent by 2020 and to disappear almost completely by 2050', says Anselm Duchrow of GIZ, who with his team is advising the Tunisian government on climate issues.

Particular challenges at present involve identifying the most suitable methods of analysis and combining very varied types of information in a web-based climate information system. Duchrow emphasises this point: 'One of our key tasks is to work with our Tunisian partners to create a system that extracts the important information from the vast quantity of data and makes it available to decision-makers and official bodies. The greatest challenge of all is to reduce the existing complexity to a sufficient extent without becoming too imprecise.'

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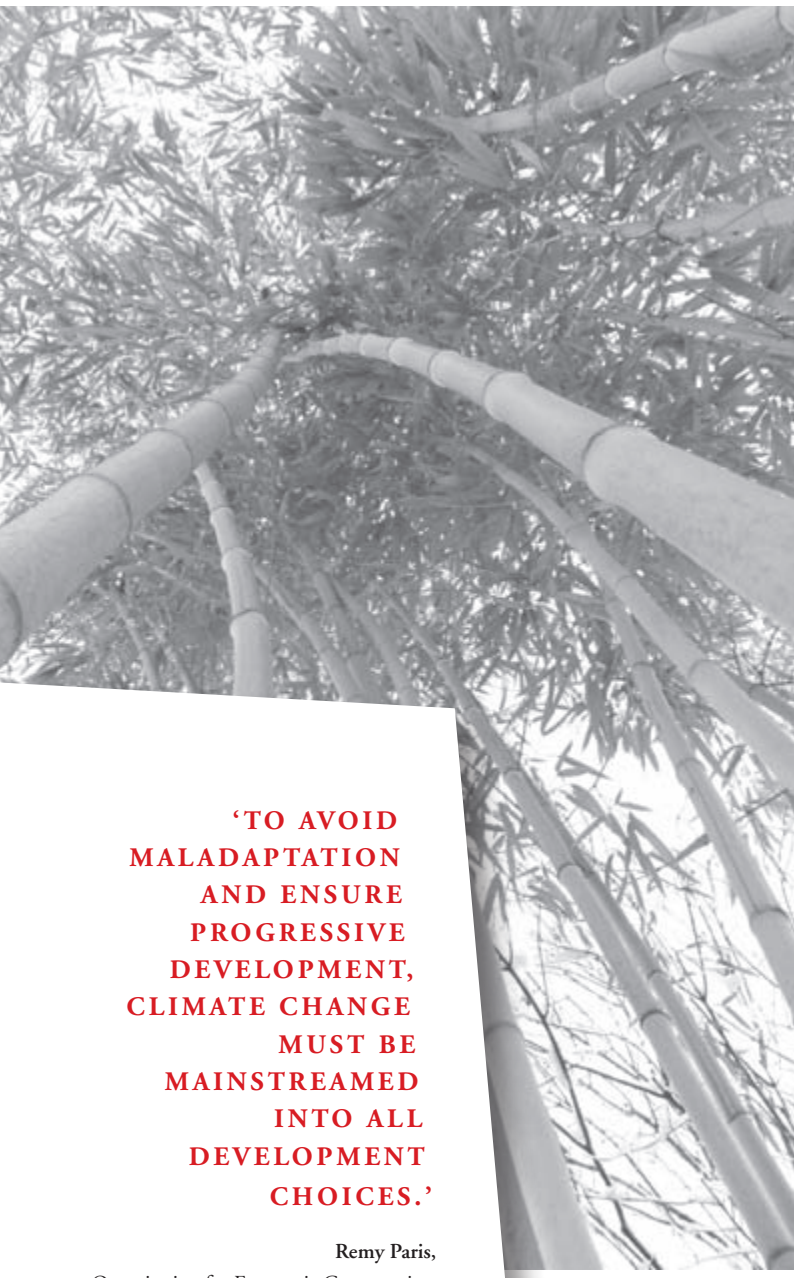
SETTING THE COURSE



'TO AVOID MALADAPTATION AND ENSURE PROGRESSIVE DEVELOPMENT, CLIMATE CHANGE MUST BE MAINSTREAMED INTO ALL DEVELOPMENT CHOICES.'

Remy Paris,
Organisation for Economic Co-operation and Development

THE EXPERT'S VIEW

REMY PARIS, Head of Section, Environment and Sustainable Development, Organisation for Economic Co-operation and Development (OECD)

Global development and economic growth will be decisively determined by what the world does – or fails to do – in response to the challenge of climate change. On the one hand, development choices have a demonstrable impact on local and global climate patterns. On the other hand, development choices made today will determine the future ability of societies to adapt to the potential impacts of climate change.

Climate affects the productivity of critical development resources, such as crops and livestock, forests, fisheries and water. And climatic impacts on populations inadequately or inappropriately prepared for climate change can have knock-on effects on all forms of development. As events such as Hurricane Katrina make clear, severe weather events can cause significant damage to the economic foundations of a country or region.

For these reasons climate change considerations must clearly be a critical component of development cooperation. Stand-alone activities related to climate change and development are not enough. To avoid maladaptation and ensure progressive development, climate change must be mainstreamed into all development choices of both donor agencies and development partners. This is particularly true for decisions taken now that may have impacts over the medium to long term, when many climate change impacts will manifest themselves.

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There are signs of demand-pull for such climate change mainstreaming from the development community. In particular, donor agencies as well as several national governments are beginning to apply a climate lens and consider current and future impacts of climate change and adaptation options within their core development activities at both project and programme levels. In addition, it is notable that climate change is being integrated into existing environmental impact assessments and strategic environmental assessments in almost all agencies.

However, there are a number of difficulties in mainstreaming adaptation to climate change within development activities. One problem is that the available climate information often lacks sufficient relevance – an issue which has already been considered in the previous chapter. Barriers within governments and donor agencies pose another challenge. The reason is that adaptation expertise is typically the domain of environment departments in donor agencies and governments, which have limited leverage over sectoral guidelines and projects. Sectoral managers for their part often face 'mainstreaming overload', with issues such as gender, governance and the environment also vying for integration into development activities. Trade-offs with other priorities are another problem. While in many cases adaptation has synergies with other development needs, there are sometimes direct trade-offs with development priorities. At the project level, mainstreaming of adaptation is sometimes even perceived as complicating operating procedures or raising costs. Moreover, as many development projects are funded over three to five years, they are not always the appropriate vehicle for long-term climate risk reduction.

How can we deal with these valid concerns and nevertheless promote climate-proof development – that is, development activities that anticipate climate impacts and respond in ways that minimise risk and utilise opportunities?

Providing more usable information as a basis for decision-making is a necessary step. There is also a need to identify appropriate entry points at which to introduce climate change adaptation into development activities and planning mechanisms. The OECD has recently developed guidance that provides entry points and checklists that might facilitate policy coherence among various agencies. Developing lean procedures is another necessity, as the emphasis needs to be on implementation rather than planning. And, last but not least, we should more often involve non-governmental partners and engage the private sector and local communities in mainstreaming climate risk management.

There is ample opportunity to enhance development efforts through better integration of climate change adaptation into development planning. However, the climate change and development communities are not monolithic blocks that can be linked by a simple handshake. Rather, mainstreaming of climate change adaptation in development requires a meshing at multiple levels between the diverse range of actors and institutions. While considerable progress in this direction has been made in recent years, there is still a need for much greater coordination at many levels, both within each domain and between them.

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METHODS

Climate change and its various impacts now affect almost all development sectors. German development cooperation has taken strong action to systematically integrate climate change aspects into its work: As of 2011, all projects have to undergo a systematic environmental and climate assessment, designed to avoid detrimental effects on the environment and the climate, improve environmental quality and reduce greenhouse gas emissions as much as possible.

'Climate Proofing for Development' was designed by GIZ to facilitate the integration of climate aspects into planning at national, sectoral, project and local level. The tool offers a flexible, participatory approach that is easy to use and even works without a computer.

