COMMUNITY ANSWERS TO CLIMATE CHAOS: GETTING CLIMATE JUSTICE FROM THE UNFCCC

POVERTY

A Christian Aid report
September 2009

christian aid

Poverty is an outrage against humanity. It robs people of dignity, freedom and hope, of power over their own lives.

Christian Aid has a vision – an end to poverty – and we believe that vision can become a reality. We urge you to join us.

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Children play in fields at the end of another failed crop season in the drought-prone village of Miambani, east Kenya. It hasn't rained here for more than four years, and for local families climate change is a devastating reality

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EXECUTIVE SUMMARY

In December 2009 in Copenhagen, Denmark, world leaders must agree a global response to climate change that will shield the world, its economy and, above all, its people from the threat of climate chaos. Decisions made at the meeting – known as the Conference of the Parties 15 (COP 15) – will then be further developed until 2012, when the Copenhagen Agreement will come into force.

A bad deal risks making potentially catastrophic climate change irreversible, and poverty permanent. Christian Aid wants poverty to be over, once and for all. Not only should all people have decent incomes and access to sufficient food, shelter, health and education, but they should also be able to protect themselves from severe weather events and dramatic climatic fluctuations, and have a degree of political power over their own destinies. A good Copenhagen deal can go a long way to addressing each of these – but much of what is being discussed falls far short.

Christian Aid has written this report to demonstrate that poor communities in the developing world are not just the victims of climate change, but can be a significant part of the international solution. They can deliver low-carbon developments that bring people out of poverty. Community action can build the resilience and stability of countries and their economies in response to ongoing changes in the climate. Through local sustainable development, working to improve and conserve the natural environment they live in, communities can improve food security and the livelihoods of millions of vulnerable people.

Many communities – including those described in this report – are already taking action on climate change. But they need support to scale up this action to make it work for many more people. They need to become a central part of the international action agreed at Copenhagen, and not an afterthought.

Christian Aid argues that communities can and must be part of the global response to climate change.

In this report Christian Aid argues that these communities can and must be part of the global response to climate change. However, they need support to engage with decision-makers and to scale up community-based action. If community-based action and participation is built into the early design and implementation of the post-2012 climate change mechanisms, then long-term sustainable solutions to climate change will be delivered through community action.

This report is split into three chapters. Chapter 1 justifies the central arguments of this report that, as a matter of justice, communities and civil society must be included at all levels of decision-making on climate change. Also, as a matter of practice, the mechanisms under development for the post-2012 climate change regime should be set up to support community-based responses.

A number of new mechanisms are being developed to deliver finance and technology transfer for mitigation and adaptation in developing countries. If not considered at an early stage, these mechanisms could bypass the poorest and most vulnerable communities of the world – as many current responses to climate change have already done.

With the political will to engage communities and deliver community responses to climate change, significant steps can be taken to achieve long-term sustainable action, climate change resilience and poverty reduction in developing countries.

Chapter 2 of this report presents policy recommendations showing how communities and other local-level actors – including local authorities and local private sectors – can be actively engaged in decision-making at the United Nations Framework Convention on Climate Change (UNFCCC) and in national-level planning, and be active partners in delivering local solutions to climate change.

There are two principal approaches that Christian Aid believes will radically change the way in which the UNFCCC mechanisms work, and will deliver responses to climate change that have poor people and vulnerable communities at their heart. Christian Aid proposes:

- a sustainable development innovation facility (SDIF). This will deliver ten per cent of the national climate change finance directly to support local-level actions through civil society, community-based organisations (CBOs), local private sector and municipal administrations
- enhancement of civil society to engage in planning for climate change responses at local, national and international levels. This requires high-quality participation of community actors at all levels of decision-making.

This report gives examples of civil society and community groups who are ready and able to participate in decision-making at the UNFCCC level. We demonstrate that community actors are able to feed into national planning through a national climate change multi-stakeholder board. The case studies give clear examples of programmes which, with a facility such as the SDIF, could demonstrate and scale up local sustainable projects to enhance national climate resilience. A critical part of the success of community-based responses is that they are integrated into wider development strategies for disaster response and poverty reduction.

Chapter 3 presents ten case studies from Christian Aid's work on climate change internationally. With local partners, Christian Aid has demonstrated that community-based solutions can work, achieving sustainable development and providing long-term solutions for local and national resilience to climate change.

Case studies include: sustainable development of biofuels to deliver off-grid electricity in Mali and India; farmers' responses to drought across Africa; forest communities being part of the effort to halt deforestation in the Brazilian Amazon; and communities working with scientists to develop rapid responses to climate-related floods in the Philippines and Central America. As a body these case studies demonstrate that there are many and diverse community answers to climate chaos.

Recommendations for Copenhagen

For a successful outcome, the negotiators must demand that the Copenhagen Agreement delivers climate justice for all countries and for all people. This means considering participation of community-based stakeholders as an integral part of the Copenhagen Agreement, and not as an afterthought or a secondary priority.

Recommendations to UNFCCC negotiators

Negotiators from countries at all income levels should strive to ensure that:

- any agreement includes a clear commitment to an SDIF, delivering ten per cent of national climate change finance directly to support local-level actions through civil society, CBOs, local private sectors and municipal administrations
- the agreement also includes a robust mechanism, with the full involvement of civil society, to ensure the SDIF is effective, accountable and adhered to
- civil society is firmly included in the formulation of national negotiation positions.

Recommendations to civil society

Civil society in countries at all income levels should aim to use the short window before Copenhagen, in addition to demanding an effective and ambitious deal,[1] to ensure that their national negotiators hear and then reflect the above recommendations within the UNFCCC process.

THE UNFCCC AT A CRITICAL MOMENT

Christian Aid/Emma Boyd

Discarded placards at the end of the Climate Change Day of Action in Coventry on 19 March 2009

Most of the world's 2.7 billion poor people depend on natural resources (water, forests, seas, soil, biodiversity, and so on) for survival and economic development.

In December 2009 in Copenhagen, Denmark, world leaders must agree a global response to climate change that will shield the world, its economy and, above all, its people from the threat of climate chaos. Decisions made at the meeting – known as the Conference of the Parties 15 (COP 15) – will then be further developed until 2012, when the Copenhagen Agreement will come into force.

A bad global agreement risks making climate change irreversible and poverty permanent. A good agreement must be effective to deal with the scale of the global threat. But it must also be fair. This means ensuring that the effort of responding to the climate challenge is borne by those most responsible and capable of dealing with it. In addition, those who benefit from action on climate change should include those people who are least responsible, but already bearing the impact of the changing climate.

The urgency of these decisions cannot be underestimated, as climate science is telling us that climate change is moving at an even more urgent rate than anticipated by the fourth review of the Intergovernmental Panel on Climate Change (IPCC).[2]

NASA scientist Jim Hansen argues that 350 parts per million of carbon dioxide in the atmosphere is the highest level we can maintain 'if humanity wishes to preserve a planet similar to that on which civilisation developed and to which life on Earth is adapted'. However, emissions – currently at about 387 parts per million – have already passed that mark and are growing by about two parts annually. Global warming suddenly feels less like a huge problem, and more like an emergency.[3]

The world's poorest and most vulnerable societies are increasingly being hit hardest by climate change, but lack the resources and capacity to respond quickly.[4] They are located within the world's most vulnerable and climatically variable zones.[5] Most of the world's 2.7 billion poor people depend on natural resources (water, forests, seas, soil, biodiversity, and so on) for survival and economic development; but the environment and the world's natural resources are already substantially degraded and increasingly being affected by changes in the climate.[6]

At the same time as we face a climate change crisis, the world is facing a crisis of poverty in the developing world and a financial crisis across the globe. These three must not be viewed as separate issues, but as closely linked in our globalised world. There must be a common solution that saves the lives, livelihoods and dignity of people while safeguarding the natural resources and environment in which we live.

Similarly, if poor countries and their populations are to sign up to a new global effort to tackle climate change they will look for it to be demonstrably fair. Poor countries have been told too often that signing up to a new international agreement will be in their interest, only for the promised benefits to fail to appear.

Now we face an unprecedented global emergency – which requires an unprecedented global transformation of our energy, transport and agriculture, as well as of the way in which we deal with our forests and seas. The widest possible engagement and ownership of people all around the world will be required to maximise the chances of this transformation taking place.

So this is a critical moment for world leaders. Time is running out to turn from climate and economic disaster to global success. While the costs of responding to climate change may seem high, the benefits most certainly are. If we respond urgently and with the common goal of restoring balance to the planet and its people, then the result will be a much stronger and more stable world – and one in which poverty need not be permanent.

FROM VICTIMS TO SOLUTIONS

Poor people are often thought of as only the victims of climate change. It is true that, according to the United Nations Human Development Report (2008):[7]

'By 2020, between 75 million and 250 million more people in sub-Saharan Africa could have their livelihoods and human development prospects compromised by a combination of drought, rising temperature and increased water stress.'

and that globally:

'By 2080, the number of additional people at risk of hunger [due to climate change] could reach 600 million.'

Developing countries – and particularly the poorest and most vulnerable people within these countries – are already and will continue to be hit hardest by climate change. The list of threats to developing countries seems insurmountable.

However, those threatened – whether by drought in the case of Burkina Faso, floods in the Philippines or hurricanes in Central America – must be allowed to secure their lives and livelihoods, and bring themselves out of poverty. Crucially, their aspirations for development must also be safeguarded, not undermined, by any new climate agreement.

Climate change is fundamentally an issue of human rights and environmental, social and economic justice. With rising temperatures, human lives and livelihoods are affected by compromised health, damaged property, degradation of natural resources (including farm land), and social and cultural disruptions. Poor and marginalised communities are the first to experience the negative impacts of climate change. Not only do they bear disproportionate burdens from climate change itself, but also from ill-designed policies to prevent climate change.

Top-down approaches have been shown to fail to deliver answers for the world's poorest people. Some of the initial responses to climate change have been reactive, and in some cases detrimental to the wider environment and the world's poorest people. For example:

- the increased use of fertiliser and pesticides on affected farm land have implications for human health and water quality
- large-scale dams for irrigation and hydro power have displaced populations and submerged sensitive ecosystems

Christian Aid/Kevin Leighton

March 2009. Building demi-lunes on a farm in Burkina Faso. Here there is rain only three months of the year and climate change is making the weather even more extreme. Demi-lunes help to keep precious water and soil around crops

- costly coastal protection systems have impacted on natural systems; they also use significant amounts of concrete, which requires considerable burning of fossil fuel to produce
- palm oil plantations for biofuels have taken over forest and peat land, a process which itself releases carbon dioxide into the atmosphere
- reforestation projects have used intensive monoculture methods and displaced valuable natural ecosystems.[8]

This has two implications for poor communities. First, such costly means of climate change response are not available to low-income households and, second, poor people are often excluded from ownership and access, yet bear the worst of the negative impacts, such as low water quality, degraded land or displacement.

This report explains why developing countries, and particularly the poorest and most vulnerable people, must not be left behind. They can and must be a significant part of the climate change solution.

CLIMATE JUSTICE

'Developed countries are historically responsible for threatening the planet with climate change and owe the world an ecological debt.'
Republic of Bolivia[9]

The UNFCCC upholds the principles of equity, responsibility and capability. From the beginning, the UNFCCC takes into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty as an overriding right. UNFCCC Article 3.1 states:

'The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.'[10]

At this critical moment for decision-making on climate change, the UNFCCC and the nations of the world have the opportunity to ensure that the mechanisms for delivering climate change actions are fair and just for all the people of the world. If they take this opportunity, they will be able to find a far-reaching solution to global climate change that allows all countries to prosper. If not, then the growing distrust between developing and developed countries will widen, alongside the gap in economic justice that the world has seen from unjust trade rules and global debt.

Climate debt[11]

'Any just approach to climate change must ensure that those who have benefited in the course of causing climate change compensate the victims of climate change.'
Third World Network, 2009

A wealthy minority of the world's countries and corporations are the principal cause of climate change; its adverse effects fall first and foremost on the majority that is poor. This basic and undeniable truth forms the foundation of the global climate justice movement.

Climate change threatens the balance of life on Earth and with it human communities everywhere. Addressing climate change requires urgent actions by all peoples, rich and poor, and all countries, developed and developing.

But to be effective our response to climate change must also be fair. Poor countries and communities are unlikely to sit by while a wealthy minority continues to consume an excessive proportion of the Earth's limited environmental space. Nor are they likely to ignore the wealthy's historical responsibility for the causes and consequences of climate change. Nor should they.

Responsibilities of the rich

Atmospheric concentrations of GHG are higher today than [at] any time in millennia. Emitted since the industrial revolution, they have built up in the atmosphere, blanketing the Earth and causing considerable warming. Responsibility for these emissions lies principally with the developed countries. With less than one-quarter of the world's population, they have grown wealthy while emitting more than two-thirds of all historic GHG emissions into an atmosphere they share with all life on Earth.

Problems of the poor

The excessive emissions of the wealthy have destabilised the climate, harming the poor and threatening our future. Already, climate change is causing the oceans to rise and acidify; melting ice caps, glaciers and permafrost; damaging forests, coral reefs and other ecosystems; and intensifying fires, floods, droughts and other extreme weather events. It is increasing water stress, hindering the production of food, altering disease vectors and threatening the infrastructure and resources that are the life-blood of millions of people. Poor countries and communities that have done least to cause climate change suffer first and worst from its adverse effects.

The concept of climate debt

For their disproportionate contribution to the causes of climate change and its adverse effects, developed countries owe a two-fold climate debt. For over-using and substantially diminishing the Earth's capacity to absorb greenhouse gases – denying it to the developing countries that most need it in the course of their development – the developed countries have run up an 'emissions debt' to developing countries. For the adverse effects of these excessive emissions – contributing to the escalating losses, damages and lost development opportunities facing developing countries – the developed countries have run up an 'adaptation debt' to developing countries. The sum of these debts – emissions debt and adaptation debt – constitutes the 'climate debt' of developed countries.

Developed countries must take responsibility for repaying the full measure of their climate debt. Doing so is not merely right; it also provides the basis of an effective climate solution.

Extracted from *Climate Debt: A Primer* by Matthew Stilwell

Christian Aid/Amanda Farrant

Flooded roads near the port in Manila, the Philippines

Climate justice, equity and sustainable development are all important parts of this debate that are often left out of mainstream discourse.

Developing countries want the Copenhagen outcome to recognise that the rich countries have a 'historical responsibility' because they were able to grow economically on the basis of cheap energy that gave rise to their huge carbon dioxide emissions. This has left the developing countries with very little space to develop their economies in the same way in the future as the atmosphere cannot absorb greenhouse gases (GHG) at the same rate.

The 'climate debt' approach (see box on p9) has been adopted by a number of developing country governments in recent submissions to the UNFCCC, including Bolivia and Sri Lanka, to present the case for rich countries to pay back that debt.

Responsibility for climate change is not the only aspect to defining fair climate change action, however. In designing a response to climate change that asks all countries to contribute we must consider their different economic capabilities. The vast and growing inequalities in the world mean that poorer countries cannot be expected to act at anything like the same level as richer countries. The solution to climate change must be a progressive one – with rich countries contributing at a level that is commensurate with their far greater wealth.

For the climate change negotiations to be successful, the UNFCCC must be seen to deliver justice for developing countries and their people.

RESPONSIBILITY OF THE UNFCCC TO DELIVER IN DEVELOPING COUNTRIES

'The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties.'
UNFCCC Article 4.7[12]

If industrialised countries take on robust mid-term targets – that is, emissions cuts from industrialised countries as a whole of at least 40 per cent by 2020[13] – and additionally agree to finance significant emissions cuts in developing countries, then the chances of global warming of more than 2°C will be much reduced, along with the need for and cost of global adaptation measures. Emissions cuts of less than this by the industrialised world will mean that the developing world will have to take on a much higher burden of adaptation and mitigation.

Therefore, when countries meet to negotiate a far-reaching global effort to tackle climate change, the central arguments for the developing world will be around two issues:

- if global warming is to be kept below 2°C – the temperature which could trigger climate chaos – then the flow of money and technology to poor countries must be sufficient to support urgent action on mitigation and low-carbon development
- securing substantial support to assist the poorest and most vulnerable people in adapting to the man-made changes in the climate that are already threatening their lives, livelihoods and dignity.

In the run-up to the climate change negotiations in Copenhagen, there are a number of new mechanisms being developed to facilitate the use of climate finance and technology cooperation at a national level in developing countries. These are aimed at planning for and delivering action on mitigation, adaptation, technology cooperation and capacity building.

Nationally appropriate mitigation actions

Developing countries will be able to control and reduce their carbon emissions only with assistance from industrialised countries. They should receive a programme of financial and technological support that allows them to take nationally appropriate mitigation actions (NAMAs) that include investing in clean energy, reducing deforestation and producing sustainable agriculture.

The extent of mitigation action taken by a developing country will depend on the effective provision of financial and technological support from developed countries. NAMAs may involve:

- sustainable development policies and measures (SD-PAMs)
- low-emissions development strategies and plans
- technology deployment programmes
- sector-based mitigation actions
- forestry measures.

Delivery of such supported NAMAs would have to be measureable, reportable and verifiable (MRV) (see box below).

National adaptation plans

National adaptation plans (NAPs) are plans for vital adaptation, which are paid for by international adaptation funding. Adaptation actions may include: systems giving early warning of disasters; infrastructure for water

Measurable, reportable and verifiable mitigation action

The Bali Action Plan of the UNFCCC calls for mitigation actions to be delivered in a MRV manner.

The phrase MRV refers to:

- nationally appropriate mitigation commitments or actions by all developed country parties
- the provision of technology, financing and capacity building which enable and support NAMAs of developing country parties in the context of sustainable development.

In the context of NAMAs, the MRV process, overseen by the UNFCCC, is essential to ensure that governments are strictly accountable – both for delivery of finance by the industrialised countries and for effective delivery of emissions cuts by developing countries.

What is clear is that technology cooperation is more than a commercial transaction to purchase technology from industrialised countries. It is a process of delivering appropriate technologies which suit national and local demands, and are ultimately fully transferred for local autonomy and implementation.

management; insurance mechanisms; and, critically, actions to safeguard vulnerable communities' sources of income and means of survival.

Developing countries should have access to finance, technology and capacity building to support adaptation at a local, sub-national, national and regional level to deliver actions identified by national sustainable development strategies, poverty reduction strategies and NAPs.

A narrow version of these – national adaptation plans of action (NAPAs) – are currently being produced by the poorest countries but could be expanded and extended to all developing countries. NAPAs provide a process for least developed countries (LDCs) to identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change. The rationale for NAPAs rests on the limited ability of LDCs to adapt to the adverse effects of climate change.

Ideally, the NAPA takes into account existing coping strategies at the grassroots level, and builds upon those to identify priority activities to assess future vulnerability and long-term policy at state level. In the NAPA process, prominence is given to community-level input as an important source of information, recognising that grassroots communities are the main stakeholders.

Technology cooperation

Technology cooperation has been a central approach of the UNFCCC since its inception, in particular technologies that are environmentally, socially and economically acceptable:

'Recognising that all countries, especially developing countries, need access to resources required to achieve sustainable social and economic development ... including through the application of new technologies on terms which make such an application economically and socially beneficial.'
UNFCCC[14]

The text for the climate negotiations promotes enhanced action on technology, addressing all stages of the technology development cycle – including research and development (R&D), deployment, diffusion and transfer of affordable environmentally sound technologies – to enable all parties, particularly developing country parties, to enhance action on mitigation and adaptation.[15]

Such cooperation starts at the national level with a technology needs assessment (TNA), which enables developing countries to:

- achieve sustainable development
- decrease emissions of GHGs
- build capacity of individuals and institutions
- strengthen cooperation between countries
- adapt to climate change.

This in turn will become a national technology action plan (TAP). Another key proposal is for global TAPs to mobilise international R&D and investment to develop and deploy new technology.

What is clear is that technology cooperation is more than a commercial transaction to purchase technology from industrialised countries. It is a process of delivering appropriate technologies which suit national and local demands, and are ultimately fully transferred for local autonomy and implementation.

Capacity-building mechanisms

A number of countries have submitted proposals to the UNFCCC negotiations requesting support for capacity building to enhance plans and actions on adaptation, mitigation, technology and finance. Part of this capacity building will be essential for developing countries to ready themselves for accessing larger pools of domestic and international financing. Additionally, many countries feel they need further support to deliver on NAMAs, NAPs and TNAs.

Overall, there is a requirement for developing countries to foster an enabling environment for policies and institutions at a national level to deliver climate change action, and to establish multi-stakeholder coordination bodies to deliver and monitor outcomes.

Achieving sustainable development outcomes

Delivering sustainable development is integral to the convention:

'The Parties have a right to, and should, promote sustainable development. Policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each Party and should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change.'
UNFCCC Article 3.4[16]

Christian Aid/Amanda Burney

This huge open-pit mine, operated by the Volcan mining company, stretches along the edge of Cerro de Pasco, a city of 70,000 inhabitants in central Peru

However, this is the one aspect of the convention that has consistently been neglected by the current climate change mechanisms. There are increasing calls for climate change actions to be integrated into the sustainable development plans of developing countries.

The drive for market solutions for mitigation actions – such as the clean development mechanism (CDM) – has meant that sustainable development has been overlooked. The market has continually failed to deliver low-carbon projects in less developed countries or smaller-scale energy projects for poor communities. If market approaches prevail, then the outcomes will be the dominance of large-scale industrial responses to mitigation.

Additionally, there is some concern that adaptation, forestry and low-carbon development will be beholden to overseas development assistance, with donor conditions attached. Such an approach is unlikely to deliver nationally owned and locally delivered programmes.

The next chapter shows how sustainable development and community engagement and ownership can be delivered through the UNFCCC. This is achievable through appropriate governance at international, national and local levels, plus a targeted fund for community-based action. Delivering such an outcome must start with political will from the very top to deliver climate justice.

GETTING CLIMATE JUSTICE FROM THE UNFCCC

Communities from villages outside Matagalpa, Nicaragua, come into the town to march against water privatisation. Christian Aid partner the Community Movement of Matagalpa (MCM) is coordinating the campaign against the government's plan to privatise the water supply across the whole country

Christian Aid/Claire Shelley

Just a small contribution towards raising the capacity of communities to demonstrate their own answers to climate change will enable far greater numbers of community and local private sector programmes to access climate funding and support.

The case studies in Chapter 3 demonstrate that communities can benefit from climate change responses, and that they can be part of the solution. Appropriate action at international, national and local levels can ensure that these co-benefits to both climate change action and communities can be maximised.

While the UNFCCC is establishing the new mechanisms for supporting mitigation, adaptation and technology transfer, it is essential that these mechanisms are responsive to community needs, and are aimed at delivering climate justice. This means establishing a governance and support system which engages community-based stakeholders in decision-making and delivery of the climate change response.

Figure 1 (page 16) shows how UNFCCC could deliver funding and support to developing countries if climate justice is not factored into decision-making. This is largely how mechanisms such as the clean development mechanism (CDM) have worked to date – with the result that funding and support fails to reach community-focused projects.

The problems preventing community and local private sector access to support for climate action (as in Figure 1) are threefold:

- lack of opportunity for engagement of civil society in the development of the UNFCCC mechanisms in the first place, so that the mechanisms do not respond to the needs of communities or local private sectors
- lack of opportunity for civil society engagement in national planning and monitoring and evaluation
- lack of capacity at the community level to engage, due to lack of knowledge, lack of funds for piloting and demonstration, lack of resources to engage, or a reluctance to take the risk of using innovative approaches.

Figure 2 (page 17) demonstrates how climate justice can be factored into decision-making at local, national and UNFCCC levels to maximise justice in decision-making.

There are two principal approaches that Christian Aid believes will radically change the way in which the UNFCCC mechanisms work, and will deliver responses to climate change which have poor people and vulnerable communities at heart. Christian Aid proposes:

- a sustainable development innovation facility (SDIF). This will deliver ten per cent of national climate change finance directly to support local-level actions through civil society, community-based organisations (CBOs), the local private sector and municipal administrations
- enhancement of civil society to engage in planning for climate change responses at local, national and international levels. This requires high-quality participation of community actors at all levels of decision-making.

In this model, civil society and local private sectors are supported through the SDIF to engage with the development of both the UNFCCC mechanisms and national-level planning. Just a small contribution towards raising the capacity of communities to demonstrate their own answers to climate change will enable far greater numbers of community and local private sector programmes to access climate funding and support.

In this chapter we detail how each level of planning – the UNFCCC, national and local – can be designed to ensure that climate justice is at the heart of climate actions. In summary, for community action on climate change to become a central part of the global response, the following steps will be required:

At UNFCCC level:

- climate justice at the heart of decision-making – the need for political will
- equitable governance at the UNFCCC
- establishing the SDIF.

At national level:

- a national multi-stakeholder board to oversee delivery of national climate change plans
- planning and delivering the SDIF
- local private sector and civil society engagement
- climate change plans integrated into national development planning
- climate science working with local knowledge to improve climate predictions.

At a community level:

- SDIF raising local capacity to act
- civil society participation in decision-making
- raising the community voice in the climate change debate.