Climate Proofing for Development follows a stepwise approach which allows development measures to be analysed with regard to the current and future challenges and opportunities presented by climate change. Knowledge of conditions on the ground and in different sectors is brought together with climate change science and policy-making expertise. The approach needs to be adapted to each specific context and institutional framework. Properly implemented, it makes a given plan or investment more climate-robust.
In applying Climate Proofing for Development GIZ develops its partners' capacities in the following areas:

- Facilitating mainstreaming processes at different levels – in particular customising Climate Proofing for Development e.g. for local development planning and public investment schemes
- Supporting organisational development – e.g. institutions, procedures, human resources
- Giving financial and technical support for implementation
- Advising on gender sensitive approaches to adaptation

RESULTS ON-SITE
MALI
SUSTAINING DEVELOPMENT ACHIEVEMENTS

The economy of Mali is essentially based on agriculture and the use of natural resources. Demographic growth and climatic constraints are increasing the pressure on livelihoods among Mali's population. The government of Mali decided to address climate change issues at various levels of development planning. On behalf of the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the German Federal Ministry for Economic Cooperation and Development (BMZ), GIZ supports Mali in the integration of climate change issues into planning at project, national, sectoral and local levels. Activities at the various levels are closely interlinked.

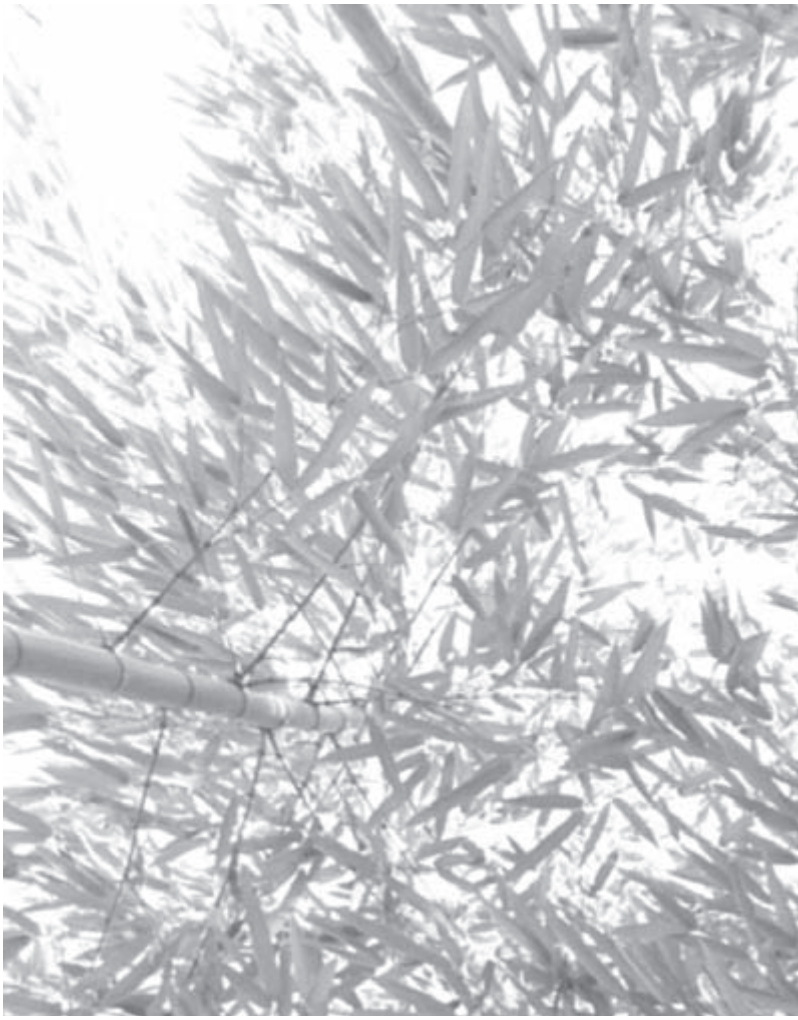
The Malian stakeholders of Sustainable Land Management (SLM) have invested a considerable amount of resources in the careful selection of a tool for taking account of climate change in development processes. They have opted for Climate Proofing for Development because of its participatory and flexible process-based approach and, above all, because it enables stakeholders to be included who are not computer-literate.

Following a series of training sessions on the Climate Proofing for Development approach involving Malian stakeholders, two projects from the Sectoral Investment Framework 'Sustainable Land Management' have been climate proofed on a pilot basis. One project in the Kayes Province, for instance,

implemented by the non-governmental organisation 'Groupe de Recherche et de réalisations pour le Développement Rural' and financed by a French partnership initiative, seeks to encourage the local population to protect natural resources in order to halt advancing desertification. Applying Climate Proofing for Development made it possible to identify several options for action aimed at allowing a more efficient use of resources while addressing current and future climate change impacts. These options include the diversification of agriculture through intercropping and the use of adapted varieties, as well as the promotion of efficient water use by collecting and storing rainwater. Following these field experiences, a manual was developed. A pool of experts has been formed and trained, and Climate Proofing for Development is being included in the planning cycles for all SLM projects.

As Climate Proofing for Development was shown to be highly successful for SLM projects, the Malian government also recommended its use at the national and sectoral levels as part of Strategic Environmental Assessments for all major policy processes and interventions. A pilot application incorporating an in-depth technical and methodological evaluation was carried out for the National Programme on Small-Scale Irrigation. Lessons learnt from this prototype are to be used to develop a standard methodology for Strategic Environmental Assessments. In order to adapt municipal planning to the impacts of climate change, a pilot project using the Climate Proofing for Development approach was carried out in four municipalities.

Integrating adaptation measures does not necessarily involve additional cost. This has been the experience of Alexander Fröde, one of the experts at GIZ involved in developing Climate Proofing for Development: 'In large and complex programmes with many stakeholders, it is easy to lose sight of simple solutions. Climate Proofing helps to ensure that these are not overlooked and to identify the most important action areas for adaptation which can be implemented with the available resources.'



BEING PREPARED

'THROUGH OUR CLIMATE CHANGE ROADMAP WE CAN MOBILISE ALL THE SECTORS TO RELATE THEIR SECTORAL PLANNING TO CLIMATE CHANGE.'

Edi Effendi,
Indonesian National Development Planning Agency

THE EXPERT'S VIEW

DR NANA KÜNKEL, Senior Technical Advisor, 'Climate Protection Programme for Developing Countries', Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Anyone who works in strategy development knows that there is a danger of producing toothless paper tigers and lists of activities that may never find their way into reality. The same unfortunately applies to adaptation strategies that set out how countries, regions or other entities can address climate change and its impacts in a proactive way. Being aware of that danger and trying to circumvent it is a major premise of success.

Adaptation strategies can fulfil two major functions crucial to effective and efficient adaptation. Firstly, they provide explicit options for steps that can be taken to adapt to projected climate impacts. This identification of strategic options is important and requires some reflection outside day-to-day activities; significant factors are the long-term nature of adaptation and the uncertainty attached to future climate change. Secondly, adaptation strategies prioritise what urgently needs to be done and the sequence in which steps should be taken. Since adaptation is not usually an end in itself but is undertaken to achieve development objectives, it is crucial that resources set aside for adaptation contribute to this broader objective.

Adaptation strategies typically involve a stakeholder process of gathering the relevant information and agreeing on mandates, key procedures and priorities. They also serve as a forum for getting climate scientists on board and communicating with decision-makers from different sectors. Adaptation strategies

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typically draw on vulnerability assessments. These highlight the most vulnerable sectors or systems and the areas in which there is a need to act. Various techniques can be used to identify strategic options, ranging from simple brainstorming to complex software solutions. The economic and technical analysis of adaptation options forms part of many adaptation strategies. Here, prioritisation methods play a key role. Rigorous prioritisation methods have, for instance, been proposed and tested by McKinsey in different countries.

The development of adaptation strategies often also involves a review of the institutional and regulatory framework. A next step is to define concrete entry points for change and coordinate the approaches of different stakeholders. The strategy itself may contain quantified and time-bound indicators to monitor progress towards the agreed vision. At the same time implementation should be integrated into standard planning and management procedures.

Adaptation strategies have been developed at all levels. At national level they can guide a country's intersectoral, interregional, long-term adaptation plans. National Adaptation Programmes and Action Plans have been prepared by most Least Developed Countries under the United Nations Framework Convention on Climate Change. Many other countries, including Australia, the Philippines and Germany, have developed comprehensive adaptation strategies at national level.

At subnational levels, sectors and administrative units – including cities – have started to downscale national strategies and have in many cases started to plan their longer-term development goals in the light of climate change. Examples include adaptation strategies at regional and local level in India and the United Kingdom. Adaptation strategies may also be developed by companies or cooperatives with different time horizons (see the example of Cafédirect on page 25).