Figure 1: Conventional approach to climate finance and support

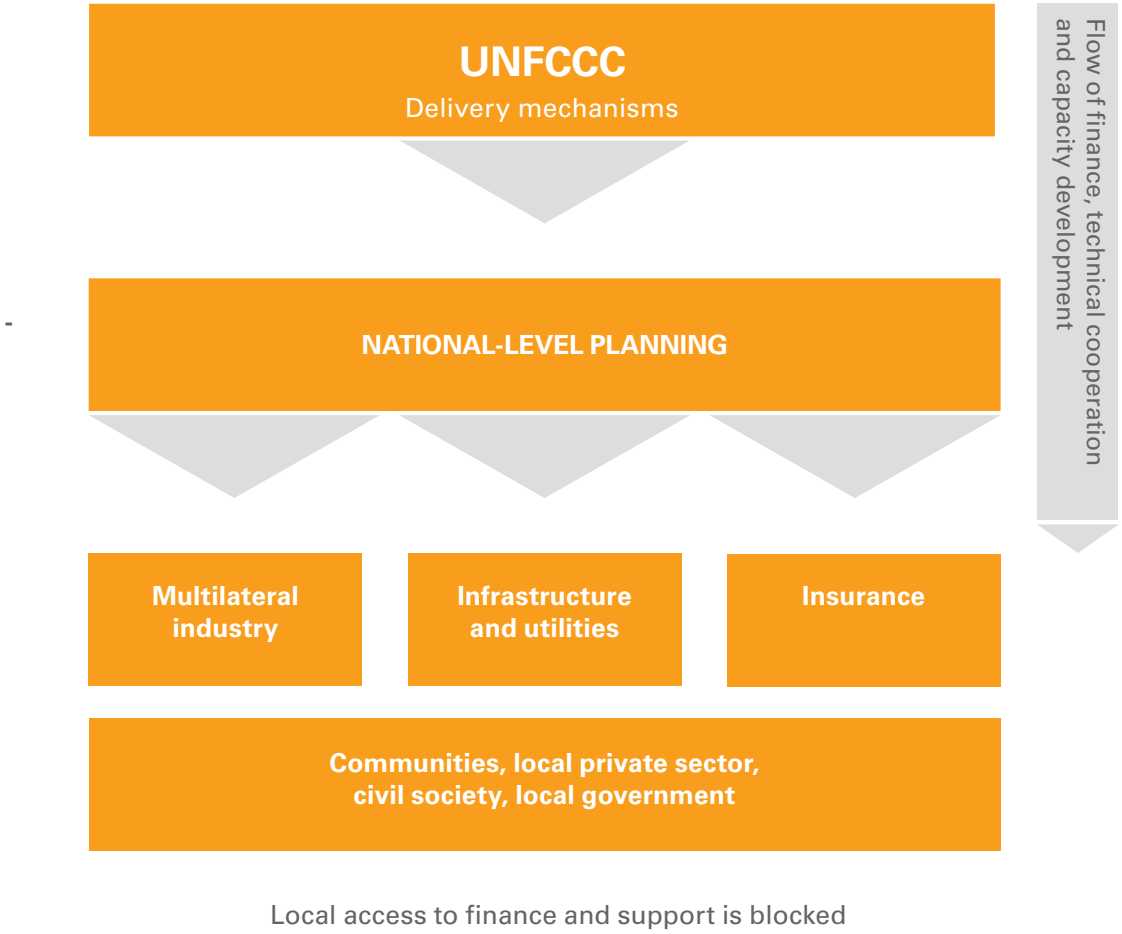
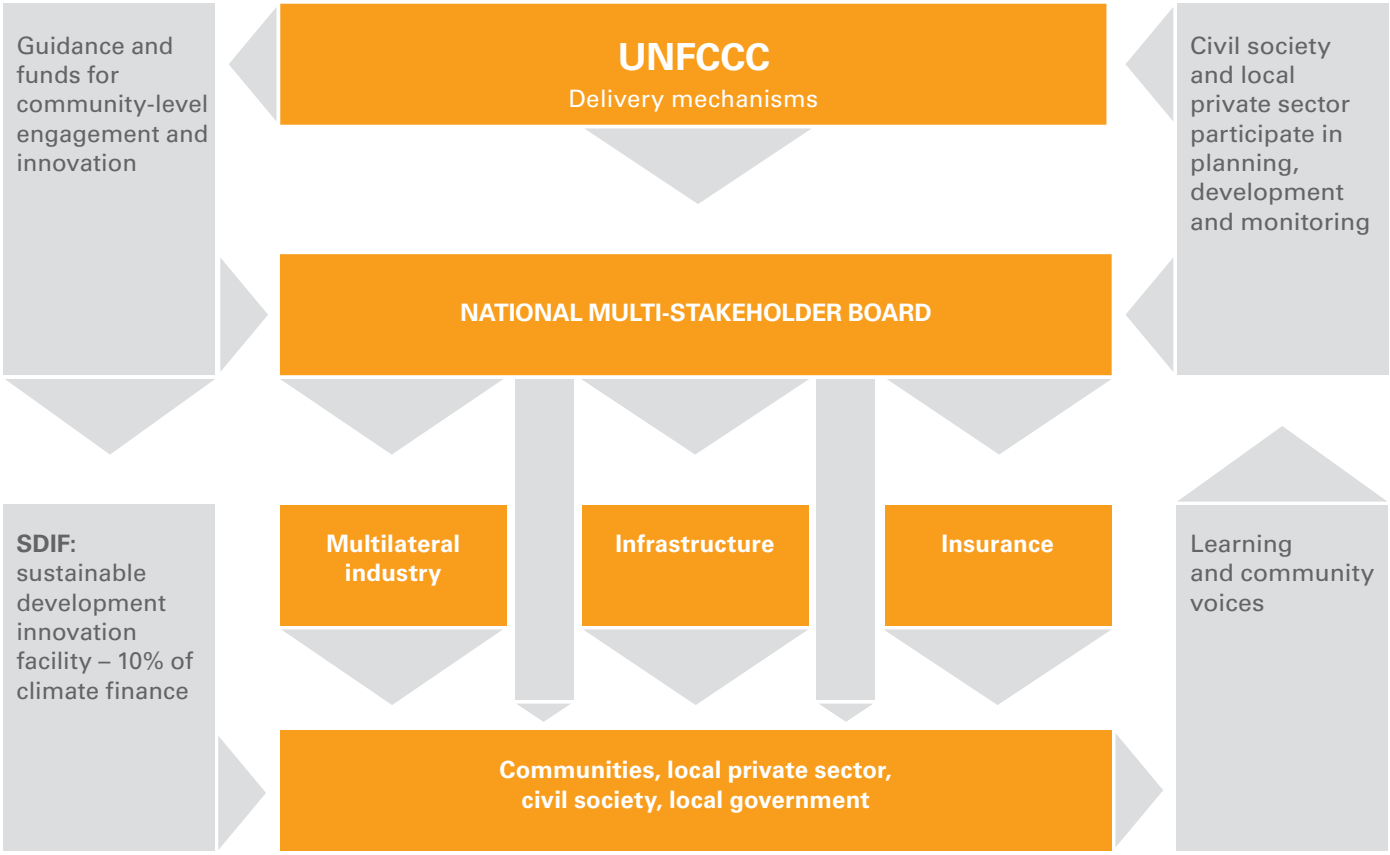


Figure 2: Climate change support with community engagement



UNFCCC

Climate justice at the heart of decision-making – the need for political will

Ultimately the task in Copenhagen and beyond must be to deliver two things: a climate agreement which removes the threat of climate chaos from the world; and access to climate justice for the people of the developing world who have not historically caused climate change but are starting to feel the devastating impact of living in a climate-constrained world.

If the climate change negotiations are driven by short-term national interests and economic advantage and dominated by the demands of rich countries, as is currently the case, then justice will not be delivered. However, with the political will to deliver a fair and equitable outcome, greater justice for poor countries will be feasible.

Equitable governance at the UNFCCC

It is essential that climate change funding should operate under the authority and guidance of the UNFCCC and be fully accountable to it.[17] For the executive board of UNFCCC climate change financing, it is proposed that there will be a one-country-one-vote rule and a majority representation for non-Annex 1 countries on the governing body. This should balance geographic and gender representation. Additionally, a provision should be made for appropriate civil society representation.

Civil society is already raising its potential to engage at the international level on climate change (see box below).

Funding should also have an independent expert panel – with representatives from the fields of climate, technology, disaster management and development – who will be able to assess the likelihood of programmes meeting their objectives, including sustainable development goals.

Establishing the SDIF

The UNFCCC should develop guidance on planning for national climate change action and, particularly, on the engagement of civil society in climate change planning. It should set the parameters for civil society engagement, and monitor the implementation of this strategy.

It is essential that applicant countries should be encouraged to include in their proposals details of how civil society and local organisations in their countries can access the climate change funding obtained by their national government and be involved in the planning, implementation and monitoring of the measures and policies.

Christian Aid proposes that the UNFCCC establishes an SDIF to ensure that countries allocate ten per cent of climate change funding to directly fund CBOs, CSOs, local private sectors and municipal authorities. This fund, to be managed at a national level in developing countries, would support community-centred adaptation and mitigation work, facilitate civil society participation in national project planning and design, and hold governments to account.

Guidance and monitoring of delivery of the SDIF should come from the UNFCCC.

Pan-African Climate Justice Alliance[18]

The Pan-African Climate Justice Alliance (PACJA) is a coalition of civil society organisations (CSOs) brought together by a common agenda of promoting and advocating for climate-related and equity-based development that considers climate change as a key driver of sustainable development.

The alliance was formed after broad and lengthy consultations among key civil society actors in the African continent, who felt that a genuinely representative, all-inclusive and conspicuously robust civil society network on climate change and sustainable development was an urgent requirement in the ongoing international dialogue on the post-2012 climate change regime.

Currently drawing its membership from non-governmental organisations (NGOs), CBOs, national coalitions and regional networks, PACJA aims to unify isolated civil society efforts on climate change advocacy and coordination in Africa to ensure that pro-poor and people-centred response measures are considered by governments as they seek to put climate change into the centre of national development strategies.

In the pursuit of its mandate, PACJA collaborates and encourages strategic alliances with international partners, national governments and regional governmental bodies as well as individuals who share its aspirations to ensure that the African voice is amplified in international negotiations.

In the ongoing dialogue on the suitable climate change regime, the alliance seeks to work with like-minded partners from the North and the South to ensure that the resultant document agreed by the community of nations is not only equitable, but also a product of massive consultation, responsive to the realities of vulnerable communities.

AT THE NATIONAL LEVEL

National multi-stakeholder board

A national multi-stakeholder board should be responsible for overseeing delivery of climate change funds, and should include civil society representatives. This board would ensure the delivery of high-quality, high-impact NAMAs, NAPs and TAPs.

As has been experienced with the implementation of poverty-reduction strategy papers (PRSPs) in developing countries (see box below), it is important that the capacity of civil society to engage should be increased. This will raise the quality of engagement of civil society, and ensure that sufficient authority is given to community views. This approach should help increase accountability, both to the UNFCCC and to national citizens.

Sustainable development innovation facility (SDIF)

It is proposed here that each county, under UNFCCC guidance, set aside a portion of their climate change funding specifically for enabling community-based action on climate change.

Up to ten per cent of the total climate change funding coming into a country can and should be used for capacity building to enable communities to engage in national planning, to pilot climate action locally and raise the capacity of communities to deliver.

This facility should support communities and the local private sectors to:

- engage with local and national climate change planning
- pilot innovative approaches to climate change adaptation and mitigation
- allow for participatory approaches to be used to enhance local decision-making
- introduce and adapt new technologies
- improve the commercial viability of business innovations to support the climate change effort – including small-scale energy, new seeds and agricultural practices and sustainable agro-forestry-based businesses
- reduce the risk for communities and small and medium enterprises (SMEs) of taking on long-term sustainable practices.

Civil society participation in the PRSP: the role of evidence and the impact on policy choices[19]

The Overseas Development Institute undertook a study of civil society's participation in the poverty reduction strategy paper (PRSP) process. Taking the examples of Bolivia and Tanzania, the study looks in detail at the evidence used by CSOs in the PRSP discussions and examines whether the arguments and recommendations made by CSOs were taken on board by the government and included in the final PRSP documents.

The case studies of Bolivia and Tanzania show that the PRSP process offers an excellent opportunity for CSOs to engage in discussions with governments on policy choices. However, the realities of the process have, in general, shown that this potential was not fulfilled.

For many CSOs, this was their first experience of advocacy work on policy issues and the process itself contributed to strengthening their capacities. However, this potential was often not fulfilled and many CSOs felt that their views and recommendations were not listened to or integrated into the final documents.

While there are some examples of CSOs having an impact on policy choices, there is an over-riding sense that there is not much of a link between the consultations and the final documents and, furthermore, that many issues were not put on the table for discussion in the first place. The reasons for this are many but include:

- the political nature of policy processes
- the influence of donors and finance institutions in the PRSP process
- the limited capacity in many CSOs to conduct rigorous analysis on highly technical issues.

As the PRSP approach moves into its second and third waves, the interest in civil society's role in policy processes will increase. The PRSP does provide an excellent entry point into the policy process but there is work for CSOs to do to make sure that their contribution to the process continues to improve. An important part of this will be for CSOs to invest time and resources into carrying out thorough research at the local and national levels to ensure that there is evidence-based advocacy work around the PRSP process.

Local private sector SMEs are key players in the long-term sustainability of climate change response. The local private sector generates jobs and responds to the needs of the local community.

The delivery of this fund will be the responsibility of the national multi-stakeholder board for climate.

Private sector engagement

Local private sector SMEs are key players in the long-term sustainability of climate change response. The local private sector generates jobs and responds to the needs of the local community. If supported in the early stages to take risks and develop new technologies and services, the sector can turn climate change responses into long-term sustainable enterprise.

Private sector business development will be an essential component of scaling up decentralised energy services, as seen in the Chapter 3 case studies featuring jatropha biofuels in Mali and decentralised power production in Nigeria and India.

Climate change plans integrated into national development planning

It is essential that national plans for climate finance (NAMAs and NAPs) are integrated into existing national planning, so that there is a cross-government response to delivering national plans on climate change action. The goal must be long-term sustainable development, not just a climate change 'fix'. This must include policy changes in different government sectors – agriculture, energy, transport, construction, water supply, and so on – to ensure climate change resilience and low carbon development.

From the case studies, the Mali jatropha biofuels programme is as much a part of an energy security plan as it is a climate change response. Additionally, the climate resilience examples – in east Africa, Central America and the Philippines – are as much a disaster mitigation response as a climate change adaptation strategy.

This approach ensures the best use of scarce resources and avoids duplication by ensuring that low-carbon development, adaptation to climate change and risk reduction are converged more closely and integrated into sustainable development planning in all sectors (see box below for an example of adaptation planning).

Climate science working with local knowledge

A number of the case studies reported in Chapter 3 highlight the importance of climate scientists working with affected communities on planning and forecasting for the future. This has been a central factor in the success of the climate resilience in the Philippines and Central America case studies.

Integrating climate change adaptation with sustainable livelihoods and disaster risk reduction

Climate change adaptation requires a guiding framework for action to promote a coherent approach. This should draw on experience and best practice gained to date from sustainable livelihoods, climate change adaptation, disaster risk reduction (DRR) and humanitarian work. This framework should be developed and implemented under the auspices of the UNFCCC and should include:

- promoting closer integration of sustainable livelihoods, climate change adaptation and DRR teams in the coordination and policy mechanisms of bilateral, multilateral and civil society organisations – such as the UNFCCC and Global Platform for Disaster Risk Reduction
- establishing inter-ministerial committees (or other appropriate national coordinating mechanisms) to integrate climate change committees and national platforms for DRR and so promote improved inter-sectoral, multi-stakeholder coordination
- integrating climate change adaptation and risk reduction into the guidance and delivery of all appropriate bilateral funding mechanisms
- refining and scaling-up existing sustainable livelihoods and DRR tools which have proved effective in dealing with climate-related events to meet the needs of climate change adaptation, including: climate-change analysis; participatory vulnerability and risk assessments; early warning systems; risk-cycle management, community-based development/land-use planning; building code regulation; and institutional and legal capacity building
- ensuring that climate change adaptation is rooted in the livelihood priorities and needs of those most vulnerable to its impacts. This explicitly includes a recognition of the local knowledge of the changing climate, its impact on livelihoods and appropriate sustainable responses.

Patricia Moyo (right) works on her family's farm when she is not at school. The family uses the conservation farming techniques taught by Christian Aid's partner ZimPro

Christian Aid/William Anderson

Of particular importance is a reversal of the underinvestment in climate and meteorological departments in developing countries. These vital scientific capacities are a central part of an integrated approach to climate change adaptation, enabling the expansion and improved communication of seasonal forecasting, early warning systems and climate prediction.

Additionally, communities have over many centuries developed strategies to cope with climate extremes. As extreme climates become the normal pattern, communities will require support to make longer-term predictions and reinforce their coping strategies in order to be more resilient year on year.

Two critical issues here are:

- the need to raise the capacity of climate science in many vulnerable countries, where data and predictions are in desperately short supply
- to acknowledge the importance of the knowledge which resides in communities that live in vulnerable eco-zones and have witnessed the effects of climate change first hand.

From international plans to national climate change action

There has to be a clear path away from an approach which has been seen too often in recent years – that of producing a 'climate change plan' written by expensive international consultants appointed by a donor and then shelved and never delivered.

There must be a movement towards delivering effective climate change actions at a national and local level that is accountable to both the people of the country and the international community through the COP.

Many of the case studies in this report demonstrate that nationally developed and owned plans can be fully implemented quickly to benefit large populations, often demonstrating improved livelihood opportunities. For example, conservation farming methods in Zimbabwe have made farming more climate-proof and thus increased yields and profitability.

COMMUNITY LEVEL

Poor people are at the coalface of climate change, poverty and natural resource management (see box below). They must be part of the solution through direct and locally led programmes. For communities to take action it is essential to have:

- promotion of systems of tenure and access to resources that are equitable and that promote sustainable use of natural resources through long-term management
- adoption of participatory bottom-up planning approaches
- effective natural resource governance structures in place
- financial resources (grants and micro-finance) available at the local level to implement community action.

SDIF raising local capacity to act

The SDIF would go through national-level planning to be delivered by CSOs, NGOs, local government or the local private sector to pilot and demonstrate community-driven action. This will set the groundwork for community involvement in long-term action on climate change through national climate change plans.

The aim of the UNFCCC SDIF is to raise the capacity of community actors. Such a facility could support and scale up responses, described in the case studies in Chapter 3, in a number of ways, including:

- supporting local private enterprise by piloting jatropha biofuel plants, and removing the risks that occur in the early stages of technology development
- scaling up local renewable energy projects through a mix of government programmes and NGO and private sector initiatives in India
- micro-finance and investment incentives to expand the use of renewable energy in Nigeria
- expanding the number of training centres and agriculture extension in west Bengal
- identifying and developing local solutions for drought-resistant agriculture in Burkina Faso
- supporting research and development in conservation farming in east Africa
- allowing for participator process to engage all sections of the marginalised *quilombo* communities in the Brazilian Amazon

From community-led research to national-level action in Tajikistan

Central Asia is a region severely affected by hydrological, geophysical and drought-related disaster and livelihood risks. While fast-onset disasters such as earthquakes tend to dominate attention, over the past five years risks and vulnerability associated with climate change have become increasingly important at community level. Risks identified by communities in Tajikistan include floods and mudflows; the accelerated retreat of glaciers and loss of water resources; increasing summer temperatures and drought episodes; erratic weather patterns resulting in rapid climate shifts; increasingly intensive rainfall; stronger winds and extreme winters. Communities find it difficult to predict these changes or access information on likely future climate change.

Christian Aid partners have developed a project to understand the impact of climate change and how communities cope with this. This project sets out certain advocacy strategies to ensure that CSOs are able to come together to address climate change issues.

This was the first innovative project involving local communities aimed at understanding the impact of climate change. The public perception study on climate change impacts sparked a number of projects to help poor rural communities improve their adaptation capacity. These projects, implemented by Youth Eco Centre, a national organisation in Tajikistan, included community capacity building on drought-resistant seeds, viable greenhouses and solar panels. They also encourage the use of local knowledge and traditions to support a more rational use of natural resources and the preservation of agricultural and biological diversification. For example, original methods of trickle irrigation devised by local farmers are now being promoted and strengthened for vegetable cultivation.

The research also contributed to developing action programmes to help communities set up advocacy initiatives at national and international levels.

It has been instrumental at a national level in initiating collective civil society advocacy to put pressure on the government to act on climate change issues. As a result, a network of NGOs on climate change and alternative energy (Tajik Climate Change Network TajCN) has been created to develop awareness on climate change.

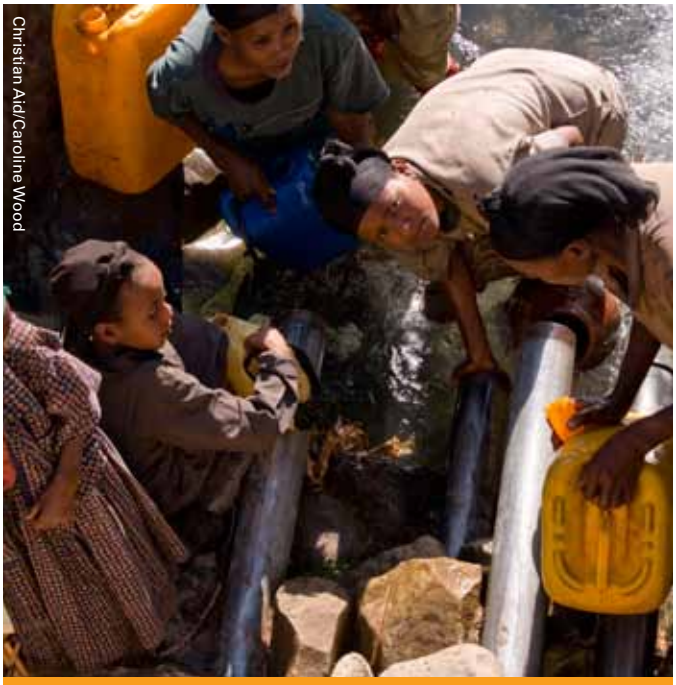
- scaling up communication between meteorology departments and communities in Central America and the Philippines.

In all cases, there is benefit in raising the capacity of civil society to participate in national planning and to contribute to the integration of sustainable development programmes into national-level climate change plans (NAPAs, NAMAs, TAPs and SD-PAMs).

Civil society participation

As with development aid, transparency of climate funds is essential to find out 'how much, to whom, and for what'. Information needs to be proactively disseminated and easily available to citizens in developing countries. It is necessary that climate change funds are seen as belonging to citizens and not just countries.

To achieve this, governments should consult with their citizens and parliaments in the design of climate change policies. Experience shows that participation in the development of PRSPs have improved relations between governments and their people. Today there are many CSOs monitoring PRSPs and holding governments to account on their implementation. Such an approach should help improve the accountability of climate change finance.


Christian Aid/Caroline Wood

It took four months to cap Ibala spring in Kedida Gamela, Ethiopia, where a gravity flow system now provides fresh, safe water to 27,000 people in three districts

'Consultation by helicopter'[20]

With the aim of improving the role of people's participation in the PRSP process, Christian Aid made an assessment of the process in Malawi. Participation in PRSP has become something of a development flagship, with poor people's involvement being one of the key conditions that highly indebted poor countries (HIPCs) must meet in order to receive future lending concessions and debt relief.

However, in Malawi, CSOs criticised the government for allowing a very short time frame for district consultation, characterising it as 'consultation by helicopter'. Well-informed CSO members felt that many senior officials and politicians saw the PRSP process only as a tool for accessing HIPC resources, and not as a means of improving policy and public expenditure.

CSO groups found the process of participation difficult because of the following:

- poor organisation of PRSP activities – a number of CSO members complained of short notice and poor organisation of meetings
- deliberate action – the coordinating ministries deliberately excluded CSOs in the initial stages of the process
- limited time – district officials and others believed that too little time was allocated to PRSP consultations
- lack of resources – CSOs had insufficient resources to commit to the PRSP process
- distance – a number of people and organisations could not make the meetings because the consultation was too far away – often in the capital city
- rejection – some potential civil society participants were simply excluded by government officials
- levels of consultation – the consultation process prioritised leaders and notables as the voice of people; this excluded ordinary people from direct participation.

'Climate change discussions in India, as elsewhere, are dominated by professionals, elite NGO s and interest groups, leaving no room for affected communities to be part of the process.'

Deccan Development Society, India

It is essential to strengthen civil society participation in strategic planning and decision-making at all levels by supporting the poor and marginalised (including women, elderly people, children and indigenous peoples). This will require investing in and supporting local institutions and processes. Evidence from the development of PRSPs has shown that the quality of participation is extremely important and there is a need to raise the capacity of CSOs to engage (see box on page 23).

Key to this will be the strengthening of the role of civil society in the development and implementation of NAPs and NAMAs.

Community voices

We have to be clear about which actors engage in local, national and international planning. Communities have very low capacity to go beyond local planning, and NGOs do not always represent communities well if they are part of the elite.

The Brazil case study in chapter 3 shows that raising the community voice will be a very important factor in supporting the quilombo communities in the Brazilian Amazon. This community has felt powerless against large international companies who want to take their land rights in order to exploit timber and mineral wealth. Strengthening the voice of the quilombo will enhance the chances of forest conservation.

The example from India in the box below demonstrates just one approach to bringing the voices of marginalised communities directly into climate change negotiations.