Adaptation strategies are resource-intensive and quite demanding, but they can and should draw on existing knowledge and available resources. Any process to develop an adaptation strategy must strike a balance between sound analysis and rigid prioritisation on the one hand and realism on the other, meaning that it must be consistent with the national planning culture and level of awareness. Adaptation strategies are to date the most common public policy instrument specifically targeting adaptation. However, as mentioned above, there is a danger that they may lack a clear roadmap of how activities will be implemented. This has been particularly evident in national planning processes mandated by multilateral environmental agreements, which have tended to target the international community rather than key processes in specific countries. In consequence, incentives for strict prioritisation and integration into existing processes in those countries are often weak.

If the traps described can be avoided and the strategy development process has the ownership of key stakeholders, adaptation strategies can be powerful instruments. They may create political momentum, shape a coherent approach and serve as a basis for benchmarking what has been envisaged against what is being achieved. 'Less is more' might be a useful motto for such a strategy.

METHODS

Providing support in strategy development is part of the key repertoire of capacity development. It involves supporting processes with different stakeholders as well as advising on methods of identifying and evaluating options. German development cooperation assists in the implementation of strategies, and in breaking them down to the relevant levels – national, provincial, district and city. Specifically the services of GIZ include:

- Clarifying the function of an adaptation strategy within the context of existing policies, strategies, plans and programmes
- Facilitating and moderating stakeholder involvement and policy dialogues
- Advising on the processes and responsibilities involved in developing and implementing adaptation strategies
- Strengthening institutional capacity and supporting creation of the necessary governance structure
- Supporting decision-making and prioritisation by identifying impacts, vulnerabilities and concrete adaptation options (e.g. using the Climate Proofing for Development approach described on page 12)
- Promoting pilot measures
- Assisting in mainstreaming adaptation into relevant planning and policies

RESULTS ON-SITE INDONESIA

PUTTING POLITICIANS IN THE DRIVER'S SEAT

'When climate change issues first found their way onto the political agenda in Indonesia, government officials didn't really know how to deal with this somewhat abstract thing called climate change', says Edi Effendi from the Indonesian National Development Planning Agency (BAPPENAS).

Three years later, the situation in Indonesia is very different. Most decision-makers not only view dealing with climate change as their official duty but also seem to have put it on their own personal agenda. A strategy-building process driven by the Indonesian government and supported by GIZ with technical, strategic and organisational know-how is one of the reasons for this change of attitude. The result of this process is a national strategy called the 'Indonesia Climate Change Sectoral Roadmap' (ICCSR 2010-2030). With this roadmap the Indonesian government plans to address the multiple climate change risks faced by this tropical archipelago country that has more than 17,000 islands and more than 95,000 kilometres of coastline.

'Climate change impacts are expected to have an adverse effect on almost all national development priorities, such as enhancing food security, improving health conditions and mitigating disaster risks', explains Heiner von Luepke of GIZ, who has been involved in the formulation of ICCSR from the very beginning. Adaptation measures can protect vulnerable com-

munities and economic activities from the impacts of rising sea levels, floods and greater rainfall variability.

One of the first steps in the ICCSR process was to lay a sound knowledge base. Concentrating on the four most-affected sectors – agriculture, coastal areas, water, and health – vulnerability and economic analyses were conducted. More than 100 local and international experts were actively involved in this process.

As a long-term vision the ICCSR sets national goals, sectoral targets, milestones and priorities for action with regard to mitigation of greenhouse gas emissions and adaptation to climate change. It provides input to the national medium-term development plan. 'Through the ICCSR, we can mobilise all the sectors to relate their sectoral planning to climate change. By considering climate change from the planning phase onwards we also reduce costs', says Effendi. Currently, several ICCSR initiatives are already under way. They are intended to further strengthen the capacity of all national ministries and agencies to anticipate climate change impacts. A vulnerability assessment is now being conducted, examining hotspots of such anticipated impacts in Java and Sumatra.

As a result, ICCSR decision-makers and policy-makers are now better equipped to incorporate climate change considerations into plans, programmes and policies in the four most-affected sectors. In the agricultural sector, for example, the analysis showed that rice production is expected to be seriously affected in the coastal zones and that productivity is likely to decline as a result of changes in precipitation patterns. In consequence, the ICCSR prioritises food security issues related to climate change and the Ministry of Agriculture has responded by planning relevant research and capacity-development activities.

Other sectors – such as health – still lag behind in terms of awareness, capacity and preparedness. Effendi concludes: 'We do not view ICCSR as something static. We must learn by doing and periodically evaluate our planning and implementation process.'

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HANDLING CLIMATE VARIABILITY

'MEASURES DESIGNED TO IMPROVE CLIMATE RISK MANAGEMENT MAKE A KEY CONTRIBUTION TO CLIMATE CHANGE ADAPTATION.'

Wolfgang Stiebens,
international consultant working on behalf of Deutsche Gesellschaft für Internationale Zusammenarbeit, Mozambique

THE EXPERT'S VIEW

DR KOKO WARNER, Head of Section Environmental Migration, Social Vulnerability and Adaptation, United Nations University; Executive Director of the Munich Climate Insurance Initiative

The IPCC 4th Assessment Report suggests that climate change impacts will likely include changing weather patterns involving a higher frequency and magnitude of weather-related hazards. The present understanding of the physical dynamics of the atmosphere suggests more torrential rains and accompanying floods as well as prolonged drought periods. Tropical storm events are also likely to shift in intensity, frequency and regional occurrence. The changes in regional climate and environmental conditions, combined with demographic changes and a global growth of settlements in hazard prone areas make it likely that exposure and vulnerability to extreme events will further rise.

Weather shocks impact natural resources in agriculture, pasture and forests on which poor people rely especially heavily. Weather-related disasters increasingly impact the lives, health and property of millions of the world´s poorest. According to the World Bank and IPCC, between 1980 and 2010, 87% of deaths due to climate-related disasters occurred in developing countries. In the absence of new innovative risk management approaches which address the increasing volatility and severity of disaster losses, the adverse impact of climate change is likely to grow in areas most dependent upon ecosystem services for their well-being. The need is greater than ever to help communities adjust to these shocks in ways conducive to climate change adaptation and sustainable development.

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RISK MANAGEMENT

Avoiding or minimising losses is the bedrock of effective risk management. Today losses from natural disasters are rising, and often governments must raise post-disaster capital by diverting funds from other budgeted programmes, borrowing money domestically, or taking loans from international financial institutions. In the aftermath of heavy devastation in their countries, low-income countries may face exhausted tax bases, little reserves and declining credit ratings, making external borrowing difficult. Loss avoidance and reduction is essential for sustainable development, and can dampen the negative cycle of hazards and poverty. Approaches such as early warning, insurance, and timely recovery can catalyse adaptation and improve the resilience of affected societies. The early warning system in Mozambique is one good example (see page 20). There, risk management helps reduce uncertainty for the poor – and helps them engage in productive activities even in the face of climate change-related events.

In the context of climate change, incentivising activities that lower the disaster damage potential will become even more important. To be effective it is essential to align adaptation incentives with risk reduction efforts. For example, insurances and similar approaches can complement and accelerate adaptation if they are designed to reduce risk exposure and avoid loss. When the costs of risk reduction measures against climate-related risks such as weather hazards start outweighing the potential benefits, risk sharing or risk transfer measures come into play, including access to social safety nets and a variety of risk transfer tools like insurance. Programmes including insurance could be designed to ensure that participating vulnerable communities are making tangible progress in implementing their disaster risk reduction plans. A microinsurance programme in Ethiopia, for instance, allows low income households to pay their insurance premiums in-kind through labour contributions to community disaster risk reduction programmes.

Disaster management organisations may also have the responsibility for gathering data about climate-related risks, and raising awareness about them. Many activities, such as the identification, mapping and pricing of risk, as well as vulnerability assessments, are useful for a variety of adaptation measures. Investing in risk management lowers losses and safeguards development goals. Moreover, it reduces planning and budgetary volatility while delivering further benefits for other adaptation measures.

Such risk management approaches can complement efforts to attain the Millennium Development Goals, underpinning and safeguarding measures to help the poor. In many developing countries there are few safety nets. Climate change will increase the need to manage and reduce risk as well as prevent losses. As a result, it will become progressively more useful to have coordinated mechanisms that incentivise risk reduction and loss prevention, and ensure that these measures complement and accelerate adaptation.