Community Charter on Climate Crisis, Andhra Pradesh, India

Climate change discussions in India, as elsewhere, are dominated by professionals, elite NGOs and interest groups, leaving no room for affected communities to be part of the process. These groups of well-wishers assume that they represent the communities, which is a myth.

Interaction and discussion with communities, partners and like-minded allies have revealed the need to initiate community-led processes to understand the impacts of climate change from a community perspective, to recognise the traditional coping mechanisms that communities adopt and to understand what their demands are, as far as the larger debate on climate change is concerned.

Deccan Development Society (DDS) works with about 5,000 dalit women in more than 75 villages in the Medak district of Andhra Pradesh. During 2009 DDS will convene a coalition of grassroots organisations to initiate community processes and action related to climate change.

The process will be led by local communities representing coastal, forest and pastoral regions. These communities will be directly involved in conducting the research studies on the impacts of climate change and the traditional coping mechanisms they adopt. The research studies will be widely disseminated across civil society, NGOs, media, government and the general public.

The project will initiate a series of dialogues with civil society groups working directly with local communities and build a consensus on the need to evolve a community charter on climate crisis.

This will be followed by a series of participatory research exercises in which farmer, fisher, forest and pastoralist communities will be directly involved. The research process will enable these communities to respond to the climate crisis in terms of their own comprehension and experiences of the crisis and the ways in which they intend to combat it. The exercise will centre on the knowledge and capabilities of the ecosystem-dependent communities and amplify their voices.

Once such exercises are completed, the communities will finalise the community charter on climate crisis. They will then hold a national summit in New Delhi a few weeks before the Copenhagen summit, when they will present the charter to the nation.

A group of the community representatives will then travel to Copenhagen to present this charter at the summit.

There will be efforts to continue this dialogue and process after Copenhagen so that there is a new atmosphere wherein communities will continue to explore their own solutions to the climate crisis.

RECOMMENDATIONS FOR COPENHAGEN

The UNFCCC meeting in Copenhagen in December 2009 is the time for policy decision-making for the post-2012 climate change agreement. Therefore Christian Aid recommends the following strategy to ensure that climate justice is an integral part of the Copenhagen Agreement.

Recommendations to UNFCCC negotiators

Negotiators from countries at all income levels should strive to ensure that:

- any agreement includes a clear commitment to an SDIF, delivering ten per cent of national climate change finance directly to support local-level actions through civil society, CBOs, local private sectors and municipal administrations
- the agreement also includes a robust mechanism, with the full involvement of civil society, to ensure the SDIF is effective, accountable and adhered to
- civil society is firmly included in the formulation of national negotiation positions.

Recommendations to civil society

Civil society in countries at all income levels should aim to use the short window before Copenhagen, in addition to demanding an effective and ambitious deal,[21] to ensure that their national negotiators hear and then reflect the above recommendations within the UNFCCC process.

Since Christian Aid partner Mali Folkecenter helped bring electricity to her village, restaurant owner Tigida Kane, 52, has invested in a fridge, making her business much more effective

Christian Aid/Rachel Stevens

COMMUNITY ANSWERS – CASE STUDIES

Christian Aid/Rachel Stevens

Mamadou Kane, 66, lobbied NGOs and government representatives to help bring electricity and water to his village, Guralo, for five years before he met the director of the Mali Folkecenter.

'We are a different community now. There are more businesses, we can keep vaccines in a fridge in the health centre, we can get cold fresh water, we have better security for the women at night and we can socialise together more in the evenings.'

Mamadou Kane, Guralo village, Mali

Christian Aid/Mike Goldwater

Northeast Kenya, a wood seller walks back to Badera, Somalia, his cart laden with wood he has collected from sparse forest

Christian Aid and our partners are actively engaged in the response to climate change across the world. The case studies in this chapter clearly demonstrate how, with the right support, communities can benefit from action on climate change and be part of the solution.

Each of these case studies demonstrates the very real issues that communities face in response to the changing climate. They demonstrate the types of action which communities themselves can take, where local private sectors and small businesses play a role and where new technology innovations can be part of the solution.

The case studies explore a number of issues and identify what support is required to achieve long-term sustainable change for these communities. These include:

- identification of vulnerable groups
- types of funding required
- governance of funding
- civil society engagement with national climate change planning
- potential for private sector engagement
- capacity building requirements
- technology cooperation and innovation.

DECENTRALISED ENERGY

Across the developing world more than 1.5 billion people (about one-quarter of the world's population) have no access to electricity – so they have no light in the evening, limited access to radio or communication, and no modern power for their work and income-generating activities. Many millions more have only a very sporadic and unreliable electricity supply. Only 25 per cent of Africans have access to electricity (the figure is far lower for sub-Saharan Africa) and only 52 per cent in Asia. In low-income Latin American countries typically only 60 per cent of people have electricity access.[22] This leaves millions of people in each region with none of the modern energy sources that many of us take for granted.

Worldwide, more than three billion people depend on dirty solid fuels to meet their most basic energy needs.[23] Over 2.5 billion people rely on traditional biofuels (wood, dung, charcoal and agricultural residues) for cooking and heating and over half a billion cook with coal. This fuel requires women and children to spend many hours each week collecting and processing biomass for the essential job of cooking. Additionally, cooking on open fires creates indoor air pollution (smoke in the kitchen), which directly causes over 1.5 million deaths every year and aggravates lung disease, including acute respiratory infection, the leading cause of child mortality.

Energy poverty has kept billions of people across the developing world in abhorrent conditions because they do not have access to modern energy, which is available at the flick of a switch or the press of a button in the developed world.

This lack of modern energy has limited the development capacity of individuals, communities and countries to achieve adequate standards of living or economic growth.

Developing countries are unlikely to see their incomes and living standards increase without a concomitant increase in access to modern energy services. Meeting the UN target of halving the proportion of the world's people living on less than US$1 a day by 2015 implies a need to expand access to modern energy services, including electricity, very quickly.[24]

However, many developing countries have energy development patterns based almost exclusively on conventional energy sources, resulting in a lack of adequate institutional frameworks and weak or non-existent policies to support the dissemination of decentralised energy technologies. In particular, decentralised mechanical or thermal energy has been almost entirely overlooked by the traditional energy sector, policymakers and planners.[25]

A new pro-poor policy approach is needed, aimed specifically at reducing energy poverty by delivering sustainable decentralised energy to meet basic needs for cooking, lighting, schools, clinics and workplaces.

In many cases clean fuels and renewable energy technologies may be the most appropriate option for many of the energy poor. Decentralised renewable technologies using local resources can effectively deliver energy to remote communities not served by centralised services.

Over recent years global funds have been channelled into low-carbon technologies, through both donor arrangements and carbon trading. The main climate change funding mechanisms for developing countries are the Global Environment Facility, run jointly by the World Bank and UN Development Programme; the CDM, which delivers finance from the carbon market to projects in developing countries; and the World Bank Clean Energy Investment Framework. Unfortunately, the vast majority of this climate change financing has bypassed low-income countries, with the poorest sectors of society receiving the least.

The current low-carbon funding mechanisms and the ever-growing carbon market are failing to deliver energy to poor people, preferring industrial-scale projects in middle-income countries. For example, to date, two-thirds of all CDM projects have been in the emerging economy countries (India, China and Brazil), and most have been industrial-scale projects. Less than two per cent of CDM projects are in sub-Saharan Africa.[26] The examples in this chapter demonstrate how poor people and countries, who currently have very limited access to modern energy, can be part of the long-term, low-carbon future. They demonstrate how people can be brought out of poverty on a low-carbon pathway, generating growth and raising standards of living. Not only do they show how communities can benefit, but they demonstrate the advantages for each of the countries in terms of energy security, long-term energy costs and expansion of energy delivery.

With relatively modest inputs from climate change funding, capacity building and technology cooperation, there can be successful outcomes for both poverty reduction and climate change mitigation.

AFRICA AND THE JATROPHA RUSH

Eliot Whittington and Kato Lambrechts

In November 2006 President Wade of Senegal hosted what has been described as a 'Green OPEC' meeting in Dakar. This was a meeting of 13 African countries that lack crude oil reserves and are interested in exploring the potential of African soils for biofuel production in order to lessen their dependence on fossil fuel imports in future.

One of the crops that they are keen to promote is *Jatropha curcas*. Jatropha is currently widely grown as a hedge crop, and its oil also has a number of uses, including making soap. However, its oil is also easily converted to biodiesel, and African governments and biofuel companies – keen to sell biodiesel in Europe where targets for cleaner transport fuel blends have opened up huge markets – have 'hyped up' the biofuel-producing potential of the plant. Given that jatropha grows naturally in semi-arid and tropical areas, they note that jatropha can be grown in soil and water conditions unsuitable for other forms of agriculture. The great hope, therefore, is that jatropha can be a fuel crop that does not compete for water and land with food crops, in the way that maize, sugar, cassava and other biofuel crops do.

In 2007 *Scientific American* called jatropha 'green gold', and across the world – from China to Brazil – there have been commitments to plant millions of acres of jatropha.[27] This 'hype' has seen a clamour by biofuel companies keen to grow jatropha plantations in a number of African countries, including Tanzania, Mozambique, Ethiopia, Kenya, Burkina Faso, Senegal and Zimbabwe.

However, the evidence that is coming in about the reality of growing jatropha for commercial-scale fuel production suggests that such plans are vastly over-ambitious.

Rob Bailis from Yale School of Forestry and Environmental Studies is currently doing a detailed environmental assessment of jatropha. He notes that 'if you plant trees in a marginal area and all they do is just not die, it doesn't mean you're going to get a lot of oil from them'. Even some biofuels companies bear this out, as Vincent Volckaert, of biodiesel producer D1 Oils, points out 'if you grow jatropha in marginal conditions, you can expect marginal yields.'[28]

Christian Aid's research also indicates that in order to achieve economically viable large-scale production of oil, jatropha does need good land and significant irrigation. For example, Kikuletwa farm in Manyara region, Tanzania, is a commercial farm on fertile land which had planned to plant some 500 acres of jatropha. However, on discovering the heavy use of labour and major inputs of fertiliser and water required for high yields, plans were scaled back to a small plot. Even that has achieved only an average of 4kg of seeds per tree per year, instead of the projected 8-10kg.

Similarly in Dagana, a semi-arid province of Senegal, a private Belgian foundation, Durabilis, has been piloting jatropha with the aim of showing local farmers its potential as a cash crop. But given the low levels of rainfall in the area, this is only possible with drip irrigation. If the community were to adopt jatropha as a crop it would have to prioritise the available water for jatropha rather than food crops.

The reality of the direction in which companies and governments are directing jatropha production bears this out. For example, in Senegal, experience from jatropha plantations in arid parts of the country saw very few fruits on the trees in the summer of 2008; in wetter parts of the country, which might see greater yields, the plantations will compete with food production. In Tanzania, government research points to the well-developed highlands and coastal areas for jatropha production, not the more arid and marginal land in the centre of the country. And in Burkina Faso jatropha production is already taking place in the south and southeast, which are more fertile and have a higher rainfall. The UK company D1-BP Fuel Crops (a joint venture by D1 Oils and BP) has plans to build a dam to supply water to some of its jatropha production schemes in the country.[29]

Jatropha for biofuels will compete for soil and water with food crops. Commercial pressure to maximise yields will result in some of the best land being appropriated for jatropha. These monoculture plantations will enhance the danger of soil erosion, nutrient and groundwater depletion, and threaten biodiversity. They may also displace communities and deprive them of their livelihoods without adequate compensation.

The issue of labour will also need careful attention from investors and government alike, as jatropha production is, at present, very labour intensive. Given the need for large amounts of seasonal labour there will be issues around wages, working conditions and the effects of migration to plantations at certain times of the year. Large-scale migrations of workers will have effects in the vicinity of a plantation – such as pressure on food supplies and prices, medical facilities and schools – in addition to possible increases in disease transmission.

'It is like [electricity] is free, grown in the field.'

Alan Dembele, government official, Mali

Jatropha in Mali: small is beautiful?

While jatropha may not be a miracle cure for the worldwide dependence on oil, and large-scale plantations may create more problems than they solve, this does not mean it has nothing to contribute.

A very different approach – piloted by a local organisation, but backed by the government – is on display in Mali. Here a combination of support to small-scale farming, an emphasis on ensuring food security, and a concern for resolving energy poverty at the rural community level has led to a project that explores the benefits of small-scale decentralised bio-energy. This approach is unique in Africa.

Christian Aid's partner, the Mali Folkecenter (MFC), has designed a project to promote the sustainable management and use of natural resources in a way that would enable local economic growth and sustainable development. MFC works with local communities on environmental protection, technology transfer and training, and the provision of clean energy to rural communities that currently have no electricity supply at all.

In 2006 MFC brought together a private electricity company, international funding and their own expertise to provide Guaralo village with electricity run on jatropha oil. The electricity company agreed to build a generator and to buy jatropha plants from the community in order to sell electricity back to them at an affordable price. 'It is like [electricity] is free, grown in the field,' as Alain Dembele, the government official for the region, explains.

The MFC grows jatropha plants in nurseries and then helps local families to farm the plants. At the moment they are growing 650 hectares, which should generate enough electricity for 20 hours a day. They plan to grow 10,000 hectares over the next few years and the extra oil will be used to make soap; it is also an excellent fertiliser.

Families grow the plants alongside food on their farms. They are restricted to growing no more than three hectares each. The jatropha trees are still maturing, but once they fruit, MFC calculates that the village generators will be run entirely on locally grown biofuel by 2011. This will power 274 homes, a medical centre (which now has a fridge in which to keep vaccines), a school, a community hall and a pharmacy.

The Malian government is developing a national strategy for biofuel development, which aims to eventually replace fossil fuel imports with locally produced biofuels. The government has been driving a national programme to popularise the energy uses of jatropha as part of its commitment to rural electrification through clean and decentralised energy provision. The Mali National Centre for Solar and Renewable Energy, through its jatropha programme, has been supplying 700 communities, comprising 12,000 villages, with biofuel generators. Crucially, at the same time, the government has adopted food sovereignty as its overall food and agricultural policy framework. This signals a commitment to small-scale farming and the promotion of local food systems – and explains why until now the Malian government has not been courting foreign investment in large-scale industrial jatropha mega-projects. It has also banned jatropha exports until the country is fully energy self-sufficient.

UNFCCC supporting a joint effort towards sustainable biofuels in Africa

The case of Mali shows that government, private sector and local communities can work together to deliver low-carbon development that has a low environmental impact and maximum benefit for poor communities. Crucially the approach chosen has been:

- piloted at a small scale, and shown to deliver real community benefits
- nationally owned and driven
- designed to meet local development objectives around security of food, energy and livelihoods, as well as climate change mitigation objectives.

With UNFCCC funding and support, this national programme could grow more quickly, and potentially spread to other countries. The commercial viability of this approach can be tested and private sector and community partnerships can be proven. Such an example could demonstrate a long-term approach to low-carbon energy security across Africa.

USING OFF-GRID RENEWABLES TO FILL THE ENERGY GAP IN RURAL INDIA

Ben Hobbs and Srinivas Krishnaswamy

Despite a government target of bringing electricity to all villages by the end of the decade, statistics show that more than half of all rural households in India still lack electricity. This is holding back development in these areas. One way of filling this energy gap is to develop 'off-grid' renewable energy schemes that are managed locally and provide electricity, biogas or biodiesel for a variety of uses, including lighting, cooking, heating, pumping water and operating machinery. These offer an important alternative, or perhaps complement, to grid-based systems, which are usually powered by coal. The double win here is that they can limit a growth in carbon emissions while also helping to meet rural poor people's urgent need for a reliable energy supply.

Below we present three case studies of off-grid systems that generate electricity, biogas and biodiesel for rural populations.[30]

Kasai village, Madhya Pradesh

Kasai is a remote, forest-fringe *adivasi* (tribal) village with 55 households and a population of 392. It is not connected to the grid. The village is endowed with abundant biomass resources in the form of wood (from forests and farmland), crop residues, cattle dung and oil seeds.

Since 2005 the government has been supporting a project in the village to generate electricity from a small, 10kW biomass plant, one of 11 such projects in Madhya Pradesh. Although the government funded 100 per cent of the capital costs, the project is managed by the local community, with some technical support from the local forest department. For instance, villagers are responsible for gathering biomass for the plant and collecting fees to meet the operating and maintenance costs.

In addition to the maintenance fee, there is a user charge, based on the amount of electricity and energy consumed. A village committee comprising 11 members, five of whom are women, has been constituted to oversee the operation.

The plant generates all the lighting for households, the school and streets, has enabled music systems and television to be installed in the village for entertainment, and supplies electricity for a flour mill, water pumping and a milk-chilling unit.

The project has helped stem migration from the area and has enabled a trebling of agricultural production due to the availability of water for irrigation. Milk is no longer spoilt by the extreme heat, so it has become marketable. This could possibly help in bringing in a village dairy system, which could mean further benefits. The setting up of a flour mill will mean that people can process wheat and rice and sell the flour at a higher price in the market. Last but not the least, this project has also led to a household water-piping system.

Traditional biomass (dung, wood and charcoal) continues to be used for cooking and heating purposes. It is possible that the existing system could be modified to ensure that gas is supplied for cooking purposes too. This would help avoid the respiratory illnesses caused by burning traditional biomass indoors.

Gosaba island, west Bengal

Gosaba island is one of the 54 inhabited islands (out of a total of 104) in the Sundarbans, a large mangrove forest region on the Ganges delta. Farming here depends almost completely on the monsoon and the area is low lying.

After independence, overall progress in the area remained severely hindered by the absence of conventional electric power due to geographical location, and because most of these places are separated from the mainland by wide rivers or creeks.

Electricity was available to only a few houses situated near specific shops or market places, generated and supplied for three-to-four hours a day by small diesel generators. Customers paid Rs4 a day per electrical point (typically a 40-watt bulb or tube light), which was a very high rate (the present rate is Rs18 per kWh, which works out cheaper). Kerosene lamps were the only source of light for many students studying at night.

A biomass gasifier power plant was commissioned on 20 June 1997 as a joint collaboration of the state and central government. It uses two fuels to generate electricity via gasification. The main fuel is biomass in the form of tree branches, twigs and bark (70 per cent). The support fuel is diesel (30 per cent). Diesel is used because when the plant was built the technology for generating power using only biomass was still not available. Local people called it the 'wood electricity' plant.

One of the reasons for the project's success was that locals were involved in decision-making from the very start. Door-to-door visits were made and briefings on different aspects of the project were given to the village *panchayat* representatives, who in turn discussed it with the local people. A series of public meetings raised awareness of the technology, its limitations, advantages, and the need for an energy plantation.

Concerned by the threat to their incomes, local diesel operators initially opposed the setting up of the power plant. But other members of the community undertook a vigorous campaign to promote the benefits of the new approach (which included the health benefit of cutting the toxic fumes from diesel generators). This dissipated the opposition to a large extent and some of the diesel operators were later employed in the plant.

The plant is locally owned and managed through the Gosaba Rural Energy Cooperative. This body was set up by the West Bengal Renewable Energy Development Agency (WBREDA) in 1996. Members of the village *panchayats* are on the board, which is one way of ensuring a good level of community ownership. The cooperative sets the tariff, advises WBREDA on where the power lines should go, and is responsible for collecting electricity bills from each household. It is a matter of pride that there have been no instances of electricity 'theft' or of defaulting on bills.

For the energy plantation, trees were planted on 71 hectares of low-lying riverbank silt beds (char lands). After three years, the plantation was fully established and providing a steady supply of wood to the plant. Additional biomass is supplied by local farmers.

This is a relatively large biofuel plant of 500kW, benefiting 3,027 households and a total population of 18,220.

The availability of electricity has allowed students to study at night and achieve better exam results. Small-scale factories have been established. These are using electric machinery to carry out boat repairs, welding, knife- and tool-sharpening and spice-grinding. An operating theatre is now functioning at the government health centre on the island. With the availability of refrigerators, it has become possible for the first time to store life-saving vaccines and medicines.

Electric pumps are now used for irrigation; people are able to watch sports and other programmes on cable television, which was not thought possible earlier; films are screened in newly established video parlours; a computer training centre has opened; and electric sewing machines are used to make fishing nets.

Gram Vikas projects, Orissa, India

Gram Vikas is an NGO and Christian Aid partner working on rural development in the eastern coastal state of Orissa. It operates in 21 of the 30 districts in the state, in a total of 732 villages.

One of their principal projects is the provision of a piped water supply and lighting for *adivasi* villages. Being remote, these villages are generally not connected to the grid. Gram Vikas' solution to the water-supply problem is to install standalone, renewable pumping systems, driven by solar power, gravity flow and biodiesel. In the case of solar and biodiesel, this is by pumping water from wells in the village; in the case of gravity flow, this is by directing water from wells or springs at a higher altitude to a water tower in the village. Under the scheme, each household is provided with a toilet and washroom and water is piped to these units as well as to taps installed in the kitchen and yard. If the project involves solar power, then lighting can also be supplied.

Measured purely in cost terms, gravity flow is the best option, followed by biodiesel and then solar power. The installation cost for each in three villages of a similar size was: Rs195,000 (£2,530) for gravity flow in Kerandi; Rs325,000 (£4,220) for biodiesel in Kichiling; and Rs500,000 (£6,490) for solar power in Chanabogodo. So far, Gram Vikas has installed 80 gravity flow systems – and the state government has been supporting this work.

Labour time is one factor that needs to be taken into account. The small-scale biodiesel projects require considerable labour input by villagers to succeed – for example, planting trees, harvesting the seeds or nuts, and then preparing the fuel (oil is extracted from the seeds or nuts and mixed with ethanol).

Gram Vikas previously supported biogas projects, which saw villagers using cattle dung to produce gas for cooking and lighting. This has made them aware of some of the maintenance challenges posed by this technology. Many of the biogas plants built in Orissa during the 1980s and 1990s fell out of use because people were not trained in how to maintain them, the upkeep was time-consuming and families did not keep enough cattle to produce sufficient dung for the plants. One advantage of Gram Vikas' current projects is that a maintenance fund is set up after the infrastructure is built. Every household makes a small contribution to the fund to cover the cost of future

Gram Vikas

Remote villages in Orissa that are too far from the infrastructure grid now get water pumped directly from wells using solar power

maintenance and repairs. One person in the village is nominated to operate the system. Gram Vikas' insistence on 100 per cent community participation increases the chances that the project will last.

Scaling up all these schemes, so that they cover whole districts, will of course require considerably more investment by government and donors. For example, in the case of solar power, the Orissa state government is subsidising some village lighting and water-supply projects. However, this support is not yet extensive enough to either pay for all the capital costs or transform the energy supply situation across whole districts. UNFCCC finance could be one trigger for a wider expansion of these projects.

DECENTRALISED ENERGY – A CLEAN CHEAP SOLUTION TO ENERGY POVERTY IN NIGERIA

Kato Lambrechts and John Chettleborough

Only about 25 per cent people in sub-Saharan Africa have access to electricity. In rural areas only one in ten people have the use of modern energy. Households and businesses that do have access to electricity often experience unreliable and sporadic supplies.

Energy poverty perpetuates and reinforces other manifestations of poverty. Millions of African women and children spend most of their time and energy collecting firewood instead of earning an income or going to school. Respiratory infections caused by indoor smoke pollution lead to a similar number of deaths in Africa to those caused by malaria and TB combined. The unsustainable exploitation of forest resources for fuel wood or charcoal is reducing the quality of arable soil. This, in turn, has led to lower agricultural productivity. In future, unless land-management practices improve, soil quality will be further degraded as a result of drying and flooding caused by global warming.

Given that Africa is responsible for less than four per cent of total GHG emissions, 1.5 per cent of which is emitted by South Africa alone, the development of clean renewable energy has not been the main priority of African governments. Instead, they have until now been preoccupied with meeting the pressing demand from their populations for a minimum level of modern energy services, mostly by focusing on reversing the persistent decline of their centralised power systems.

Given that they carry almost no responsibility for current GHG levels in the atmosphere, African countries should not be required to make any legally binding commitments for any future emissions reductions in a post-Kyoto climate agreement. Notwithstanding, the failure of centralised conventional forms of energy generation to even begin to address energy poverty in most of Africa, combined with new knowledge about the possible impacts of fossil-fuel-generated GHG emissions on future development in Africa, means that 'business as usual' is no longer an option.

Assessing alternative energy scenarios for Nigeria

The World Alliance on Decentralised Energy (WADE) has developed an economic model that compares the cost and GHG emissions for different energy generation scenarios. The model can compare the cost and emissions generated from different combinations of centralised and decentralised provision of energy services. Decentralised energy, according to WADE, is energy generated 'at or near the point of use, irrespective of the size, technology or fuel used'. Decentralised energy generation can be on-grid or off-grid. It includes:

- on-site renewable energy – for example, small hydropower or biodiesel generators fuelled by locally grown biomass
- high-efficiency co-generation – for example, the heat generated from agricultural by-products such as bagasse can be used by agro-based industries to meet their own power requirements
- industrial energy recycling and on-site power – for example, on-site gas turbines.

Decentralised energy technologies generate electricity where it is needed. Centralised generation, on the other hand, generates electricity in large remote plants and power must then be transported over long distances at high voltage before it can be put to use.