METHODS

Risk management is a key element of climate change adaptation. German development cooperation deploys appropriate risk reduction and risk transfer measures to that end. Such work includes analysing measures in the light of all available projections of climate change relevant to vulnerable target groups, while taking account of their interplay. For instance, index-based insurance can be deployed in situations in which – despite risk reduction measures in the shape of rainwater storage and improved soil cover – major harvest losses arise because of extended periods of drought.

German development cooperation helps its partner countries to engage in risk management. GIZ delivers the following services:

- Assessing climate change risks and risk management strategies in the light of diverse scenarios of climate change
- Providing advice on cross-sectoral risk management strategies
- Integrating climate risk management strategies within relevant national, sub-national and local planning processes
- Building institutional structures to network and coordinate all relevant state and non-state actors
- Helping to introduce weather insurance and harness financial market instruments
- Implementing disaster prevention measures

RESULTS ON-SITE MOZAMBIQUE

SIMPLE AND EFFECTIVE

Pictures from Mozambique went around the world in 2000 – pictures of floods with people caught for days on roofs and in trees. Overall, those floods claimed 800 lives.

Flood disasters are on the increase, worldwide and in Mozambique. Until the late 1990s, rivers such as the Sambesi and Búzi in Mozambique breached their banks roughly every five to ten years. In the meantime, such disasters have become an almost annual occurrence. Each time many people – even hundreds of thousands – lose all their possessions. And yet cyclones and storm surges are only one side of the coin in Mozambique. Increasing drought frequency is the other.

But a response is under way since the flood disaster of 2000. When cyclone Favio hit the country in 2007, causing renewed and major flooding of the river Búzi, a functioning early warning system was in place for the first time. The National Disaster Management Institute (Instituto Nacional de Gestão de Calamidades – INGC) had installed the system with support from German development cooperation and the Munich Re Foundation.

Wolfgang Stiebens was active from the outset in supporting the establishment of early warning systems, emergency centres and coordination structures – work forming part of the inputs of GIZ. ‘Measures designed to improve climate risk management make a key contribution to climate change adaptation, especially in countries subject to extreme weather events such

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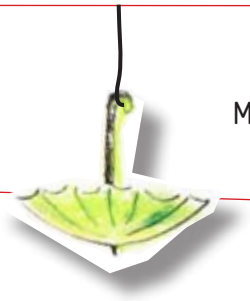


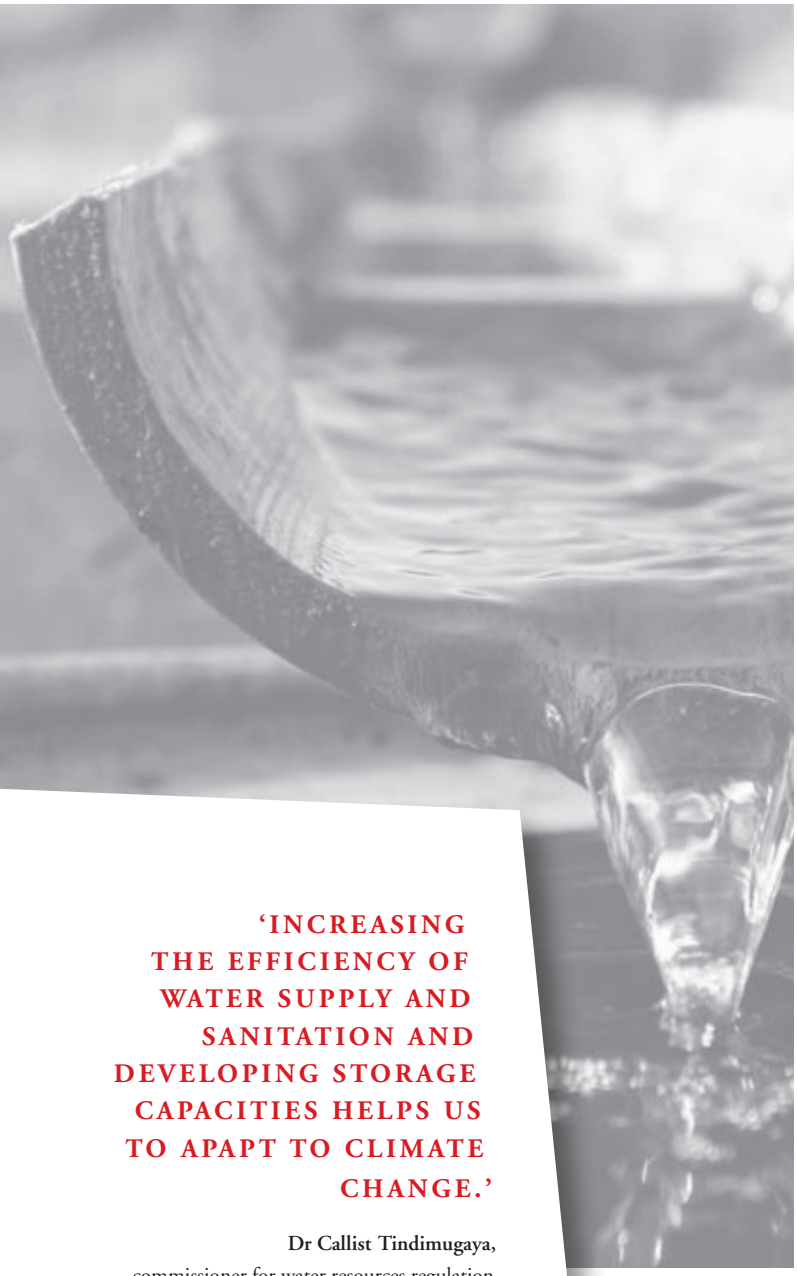
as Mozambique, where large parts of the country lack protective and supportive mechanisms,' explains Stiebens.

Thomas Loster, chairman of the Munich Re Foundation, notes the special quality of the joint project: 'The early warning system in Mozambique is simple and effective, and tailored precisely to the living conditions and capabilities of the people. Local people assume ownership of it over the medium to long term. That crucially determines its success.' As a result, local governments and, above all, the people living along the river understand and support the system. Since 2005, GIZ (then GTZ) has delivered training to teachers, disaster management officials, religious leaders and youth organisations in 60 endangered villages and districts, and has recruited volunteers for disaster risk management committees. The volunteers measure water levels regularly and report them to an analysis centre, which in turn relays information about precipitation and water levels to village communities by radio. If a flood alert is issued, designated individuals go out, raising blue, yellow or red warning flags and alerting people by megaphone. The committees then help the district authorities to organise evacuation and emergency supplies. In order to drill emergency procedures, especially for the flow of information, simulation exercises are conducted annually everywhere. This strategy proved its worth during the 2007 flooding on the Búzi, rendering external assistance unnecessary. As a result, the 'Búzi approach' is now considered a model strategy and is being applied to two further rivers in central Mozambique.

Yet the early warning system alone does not suffice to address the risk. While it can indeed greatly reduce the economic damage caused by floods, many families still have to cope with severe harvest losses once the waters recede. Micro-insurance could cover at least a part of the damage. That instrument is now being explored.

A further aspect calls for a response: declining and ever more variable rainfall, with long periods of drought. To boost adaptive capacity in this regard as well, GIZ is helping INGC set up demonstration and training centres in semi-arid and arid areas. It is hoped that these will establish water-efficient cultivation methods and drought-resistant crop varieties in Mozambique – further risk reduction measures. The first pilot projects are promising: subsistence farmers are bringing in larger harvests, some more than doubling their yields.

GOOD PRACTICES AND INNOVATION



'INCREASING THE EFFICIENCY OF WATER SUPPLY AND SANITATION AND DEVELOPING STORAGE CAPACITIES HELPS US TO APAPT TO CLIMATE CHANGE.'