Renewable energy sources are abundant in Africa, and such technologies, when delivered 'on site', have a significant unexploited potential to help African countries meet their growing energy needs. Renewable decentralised energy technologies include:

- geothermal energy – the natural heat from the Earth's interior stored in rocks and water
- biomass energy – ethanol, biodiesel, gasification, heat co-generation
- solar photovoltaic panels
- roof-top/local wind turbines
- renewable energy-powered fuel cells
- thermal-based technologies – biomass-fired gas turbines, steam turbines.

Biomass energy in the form of fuel wood is already the dominant, albeit undesirable, source of household energy. If properly harnessed, decentralised renewable energy could meet a significant proportion of energy demand from the industrial, agricultural, transport and commercial sub-sectors in Africa, and end energy poverty, especially in rural areas.

Recent WADE research in Nigeria, commissioned by Christian Aid, has shown that renewable decentralised energy systems will be cheaper, cleaner and faster to develop and run than fixing or installing new, conventional centrally generated energy systems.[31]

Renewable decentralised energy systems will be cheaper, cleaner and faster to develop and run than fixing or installing new, conventional centrally generated energy systems.

A man washes the solar panels on the roof of the village business centre in Wawan Rafi, Jigawa state, Nigeria

WADE researchers collected data on existing energy generation capacity and technologies in Nigeria, as well the capital and retail cost of upgrading or developing new forms of energy delivery. They then developed three different energy future scenarios for Nigeria. The scenarios, outlined below, differ only in the share of renewable or non-renewable technologies employed to generate sufficient energy to meet future projected demand:

- Reference scenario: this is based on the government's existing power development plan, using mainly non-renewable, centralised energy technologies.
- Environmental scenario: environmental sustainability is the aim here. In this scenario the share of energy generated from renewable sources is larger than in the other two scenarios. The technologies used are small hydro plants, photovoltaic panels and biomass-generated technologies.
- Security of supply scenario: the aim of this scenario is the desire to secure future fuel supplies, particularly in view of oil price rises. Coal-fired and nuclear technologies form part of the energy technology portfolio in this energy future.

Each scenario considers the different cost, emissions and energy-efficiency implications of the way in which new generation capacity is developed. Although all three scenarios still rely heavily on fossil fuels – particularly natural gas – to generate electricity, the findings make a compelling economic and environmental case for the Nigerian government to prioritise investment in renewable decentralised energy in its future energy plans.

Compared to the current government centralised energy strategy, an environmental scenario with at least 40 per cent decentralised energy would lead to the following savings by 2028:

- 16 per cent on capital costs
- 25 per cent on retail costs
- 26 per cent on carbon dioxide emissions
- 24 per cent on nitrogen oxide emissions
- 43 per cent on sulphur dioxide emissions
- 28 per cent on particulate matter emissions.

Most of the cost savings occur from the reduced investment in the energy transmission network. On-site renewable energy also requires less fuel, further cutting costs, pollutants and GHG emissions.

Incentives for a green energy future

However, despite the recognition of their importance, renewable energy technologies have not attracted the requisite level of investment or policy commitment from African governments. Very little expenditure has been allocated to small- and medium-scale renewable energy technologies, especially those that can be delivered 'on-site', as compared to the conventional energy sector.

Given their ability to address energy poverty more cheaply and more cleanly than conventional energy generation, renewable energy technologies should receive priority funding under any new climate fund agreed in Copenhagen. Most renewable energy technologies – especially those that can be manufactured locally – require subsidies only in the initial stages, and can become financially sustainable in the short to medium term. Innovative financing programmes for renewable energy technologies could include the creation of a national fund for renewable energy projects to be accessed by communities and small cooperatives, as well as micro, small and medium enterprises.

SUSTAINABLE AGRICULTURE AND AGRO-FORESTRY

Some 2.7 billion people – almost half the world's population – still live below the US$2-a-day poverty line.[32] Those living in poverty are disproportionately dependent on natural resources for livelihood security. The natural environment provides people with basic products, such as food, fuel and water. Overall, natural resources provide roughly two-thirds of household income for the rural poor.[33] At national levels these goods and services account for 26 per cent of the wealth of a low-income country – disproportionately higher than the two per cent they provide to Organisation for Economic Cooperation and Development countries.[34] Agriculture, fishing and forests provide between 65 and 90 per cent of jobs in many developing countries.

The poorest people often live in places that already experience extreme climates – such as drought-prone sub-Saharan Africa or flood-prone Bangladesh – and are most vulnerable to climatic change. Reliance on climate-sensitive sectors – such as agriculture and fishing – is also high.[35] Therefore adaptation to climate change is absolutely vital. However, the ability of these countries and people to adapt is often lower than that of developed countries because of limited financial resources, skills and technologies and high levels of poverty.

Food and agriculture

In Africa over 500 million people depend on agriculture. In India this figure is 600 million. Global agriculture faces many challenges. Currently around 800 million people are at risk of hunger (about 12 per cent of the world's population), and up to two billion people lack food intermittently because of varying degrees of poverty.

A reduction in agro-biodiversity, degrading soils and declining agro-ecosystems and water scarcity place enormous strain on achieving food security for growing populations.

The IPCC predicts that over the coming century in the seasonally dry tropics, crop yield potential is likely to decline if the global temperature rises by even a small amount, which would increase the risk of hunger, famine and conflict, especially when coupled with reduced access to water.[36]

Forests and timber

Tropical deforestation is responsible for around 20 per cent of carbon dioxide emissions and has negative impacts on biodiversity, local communities and indigenous peoples, sustainable long-term economic growth, air quality and other environmental and socio-economic goods and services. Reducing tropical deforestation can contribute to reducing overall global GHG emissions and to staying below 2°C global warming.

With the livelihoods of 1.6 billion people dependent on forests, the annual global market value of forest products is US$400 billion. Each year US$10-15 billion is lost to the global illegal trade in timber.[37] Annually, 13 million hectares of tropical forests are cut down – that is around 36 football pitches every minute.[38]

The IPCC predicts that climate change will increase the frequency of forest fires and pests impacting on forestry. By 2050 it is predicted that tropical forest will gradually be replaced by savannah in the eastern Amazon, with some predictions of much more severe degradation of the Amazon by 2100.

While forest protection is often thought of as primarily a mitigation response, reduced emissions from deforestation and degradation can also have significant benefits for adaptation and sustainable development of forest-dependent communities.

Freshwater access

The IPCC 2007 report highlighted water resources as a sector that would be one of the most heavily impacted by climate change and identified it as a priority concern for poverty elimination – especially for many of the world's poorest and most vulnerable countries. It is clear that many of the economic and development consequences of climate change will involve water – including melting glaciers, rising sea levels, droughts and heat waves. A lot of these effects are already evident, although the global temperature is only 0.8°C above pre-industrial levels.[39]

Changing precipitation patterns have already affected water supplies and agricultural productivity. Increasingly heavy rain is falling on the mid- and high latitudes of the northern hemisphere, while rains have decreased in the tropics and subtropics of both hemispheres. Surface water storage could decline as extreme rainfalls and landslides encourage silting and thus reduce reservoir capacity. These impacts will increase existing pressure on freshwater supplies.

The Hadley Centre predicts that by 2100, if significant mitigation does not take place, around half of the planet's land surface will be liable to drought.[40] Some less developed countries are likely to be severely affected. Africa, South America and parts of southeast Asia are likely to see worsening conditions.

It is clear that many of the economic and development consequences of climate change will involve water – including melting glaciers, rising sea levels, droughts and heat waves.

Marinduque, the Philippines: After it was nearly destroyed by a mining disaster in the 1990s, Ronaldo Malitao's fishing livelihood continues to be threatened by severe and frequent typhoons

Christian Aid/Amanda Farrant

Coasts and marine fisheries

Coastal zones and small islands are extremely vulnerable. Coasts have often been modified and intensively developed and are very vulnerable to higher sea levels, which could damage key economic sectors. A sea level rise of just two centimetres – well within current estimates – would displace two million people from the Nile delta, an area which is currently Egypt's agricultural heartland. A great deal of food is produced in coastal areas, making fisheries, aquaculture and agriculture particularly vulnerable. The IPCC predicts that a temperature rise of over 2°C will diminish fish stocks due to acidification and decline in coral reefs, and cause regional changes to distribution and production of particular fish species, adversely affecting fisheries.

The case studies in this chapter demonstrate that community responses to agriculture, fisheries and agro-forestry can be part of the adaptation and mitigation response to climate change.

How NGOs are promoting more sustainable fishing practices in the Philippines

There are already many examples of southern hemisphere NGOs promoting sustainable natural resource management strategies that are socially equitable, economically viable and sensitive to the environment. For example, Filipino NGOs working with fishing communities use an approach called community-based coastal resource management (CB-CRM). This system seeks to resolve disputes over access to fisheries and other coastal resources by assigning 'use rights' to different economic interests – with particular attention being paid to the interests of small, 'municipal' fishermen. The use of legally recognised local bodies, such as municipal fisheries and aquaculture resource management councils, is also promoted as a way of reducing conflict between users – for example, between communities or between small fishermen and commercial fleets.

There is still some way to go before these mechanisms can reverse the overall situation of declining stocks in coastal waters – this will depend on a higher level of government support and also policies to tackle some of the causes of declining stocks that are outside the powers of local groups (such as the encroachment of municipal waters by commercial vessels and pollution from mining). However, CB-CRM does offer the chance to integrate sustainability into government and community planning. It also provides an analytical lens through which different threats, including climate change, can be assessed and managed.

SUSTAINABLE FARMING IN WEST BENGAL

Ben Hobbs and Richard Ewbank

Established in 1982, Christian Aid partner Development Research Communication and Services Centre (DRCSC) works in 12 districts of west Bengal to promote food and livelihood security among the rural poor. It has created a network of autonomous area resource and training centres (ARTCs), which provide training and support for groups of farmers. Through these centres, farmers learn about sustainable farming methods that are both environmentally friendly and economically viable. As will be seen, the methods also appear better suited to the changing climatic conditions in the state than conventional approaches, characterised by intensive rice monocropping.

The network consists of 17 ARTCs, 12 of which are now fully autonomous. Each centre is the focal point for several farmer groups from different villages. These groups are self-selecting and typically number 15 to 20 farmers. The centres also offer training for farmers not involved in the groups, conduct research, manage loan schemes and establish linkages with the local *panchayats*.

Farmers in west Bengal have reported a number of changes to the weather and the seasons in recent years. One of the most significant is that the monsoon has become more erratic: it is sometimes starting earlier – in April or May rather than June – and there is often a long dry spell in the middle. Rainfall during the monsoon season (June to August) has also become heavier and lasts for longer – typically six-to-seven days rather than the one-to-two days seen before. All this has had an effect on farming: normal crop-planting cycles have been disrupted; crops are no longer benefiting from regular (but lighter) rainfall and are increasingly affected by the heat during the dry spells; and farm work has become more difficult during the prolonged periods of rain. In Birbhum district, for example, rice yields have dropped by 0.3 tonnes per acre (from 1.8 to 1.5) as a result of the heavy rains. Some of the other observed climatic changes are:

- a shortening of spring and autumn
- hotter summers (April to June): with temperatures now reaching the 40s compared to the high 30s before
- an increase in the number of hailstorms, which are particularly damaging to crops
- warmer winters (December to February): with temperatures no longer dropping below 10°C
- diminished harvest rains in October and November
- more frequent and intense storms along the coast.

In coastal areas – for instance in the Sundarbans, a large coastal mangrove forest located on the Ganges delta, salt water intrusion into agricultural land is being exacerbated by a rise in sea level (another factor is water-logging caused by salt water breaching flood defences). Salt deposits in the soil reduce yields of rice, fruit and cash crops, such as chillies.

DRCSC and the local centres are promoting a range of 'integrated' farming methods which have at their core the principles of sustainability (both economic and environmental), diversification and income generation. Although not originally conceived of as a response to climate change, it turns out that these methods also help farmers to adjust to some of the climatic changes described above. Table 1 presents some of the methods and their main benefits. It should be pointed out that these approaches have been introduced successfully in different agro-ecological zones of west Bengal (coastal, upland and lowland), and are therefore relevant to more than one zone.

By adopting these methods, local farmers have been able to enhance their food security and resilience to climate change, while minimising the negative impacts on the environment. As such they offer a viable alternative to chemical-dependent rice farming. As the table shows, each measure usually brings multiple benefits: for instance, diversifying crops improves diet, raises yield and income (as the example of maize shows) and has an additional adaptation and mitigation benefit.

DRCSC and its centres currently face three main challenges. First, they need to ensure that their livelihood models are climate-proofed to the extent that they are not just appropriate responses to the climate change experienced over the past five to six years, but to the likely future climate change expected over the next ten to 15 years. Making this move from reactive to forward-looking adaptation will be possible only if area-specific information on future climate trends becomes available and can be built into local plans.