Dr Callist Tindimugaya,
commissioner for water resources regulation at the Ugandan Ministry of Water and Environment

THE EXPERT'S VIEW

DR MARK SVENDSEN, Chairman, Working Group on Climate Change and Agricultural Water Management, International Commission on Irrigation and Drainage

Some of the most challenging and pervasive impacts of global climate change will be felt through its effects on water and agriculture. These impacts stem both from the direct effects of rising temperatures on the hydrologic cycle and from their effects in melting glaciers and snow caps and raising sea levels. This leads to reduced and more erratic rainfall in mid-latitude areas and reduced irrigation supplies and groundwater recharge in some key agricultural areas. Assuming a business-as-usual scenario with respect to greenhouse gas emissions, researchers expect global agricultural capacity to decline by 10 to 25 per cent by the 2080s, with damage disproportionately concentrated in developing countries.

One of the most important water-related changes affecting the human population will be the increased proportion of precipitation falling as rain rather than snow in the water towers of the world – the Himalayas, the Sierra Nevada, the Andes and the European Alps among others. This effect, coupled with diminished mountain storage of water as snow and ice, will cause important rivers of the world to have higher flows in the winter and spring than they do currently, and lower flows in the summer when their water is critically needed for irrigation and domestic use.

A second major effect will be the intensification of the hydrologic cycle. Although higher temperatures will allow the atmosphere to hold more moisture, leading to higher global

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rainfall, this increase in rainfall will be somewhat perversely distributed, with currently wet regions becoming wetter and dry regions dryer. Moreover, the intensification will yield increased occurrences of flooding and droughts.

Adaptive measures in water management and in the agricultural sector will most certainly be required. The challenge is to initiate these actions now, even though the most severe impacts may still be years away.

Some adaptation techniques would be good practice in sound development strategies even in the absence of climate change. These are 'no-regret' measures and should receive priority. Such measures include improving the knowledge base on water, improving water-use efficiency, strengthening resilience of agricultural systems, and strengthening planning and management skills. Efforts to raise awareness of climate-change-induced problems and potential solutions must accompany adaptation measures. Decision-makers must value and use new knowledge and planning and management tools if water services and agricultural products are to be sustainably provided.

Infrastructure investments must ultimately be a part of any adaptation approach related to water and agriculture some of which are also of the 'no-regrets' variety. Among these are investments in municipal wastewater treatment. Future water resource management strategies, particularly in arid regions, will accord priority to urban water use and the subsequent reuse of treated urban wastewater in agriculture. Making investments in water treatment now has distinct public health benefits in addition to creating a secure supply of water for peri-urban agriculture. Selected investments in groundwater recharge, off-stream storage, and shallow tubewell development for irrigation are also strategies for which there may be strong justification now.

'Soft innovations' will also be needed to prepare for climate change. A key adaptation investment in agriculture is research to develop heat- and drought-tolerant varieties of important cereals and legumes. A great deal of corporate research in these areas is already under way. This must, however, be complemented by publicly funded research through international agricultural research centres and national programmes if drought and heat-adapted varieties are to be available not only to large commercial farmers but also to poor smallholders. Another important research topic is low-cost drip irrigation technology.

The challenge for the future is to find and develop the appropriate mix of tested and new technologies, infrastructure investments, and better knowledge bases and new analytic tools with which to craft robust adaptation solutions. Both private and public sector actors, working at both national and local levels, must play a part in this. The ultimate aim is to have in place integrated holistic solutions to global-warming-induced problems that cut across water, agriculture, and forestry sectors to ensure water and food security for countries and communities.

METHODS

Adaptation measures in the sectors of water and agriculture are among the earliest actions countries take when faced with the risks of climate change.

German development cooperation advises its partner countries on the implementation of such measures. The purpose is not to reinvent the wheel. There are many ways in which water resource management and sustainable agriculture are already playing an important part in adaptation to climate change. However, existing best practices have to be combined with innovative approaches. These are in particular:

- Supporting cross-sectoral coordination between relevant ministries and institutions responsible for water resources, agriculture and forests
- Improving water efficiency – e.g. through water loss reduction programmes and demand management instruments
- Increasing local water availability and storage capacity especially in dry areas
- Applying integrated water resources management and integrating climate change aspects into mid- and long-term resource planning – e.g. in transboundary water management and land-use planning
- Enhancing the robustness of agricultural production systems
- Exploiting market opportunities – e.g. through improving market access or promotion of public-private partnerships
- Strengthening agricultural insurance schemes and financial services in rural areas
- Supporting applied agricultural research on climate change

RESULTS ON-SITE

WATER MANAGEMENT UGANDA

WORKING TOGETHER ACROSS SECTORS AND COUNTRIES

'Water shortage hits the country' is a headline that is appearing ever more frequently in the Ugandan news. In this part of Africa both droughts and floods are increasing and a fast-growing population is putting huge pressure on water supplies, especially in the cities.

Together with German development cooperation, the Ugandan Ministry of Water and Environment is responding to this issue. Since 2002 its programme 'Reform of the Urban Water and Sanitation Sector' has been working to improve urban water supply and bring adequate sanitation services to the population, above all to the urban poor. In 2009 a climate change adaptation component was added to the programme. 'Increasing the efficiency of water supply and sanitation and developing storage capacities helps us to adapt to climate change and target the main effects of it', explains Dr Callist Tindimugaya, commissioner for water resources regulation at the Ministry of Water and Environment.

One of the major tasks is to encourage cross-sectoral coordination since water, with its relevance to almost all activities, transmits the impacts of climate change to many other sectors including agriculture, energy and natural resources. An initial stakeholder analysis showed that 160 actors are in one way or another involved in climate change assignments in Uganda. Thanks to the analysis, these actors – who in the past would not have known of each other's work – can now collaborate and join forces.

Further activities involve improving water- and climate-related data and the ways in which it is analysed and prepared for decision-making in water resources management.

Looking at what neighbours are doing is also a useful exercise. Kenya, for example, has a more advanced meteorology department than Uganda and is willing to share its experiences and methods with Uganda's Department of Meteorology. GIZ has therefore organised an exchange between the two countries. According to Deus Bamanya of the Ugandan Department of Meteorology, 'efforts are being made to ensure that Uganda's Department of Meteorology is elevated to an authority, a more autonomous organisation that will deliver better and more efficient meteorological services'. However, GIZ's support is not limited to know-how exchange – it also promotes the acquisition of automatic weather stations that are invaluable for collecting data that can inform efforts to adapt to changing weather and climate conditions.

RESULTS ON-SITE
AGRICULTURE
LATIN AMERICA

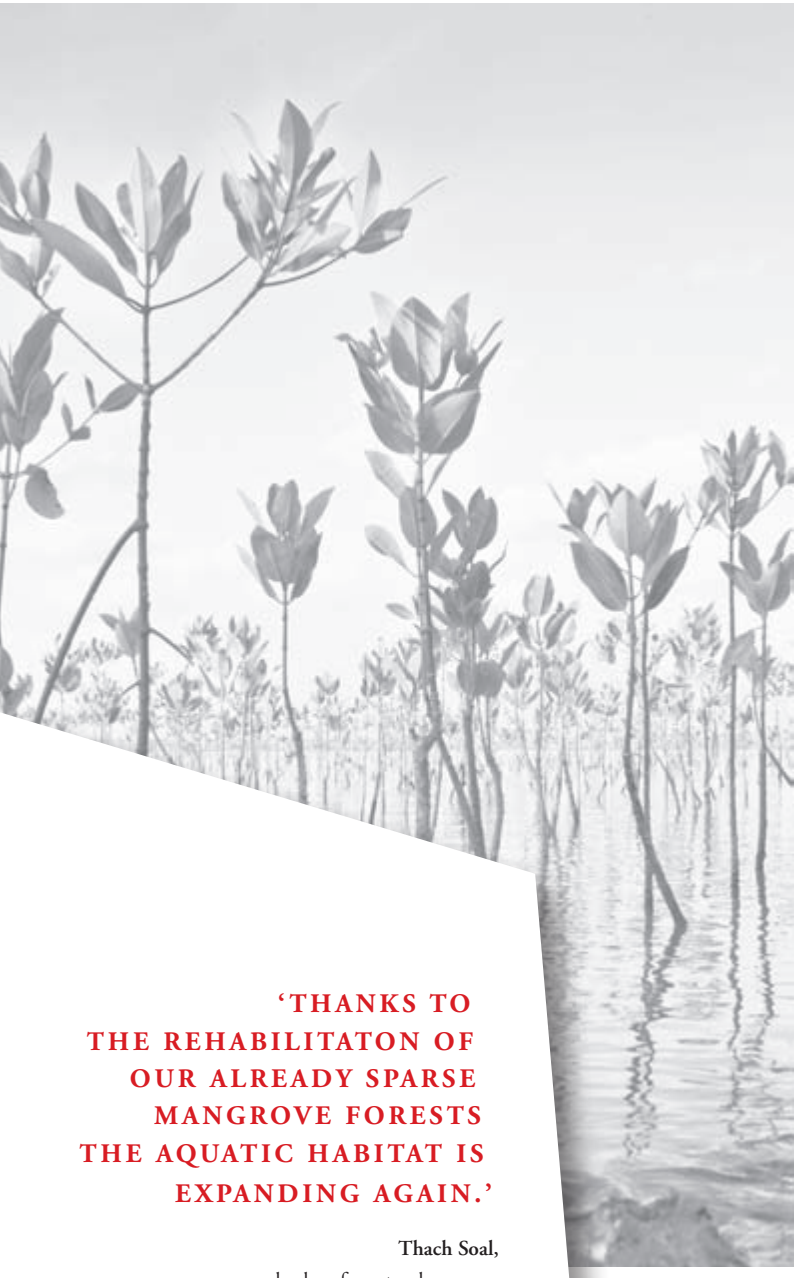
LINKING KNOW-HOW AND RESOURCES

Many coffee farmers in Peru, Nicaragua and Mexico now have good knowledge of how to cope with the risks and impacts of climate change – thanks to the public-private partnership 'Adaptation for Smallholders to Climate Change' (AdapCC). Lizana Yajahuanca Santos, a Peruvian coffee-grower, goes so far as to say: 'This project has not only advanced our own knowledge of how to adapt to climate change, but is going to serve the future of our children and our grandchildren yet to come.' AdapCC was a joint partnership between the UK's first and largest Fairtrade company, Cafédirect, and German development cooperation. The partnership used its financial, technical and human resources to work with coffee and tea smallholder organisations in four countries over a period of three years. As part of the partnership's activities, numerous Latin American farmers were trained in good practices for adaptation such as shade management, soil management and integrated pest management. These 'promoter' farmers then passed on their knowledge to other farmers in their organisations. In addition, the farmers were also trained to analyse the climate risks and vulnerabilities faced by their coffee-producing organisations.

In Peru, where coffee producer Lizana Yajahuanca Santos makes her living, 200 promoter farmers received training through AdapCC. Based on the knowledge shared by the promoters, 36 member cooperatives have since designed climate change action strategies. Another outcome of the project is that 1,000 Peruvian farmers now produce their own organic manure and have installed barriers to prevent soil erosion and landslides. In addition, a unique smallholder-owned carbon reforestation project has been initiated; it will produce and sell carbon credits, using ten per cent of its profits to fund further adaptation measures among coffee farmers.

Furthermore, Cafédirect and GIZ (then GTZ) have significantly broadened and strengthened the network of civil society organisations, public and private bodies and research institutions working on agriculture and climate change at different levels. They have also ensured that the results of AdapCC have found their way into regional policies, new projects and tools. 'All this helps us to safeguard the sustainability of the three-year investment and to take the philosophy of our project and our efforts further', says Wolfgang Weinmann, who was responsible for AdapCC at Cafédirect. He adds: 'As an outcome of our project many farmers and producer organisations are able to take action and responsibility for their own future today.'

USING LINKS AND SYNERGIES



'THANKS TO THE REHABILITATON OF OUR ALREADY SPARSE MANGROVE FORESTS THE AQUATIC HABITAT IS EXPANDING AGAIN.'

Thach Soal,
leader of a natural resource user group in Viet Nam

THE EXPERT'S VIEW

JAIME WEBBE, Programme Officer,
Secretariat of the United Nations Convention on Biological Diversity

Biodiversity is the variety of life, and includes genetic diversity, diversity among species and diversity among ecosystems. At all levels, biodiversity is connected to climate change adaptation. Addressing the links between biodiversity and climate change adaptation and using synergies is critical if we are to achieve sustainable development and meet the objectives of the Rio Conventions. For people in developing countries, in particular, biological diversity and ecosystem services are a question not only of future adaptability but a key contribution to livelihoods.

At the genetic level, biodiversity provides key building blocks for addressing the impacts of climate change. Wild relatives of crops and tree species may have traits and characteristics such as pest resistance or drought tolerance that will become critical components of new varieties that are better adapted to changing climatic conditions.

At the species level, biodiversity is both affected by climate change and able to support adaptation. It is projected that every rise in temperature of 1°C will put an additional ten per cent of species at increased risk of extinction. Furthermore, each degree of warming could yield an upward non-linear increase in bird extinctions of about 100-500 species.

As with individual species, entire ecosystems are being threatened by climate change. The direct effects of elevated atmo-

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spheric CO_2 are, for example, influencing marine ecosystems, where increased ocean acidification is adversely affecting the health of many species, especially shellfish. Sea-level rise is having adverse impacts on coastal ecosystems, especially mangroves and other wetlands.

Intact ecosystems play an important role in climate change adaptation. Using the ecosystem services provided by healthy ecosystems can be an efficient and cost-effective approach to climate change adaptation. This is particularly the case in developing countries. In small island developing states, for example, the combination of significant dependence on nature-based tourism and the major contribution of fisheries to food security exacerbates vulnerability.

Linking biodiversity and climate change therefore requires two main responses: adaptation for biodiversity and biodiversity for adaptation. The first response involves ensuring that biodiversity is able to adapt to the adverse impacts of climate change; the second involves mainstreaming biodiversity into broader adaptation approaches in order to help people, infrastructure and economies adapt.

Helping biodiversity to adapt to climate change has implications not just for species and ecosystems but for lives and livelihoods as well. For example, in Fiji coral reef degradation attributable to climate change is expected to cost between USD 5 million and USD 14 million per year by 2050. The lost value for protected areas associated with the projected impacts of climate change in Africa is estimated at USD 74.5 million by 2100.

Steps that can be taken to maximise the natural adaptive capacity of biodiversity include: reducing other threats such as those arising from habitat change, overuse, pollution and invasive alien species, maintaining connectivity of ecosystems to facilitate migration and building an adequate knowledge base on status and trends.

In cases in which natural adaptive capacity will be exceeded, such as for vulnerable species or ecosystems, other options may be considered including assisted migration and ex-situ conservation. However, it should be noted that such options tend to be more expensive, can present risks for other species and may require a shift in conservation thinking on issues such as invasive alien species.

With regard to the second response – biodiversity for adaptation – there is growing interest in ecosystem-based approaches which integrate the use of biodiversity and ecosystem services into an overall adaptation strategy. For example, restoring degraded wetlands and protecting existing ones can enhance coastal protection, reducing vulnerability to sea-level rise and storm surges. The same actions can improve income from fisheries and tourism, provide raw materials for construction and maintain cultural value. Such ecosystem-based approaches to adaptation are particularly effective when combined with sector-specific approaches. In the wetland scenario, for example, combining the protection and restoration of wetlands with investments in food production – such as small-scale fish ponds or support for agroforestry – can help meet urgent adaptation, food security and development needs of developing countries. Implementing ecosystem-based approaches to adaptation requires identifying ecosystem services, understanding the risks and vulnerabilities associated with climate change and involving relevant stakeholders in the conservation and sustainable use of biodiversity.

METHODS

Through climate change the risks to biodiversity and ecosystems have acquired a new dimension. 'Classical' projects aimed at the conservation and sustainable use of biological diversity are already playing an important part in reducing vulnerabilities, especially for rural populations, who are particularly dependent on natural resources. Increasingly, though, German development cooperation is also initiating measures that target the interface between biodiversity conservation and climate protection. Biodiversity conservation in this context usually contributes not only to adaptation to climate change but also to greenhouse gas mitigation. This is achieved by creating and maintaining carbon sinks, e. g. by conserving forests and putting anti-erosion measures in place. The main focus of GIZ's advisory work is on the following issues:

- Reducing causes of biodiversity loss that are not attributable to climate change – e.g. pollution, land conversion and desertification

- Conservation and sustainable protection of biological diversity – e.g. by networking protected areas

- Conservation of intact ecosystems and their services to enable people to adapt to climate change and mitigate its consequences – e.g. coastal protection through conservation of mangrove forests and promotion of agrobiodiversity to increase the resilience of agricultural production systems

- Conducting analyses and providing tools to support decision-making – e.g. economic assessments of ecosystem services, ecosystem vulnerability analyses or climate proofing approaches for natural resource management

RESULTS ON-SITE
VIET NAM

MEDIATING BETWEEN ECONOMIC AND ECOLOGICAL NEEDS

The Mekong Delta is important as the 'rice bowl' for the whole of Viet Nam – and as a shrimp producer for the rest of the world. But the services of aquaculture are bought at a high price. In many areas the mangrove belt that protects the coastline from erosion, storms and flooding has already been eradicated, disappearing in the face of the continuous encroachment of shrimp and fish farms and the unclear responsibilities of local authorities. One of these areas is the coastal zone of the Soc Trang Province where the sea is pushing further and further inland and erosion is spreading by up to 40 metres per year.

As a result the costs of maintaining sea dykes have increased significantly while sources of income for local communities whose livelihood depends on coastal fisheries and low-lying agricultural lands are decreasing. For them each hectare of mangroves destroyed represents about one tonne less in the fishing nets each year.

The project 'Management of Natural Resources in the Coastal Zone of the Soc Trang Province', launched by GIZ (then GTZ) in March 2007, aims to pilot means of resolving the conflict between economic development and sustainable management of natural resources. Based on analysis of past experience of mangrove planting and historical changes in mangrove cover and coastline, an integrated and site-specific approach to adaptation to climate change has been put in place. It focuses on mangrove planting and rehabilitation with an emphasis on resilience to climate change. An important aspect is the partic-

ipatory involvement of local communities in mangrove management and protection through co-management. An erosion control model has also been developed. This combines dyke design, wave-breaking barriers and mangrove rehabilitation.

This project demonstrates that mangrove rehabilitation does not simply mean 'more of the same'. The project seeks, for example, to convert even-aged mangrove plantations into forests that are more diverse in terms of structure and species composition. This leads not only to increased resilience to climate change but also to greater biodiversity. 'We are testing new and innovative approaches since not all approaches used in the past have proved successful. In this way we try to keep abreast of the changes and uncertainties that come with climate change', explains Klaus Schmitt, the project's chief technical advisor. One approach is to mimic nature by imitating the successful regeneration of natural mangrove forests.

However, planting without protecting the seedlings would meet with limited success, since the use of trawling nets in regeneration areas would destroy the mangrove seedlings. In addition, mangroves must be protected from logging and other destructive forms of resource use. That is why the project is introducing mangrove co-management schemes that involve both local resource user groups and local authorities. Co-management agreements regulate access and exploitation rights in different zones within the mangrove belt and constitute another key to protection and greater biodiversity. Thach Soal is the leader of a resource user group and attests: 'Thanks to the rehabilitation of our already sparse mangrove forests the aquatic habitat is expanding again. As a result our mussel and crab harvests and thus our incomes are improving.'

The project's way of 'doing things differently' is also acknowledged by other donors. 'The development of practical solutions for responding to the impacts of climate change is crucial for the Mekong Delta, and GIZ's pilot project has yielded good success over its first two years. That's why we decided to support the programme', says Mark Palu, an advisor with Australia's Overseas Aid Program (AusAID) in Viet Nam.

TRACKING EFFECTIVENESS

THE EXPERT'S VIEW

ILONA PORSCHÉ, Senior Technical Advisor, 'Climate Change Adaptation in Rural Areas of India' Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

HEATHER McGRAY, Head of 'Vulnerability and Adaptation' Project, World Resources Institute

'FOR MONITORING ADAPTIVE CAPACITY DEVELOPMENT, IT IS IMPORTANT TO BE CLEAR WHICH CAPACITIES ARE KEY FOR ADAPTATION IN A GIVEN CONTEXT.'

Heather McGray, World Resources Institute
Ilona Porsché, Deutsche Gesellschaft für Internationale Zusammenarbeit, India

Monitoring and evaluation (M&E) plays a central role in capturing whether and how interventions lead to the successful achievement of their objectives. This is of particular importance in the relatively new field of adaptation to climate change, where interventions are still in a phase of being defined and tested. Showing which adaptation interventions lead to desired results is also important to secure funding, since financial resources are being made available specifically for adaptation measures and funders want proof as to how these enable adaptation.

A key role for M&E of adaptation can be framed as tracking the 'adaptation difference,' i.e. what is done additionally or differently to reduce climate change risks, or build capacities to adapt? This is challenging, particularly because there is growing interest in treating adaptation as part-and-parcel of development – integrating it into development initiatives to assure that they achieve their goals even as the climate changes.

It can be useful to think of the distinctions among M&E needs and approaches for three different areas of adaptation:

Monitoring and evaluating adaptive capacity: Adaptive capacity is generally understood to be a system's ability to adjust to climate change, moderate potential damage, take advantage

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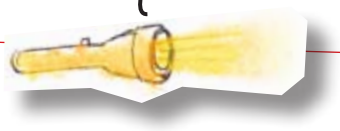


of opportunities or deal with consequences. In the development context, key elements of adaptive capacity include: access to information on climate variability and change; skills to make use of the information; institutions with the ability to facilitate and manage for adaptation; and equitably distributed economic resources.

For monitoring adaptive capacity development, it is important to be clear *which* capacities are key for adaptation in a given context. Once the critical capacities which enable people to take adaptive actions have been identified, established monitoring techniques of capacity assessment can be used. In addition, it is necessary to regularly and systematically evaluate whether the identified capacities are actually the right ones to leverage the changes necessary to deal with climate change.

Monitoring and evaluating the implementation of adaptive actions: Adaptive capacity provides a basis for concrete interventions to address identified climate risks. These 'adaptive actions' might include measures to increase water storage capacity in areas with extended dry periods, or measures to protect biodiversity to increase an ecosystem's climate resilience. Information on climate variability and change, and on vulnerabilities of the target group or system, provides the basis to identify and select appropriate adaptation actions.

A goal of M&E is to determine whether the identified factors, such as an increase in biodiversity or increased water storage capacity, are indeed resulting in greater resilience or sufficient water availability. In the latter example it could be, for instance, that increasing storage capacity is not addressing risks adequately if it becomes apparent that precipitation is declining in real terms and not only changing in temporal distribution. Here it could then become necessary to broaden the approach to addressing the climate risk of reduced water availability, for example through market mechanisms that create a demand for less water intensive agricultural produce.

Monitoring and evaluating achievement of development results: The ultimate indication of successful adaptation is the achievement of development goals under a changing climate. This will only become apparent in the longer term, usually after the completion of a development intervention that includes adaptation actions and enables adaptive capacity to sustain the positive results of those actions. Here the 'attribution gap' is quite large, since the achievement of a development goal can generally not be ascribed to any one intervention with a great degree of certainty. Nevertheless, effective M&E for adaptation interventions can track the interim results for target groups (e.g. stabilising income of particularly vulnerable communities). This can serve as a basis to understand the degree to which climate pressures have affected the achievement and sustainability of development goals over time.

Growing climatic variability and the many uncertainties associated with climate change mean that there are limits to planning. The assumptions, conditions and expectations at the start of an intervention are now even more unlikely to remain true for its duration or beyond. M&E can provide feedback loops to assist us to be flexible, respond rapidly and adjust appropriately to varied climatic changes, applying principles of adaptive management. All this is critical for sustainable development – and even more so now that the climate is changing.

METHODS

In light of the Aid Effectiveness Agenda, sound M&E has become a must for development cooperation, which uses a range of differentiated tools to monitor and evaluate its work. German development cooperation places strong emphasis on M&E of adaptation activities, and invests in the development of new methods and capacity building in order to address the challenges of M&E for adaptation. Furthermore, it actively engages in exchanges with international communities of practice on these issues and cooperates with renowned institutions like the World Resources Institute.

German development cooperation assists its partner countries in various M&E activities in adaptation. GIZ's main activity areas are:

- Developing and implementing information and knowledge management systems
- Building up environmental statistics and observation
- Developing vulnerability assessments as a basis for planning adaptation and to provide information for M&E baselines against which achievements can be monitored
- Setting up M&E systems for adaptation interventions, especially at strategic and organisational levels – e.g. M&E for regional and national adaptation strategies or M&E approaches for organisations that need to evaluate their services
- Evaluating the effects of risk reduction strategies and adaptation techniques

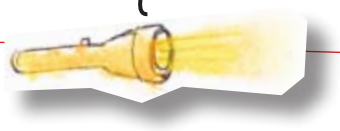
RESULTS ON-SITE
INDIA

ACTIVE LEARNING FOR ADAPTATION

Due to its extremely diverse ecosystems and agro-climatic zones, high population density and poverty levels, India's climate change challenges are manifold. The project 'Climate Change Adaptation in Rural Areas of India' (CCA RAI), launched in 2010, is being implemented by the Government of India and German development cooperation at different scales, from piloting adaptation measures on the ground to supporting policy frameworks at state and national levels.

CCA RAI is the first bilateral project dedicated purely to adaptation to climate change in India. Dr S. Satapathy, Director of the Climate Change Division at the Ministry of Environment and Forests, who manages the project on behalf of the Government of India, explains: 'Communities have been continuously adapting to climate variability. However, planned adaptation to climate change is a relatively new field of work for all of us. As adaptation research is still at an initial stage, we need to test different approaches both in the field and at the policy level to assess what the best approaches to build the resilience of the rural people are.'

Project components of CCA RAI contribute to both building adaptive capacities and supporting adaptive actions. During operational planning, results chains with indicators were developed outlining the logic of how project compo-



nents contribute and interact towards the project goal of 'enhancing the resilience of the rural poor to live with climate variability and change'.

Adaptive capacity: The CCA RAI's components supporting State Action Plans on Climate Change, vulnerability assessment, climate-proofing government-sponsored schemes, and information and knowledge management, relate mostly to building adaptive capacities. Monitoring will focus on how and to what extent capacities relevant for adaptation are strengthened through project activities.

Adaptive actions: The project component that is piloting adaptation measures places a strong emphasis on learning how to technically reduce the risks resulting from climate change in an efficient and effective manner. An 'adaptation hypothesis' is developed for each pilot project which explains how the analysis of climate risks leads to the proposed intervention. The Sundarbans estuary in West Bengal, for example, faces increasingly more frequent and intense storms and heavy rains as well as sea-level rise. A lack of sediment deposition on inhabited islands, coupled with increasing salinisation of soils and overuse of the little existing ground water, increases the risk of severe flooding damage and freshwater shortages. Technical pilot measures of CCA RAI are planned to test possibilities of controlled flooding, freshwater storage, and salt-tolerant crop varieties. 'Monitoring these activities will involve measuring sediment deposition rates, increased availability of freshwater through project activities, and yield improvements on saline soils', says Debal Ray, Chief Environment Officer of the Department of Environment and Forests in West Bengal. 'In the longer term we need to evaluate whether controlled flooding could become a measure to counteract the 'sinking' of inhabited islands. We also have to evaluate to what extent new storage facilities and tolerant crop varieties can help local people deal with the more extreme weather events and changing soil conditions.'

The M&E system of CCA RAI will be used for active learning about adaptation, techniques and processes, as well as for tracking the effectiveness of the project itself.

DOING THINGS **NOW**

BECAUSE OF CLIMATE CHANGE

EXPERIENCES FROM A PROGRAMME IN THE PACIFIC

DR HERMANN FICKINGER, Director of the International Climate Initiative Programme Office, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

'I FEAR THAT OUR CHILDREN AND GRANDCHILDREN WILL LOOK BACK AND ASK: HOW IS IT THAT THEY KNEW WHAT THEY KNEW, AND YET DID SO LITTLE?'

Anote Tong,
President of the Republic of Kiribati in the Pacific, referring to climate change in his address to the General Assembly of the United Nations in September 2009

Climate change is already a widely observable reality in the Pacific – as in many other island contexts. The presidents and prime ministers of all the Pacific Island states have put it high on their political agenda at home and internationally. They are aware that climate change threatens current and future development achievements in vital sectors of their economies and communities. That is why they are using every opportunity to call for the developed world to take action to reduce its emissions.

Adaptation is essential for the Pacific Island countries, which together emit only 0.03 per cent of global greenhouse gases. Without adaptation, existing problems such as water scarcity, drought, poverty and food insecurity will be exacerbated. Development plans that promote increased food production or the expansion of tourism in coastal zones will fail if appropriate adaptation measures are not in place to reduce vulnerability to climate change.

The German-Pacific Regional Programme 'Coping with Climate Change in the Pacific Island Region' (CCCPIR) takes up these challenges. It is assisting 12 Pacific Island countries in

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developing national adaptation strategies. Stakeholders from ministries, civil society, research organisations and the private sector meet regularly to identify vulnerabilities to climate change impacts. They discuss strategic adaptation options and develop concrete action plans. This process brings together different sectors and their activities in a coherent framework which forms the basis for strategic political decisions and concrete actions on the ground.

While national adaptation strategies provide the underlying framework, integrating climate change into sector policies and plans is another focus of the CCCPIR Programme. From July to December 2009 it assisted the Republic of Tonga to integrate climate change into its forest policy. In July 2009 the newly drafted forest policy, which was about to be endorsed by the Tongan cabinet, was put on hold so that missing climate change aspects could be incorporated. In several consultative cycles, CCCPIR supported stakeholders in Tonga in feeding in new ideas, provisions and paragraphs related to climate change. When the policy was finally endorsed by the Tongan cabinet in December 2009, more than 30 significant changes had been made. For example, felling mangrove forests is now prohibited, whereas tree planting and agroforestry through public and private initiatives is encouraged as an appropriate measure to enhance resilience to climate change and improve food security.

But how is the policy translated into action? A pilot project on the island of Eua in the Tongan archipelago demonstrates how this can be achieved. About 500 people live on the island, whose 85 square kilometres are covered mainly with forests (23%) and grassland associated with coconuts (74%). The inhabitants want to preserve and increase their forests, establish sustainable agroforestry systems and ensure long-term water supply. These challenges are not new and are familiar to the people of Eua. But as a result of intensive training and awareness activities they now know that climate change is likely to aggravate their situation very quickly if they do not act immediately. Management of the remaining natural rainforests will therefore be based on the new forest policy. Land-use plans are being developed that will require all aspects of current and future land use to be reviewed in terms of their resilience to climate change or their contribution to greenhouse gas emissions. The Secretariat of the Pacific Community is also ready to provide appropriate varieties of agricultural crops that are drought-resistant and saltwater-tolerant. The CCCPIR Programme is a catalyst for all these activities. It provides technical expertise and equipment, holds training workshops and produces information material for both the people of Eua and the decision-makers in the capital Nuku'alofa.

It is exactly this kind of action that Antoine Malsungai, senior journalist and news editor at Radio Vanuatu and Television Blong Vanuatu, highlighted in an article in the Toktok journal of the Pacific Media Centre in 2009: 'Learning to live with climate change will require multiple new skills. It will require greater awareness of the impacts of climate change and its causes. It will also be necessary for the communities to change certain practices that are harmful to the resilience of the islands and communities. Practices such as sand mining and cutting down of mangroves can have detrimental impacts on the ability of coasts to withstand storm surges, for example.' Antoine Malsungai is one of 25 journalists from all over the Pacific who were trained during the media summit of the Pacific Island News Association in 2009 to increase their understanding of what climate change is, what it means for the Pacific and how information on climate change can be conveyed to the audience. There is now also a weekly radio programme on climate change that reaches an average of 90,000 people across Vanuatu and is one of the few means of reaching people in the remote islands of the 80-island archipelago.

Appropriate responses to the threat of climate change will certainly vary from country to country and depend on the specific vulnerabilities of particular exposure units. Yet it is important to bear in mind that coping with the impacts of climate change does not always require new and innovative approaches. In many cases traditional knowledge and established practices can contribute a great deal to solutions. For the communities and nations in the Pacific the time factor plays a major role in responding appropriately to climate change. Anote Tong, President of the Republic of Kiribati, put it thus in his appeal to world leaders at the General Assembly of the UN in September 2008: 'While climate change may be a matter of economics for some of you, for us it's not economics: it's a matter of survival.'

Published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH,
Climate Protection Programme

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Design
Additiv. Visuelle Kommunikation, Berlin

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Photo credits
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*) Fotolia.com

Production
Annette Lutz

Printed by
Rhein-Main Geschäftsdrucke, Hofheim-Wallau

This publication is printed on paper and cardboard certified according to FSC standards.

Eschborn, May 2011

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Internationale Zusammenarbeit (GIZ) GmbH

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