The country's meteorological services and state and central government have an important role to play in generating this data and disseminating it downwards. Donors could assist in this process – for example by sharing climate science know-how and best practice (as done by the UK Met Office's PRECIS climate-modelling system). A second challenge is to improve farmers' access to daily and seasonal weather forecasts, to enable them to make more informed decisions on when to plant crops or prepare for extreme weather events, such as heavy rains, floods and storms. At present, farmers either do not have access to television or radio forecasts, or do not find the information useful enough.

By adopting these methods, local farmers have been able to enhance their food security and resilience to climate change, while minimising the negative impacts on the environment.

A third challenge is to maximise the benefit of DRCSC's integrated farming model through scaling up. This could be done both through the ARTCs and adoption by other organisations (both NGOs and the public sector). The goal must be to demonstrate to policymakers the model's efficacy on a range of fronts including how it: delivers yields that can compete with conventional agriculture; enhances food security; is a useful adaptation and mitigation tool; and is in tune with the local environment. Donors could support this process by funding research on the benefits of sustainable farming techniques and stepping up the general level of aid going to projects of this kind in India and other developing countries.

Table 1: Integrated and sustainable farming methods promoted by DRCSC in west Bengal and their main benefits

Method	Main benefits
Integrated farming (rice; fish; duck; azolla) using ponds or ditches	Fish provide a valuable protein source for households; natural pest and weed control reduces reliance on external inputs; supply of organic manure and fodder; exchange of nutrients between ducks and fish; water from ponds/ditches used to irrigate vegetable plots and crops during dry periods.
Seed banks	Enable farmers to switch from costlier hybrid varieties; preservation of biodiversity.
Grain storage facilities	Improved food security, especially in the 'hungry' September–November period.
Vegetable 'nutrition' gardens	New source of food with a high nutrition value; household organic waste gets recycled; additional income source.
Diversification/mixing of crops such as millet, groundnuts, maize	Lowers the risk of a complete crop failure, as some crops are better suited to the 'new' climate – for example, maize copes better with erratic rainfall and is higher yielding than rice (1,200 kg/acre compared to 950 kg/acre); dietary benefits; lower methane emissions than wet rice cultivation.
Intercropping and crop rotation	Improves soil fertility; requires less water/fertiliser; extends farming season.
Use of indigenous rice varieties (including saline-tolerant varieties in coastal belt)	More resistant to pests and drought than hybrid varieties; also fare better in waterlogged and/or saline soils.
Community-managed loan and savings schemes	Helps farmers meet the initial costs of diversification; households avoid going hungry during lean season.
Degraded land restoration and cultivation – for example, bunding, tree planting for firewood and fruit	Enables cultivation of previously unused land; additional firewood and fruit.
Reforestation of river banks	Protects against floods and river erosion.
Poultry farming	Food and income source; reduces dependence on a single livelihood system.
Trellis gardening	Enables more crops to be grown on the same amount of land, with less energy and water.
Reduced use of chemical pesticides and fertilisers; replacement with organic alternatives, such as neem (a natural pesticide) and vermicomposting	Lower GHG emissions; benefits for human health and local environment; cost savings; improved soil quality.
Summer planting of supplementary crops	Helps avoid crop damage caused by soil salination in winter.

SOCIAL TECHNOLOGY TRANSFER THROUGH LOCAL PARTNERSHIPS IN BURKINA FASO

Bina Desai, Rachel Baird and Cristina Ruiz

The biggest challenge

The biggest challenge for climate change adaptation will be to make real progress at the local level: to ensure that communities are able to cope with and adapt to climate change on a much wider scale. To make real progress we will need to build on existing local knowledge and capacity that can be mobilised cost-effectively.

Years of efforts to reduce vulnerability to disasters teach us one clear lesson: communities are more successful in protecting their lives and developing their livelihoods when they work together in close partnership with governments and civil society sectors. These partnerships ensure that resources and skills are pooled, optimising outcomes.

For example, in Burkina Faso, the process of assessing community vulnerability and capacity in a participatory manner, involving local government representatives and experts, CSOs and communities themselves, resulted in the transfer and pooling of expertise that can now be used for joint action.

Burkina Faso is one of the least developed countries in the world and the majority of its people rely on agriculture and livestock for a living. Located in the Sahel region of Africa, northern Burkina Faso has long been a dry area. But recently, rapid population growth, overgrazing and deforestation are making its soils even less fertile, quicker to dry out and prone to erosion, turning parts of the country into desert. Climate change is exacerbating these already serious problems, leading to a severe decline in rainfall and an increase in seasonal variability.

Despite a lack of climate data and therefore sure predictions of climate variability in the country, the trends are clear: rainfall is expected to decline substantially, but overall figures mask important seasonal variations. Rainfall is forecast to fall by 20 to 30 per cent during the dry season months of July, August and September, and to increase by 60 to 80 per cent during November.

The IPCC also suggests that very dry years, as well as very wet years, will become more common in the Sahel region this century. This is consistent with the frequent floods and droughts with which Burkina Faso is already struggling.

The decline in rainfall has caused serious problems for people in the north, most of whom grow their own food and depend on rain to water their crops. Without the right amount of rain at the right time of year, their crops are damaged or destroyed, leaving them struggling to feed their families. As a result, half the rural population suffers from food insecurity.

How are people adapting to climate change?

People have been adapting to the climate in Burkina Faso for decades. For more than 50 years, a common and immediate way of adapting to the challenging situation in the north has been to migrate to the more hospitable south of the country – or into neighbouring countries. However, not everybody wants to and can migrate, and life has become tough for those remaining in the region.

Reseau MARP (RM), a Christian Aid partner in Zondoma province in the north of the country, supports local communities to make a living under these harsh conditions. While RM helps communities to respond to crises such as droughts and floods, the main aim is to build people's ability to withstand such crises and adapt to an ever-changing environment in the long term.

Zondoma province has one the highest population densities in the country: even in a good year, with adequate and timely rains, local cereal production covers only 65 per cent of consumption needs. Realising that merely responding to hunger and food insecurity during times of drought again and again was not sustainable, RM became part of a global Christian Aid project on building disaster-resilient communities. The project aims to build the ability of people to protect themselves and their livelihoods, and to enable them adapt to climate change.

Starting to rethink

In Zondoma province, RM started by taking a step back and letting the people themselves reflect on their experiences and express their views. Most importantly, RM began the process by involving not only community members, but also local government representatives and relevant experts from both civil society and government bodies. Jointly, these groups analysed current and possible future risks and the resources and assets that existed in the area.

This process – called participatory vulnerability and capacity assessment (PVCA) – can be, if done well, empowering for all people involved. Moreover, the joint reflection and discussions stretch over several days, meaning that a whole range of information and knowledge is shared across

Those involved often express surprise and pride at how much collective knowledge exists.

Christian Aid/Sarah Filbey

Typical Burkinabe living compound in Gourcey, a community at the gate of the Sahel desert in Zondoma province, Burkina Faso

the group that otherwise tends to remain with specific individuals, families or organisations. Those involved often express surprise and pride at how much collective knowledge exists.

Turning knowledge into action

During the final stage of the process, the groups develop a joint action plan, identifying collective and specific actions and clarifying the roles and responsibilities of all involved. Many such actions require little additional resources but build on and improve existing practices and technologies.

For example, assessments in several villages of Zondoma province revealed that farmers were building small depressions in the soil, called *zai*, in which they plant their crop seeds to ensure they have adequate water and nutrients. Digging the zai is very labour intensive and takes up a lot of a farmer's time before the planting season. During the assessments, communities highlighted the lack of labour as a key constraint to growing enough crops and therefore to food security. As a result, RM is introducing a mechanical system to digging zai, reducing the time

'We are sitting on dry soil. It looks dry but in fact it is full of water beneath. It is this water which is keeping the trees alive.'

Ally Ouedraogo, farmer, Burkina Faso

dedicated to this task from 300 hours per hectare to a maximum of 90 hours. As part of the project, 120 farmers will be trained in the technique and receive the tools required.

There are many similar local techniques, such as rock belts (low rock walls to stop soil erosion) that, with a little improvement, can go a long way in helping people to protect their income and further develop their livelihoods.

Farmers who have implemented such techniques become passionate advocates for them. Ally Ouedraogo, aged 79, a farmer who has been building rock belts on his farm near Gourcy in the northeast of the country, says: 'Since I surrounded my land with rock belts, I can keep a lot of water in my farm. Consequently, no trees died since that time.' Patting the bone-dry soil on which he sits, he adds: 'We are sitting on dry soil. It looks dry but in fact it is full of water beneath. It is this water which is keeping the trees alive.'

Is this enough?

While these actions and numbers seem small in comparison to the levels of food insecurity in the country, they are important examples of how small changes in local practices have the potential to substantially improve the food production and income of farmers with benefits for the wider community. In order to scale up such innovations, the technology and knowledge will need to be shared more widely. Because RM involved a whole range of people in the assessment process, local government staff in the area are now aware of the practice and can get involved in transferring the technology to other communities.

However, in many cases there is a need for further support from local and municipal administrations, and communities need to be better equipped to assert their rights and lobby governments to provide the services to which they are entitled. Therefore, awareness of what these rights are and what services are or should be available are key factors for progress. Where communities have undergone the process of PVCA with the facilitation of organisations and individuals who are able to make these connections and create this awareness, they have often been able to create good relationships with local governments. Also, organisations involved in the process find it enables them to start engaging in a different form of advocacy: aiming for longer-term policy changes rather than just immediate services.

Given the urgency, adaptation to climate change has to progress on a significant scale and at a fast pace. As the impact of climate change is felt most negatively by communities in low-income countries, such progress can only be made at the local level. The above example has shown that local initiatives that create partnerships between government, communities and civil society are important catalysts for long-term change. Such initiatives, however, are currently small in number and scale. They need substantial additional investments.

Therefore, adaptation funding needs to be directed to local levels: where adequate and transparent governance structures exist, through national and local government; otherwise directly to CBOs and civil society. To support this, funding targets need to be established for local and community-based adaptation and DRR work. Tracking systems for adaptation funding for and from national governments should also be developed in support.

PROTECTING FORESTS AND LIVELIHOODS IN THE AMAZON

Lúcia Andrade

Within the Brazilian Amazon, in the municipality of Oriximiná, are located 33 quilombo communities formed by descendants of black slaves – known as Maroons – who, in the 19th century, fled from farms to the forests, where they remained even after the official abolition of slavery.

These populations persist today as social groups whose ethnic identity is distinct from the rest of society. This gives them social cohesion, geared to their political action and their economic decisions. It is estimated that there are more than 3,000 such communities spread across all regions of Brazil, mostly in rural areas.

In Oriximiná about 8,000 quilombo are spread over seven ethnic territories with a total area of 6,800 km² of tropical forest. This has resulted in the preservation of a lifestyle of a people who, for almost 200 years, have used the resources of the forest in a sustainable way, prioritising the extraction of non-timber products as a source of income.

Products extracted from their territories are used not only as food but also to build their homes, in the production of tools and for medical purposes. The main source of income for the quilombo of Oriximiná is the extraction of Brazil nuts. This activity is part of their tradition and dates back to the time when the slaves were the first quilombo fugitives.

Like other indigenous peoples, the quilombo conceive their territory as a common good that cannot be divided or sold. Their ethnic territories represent one of the pillars of their existence as a group. Therefore, legally securing their territory ensures not only their physical survival but also their culture and way of life.

Twenty years have passed since the Brazilian state recognised the existence of contemporary quilombos and assured them of their constitutional right to ownership of their lands. However, until today, the number of communities with land securities represents only five per cent of the total existing in Brazil: 157 of a total of 3,000 communities.

The quilombo of Oriximiná were the first in Brazil to receive collective title to their land in 1995. Half of the area occupied by the quilombo Oriximiná is legally registered in their name. Currently they are owners of 3,618km² of Amazon forest – which represents 38 per cent of the size of all land held by the quilombo in the country.

Quilombo communities experience profound socio-economic inequality and racial discrimination, which makes them very vulnerable. The integrity of their territory is being threatened by the action of agrobusiness, timber exploitation and mining, as well as development projects. Climate change and its consequences represent another challenge to face.

Brazil context

Deforestation in the Amazon has taken place at an alarming pace. More than 70,000km² were lost between 2002 and 2005 alone. If the current pace of deforestation is maintained, a significant part of the six million km² that make up the Amazon forest will be transformed into savannah in the next 50 to 100 years. The risk of losing the potential wealth that could be generated from the sustainable biodiversity of the Amazon remains, and will worsen in the context of drastic changes in the global climate system.

Deforestation is responsible for 75 per cent of Brazilian carbon emissions. Fires in the Brazilian Amazon constitute the fourth largest emitter of GHG in the world and destroy much of the national biodiversity.

On a global scale, deforestation of tropical forests is the second largest source of GHG emissions. It is responsible for 18-25 per cent of global emissions, second only to the emissions caused by the use of fossil fuel energy.

The population of the Amazon is already experiencing the effects of climate change. In 2005, exceptional heat caused the worst drought in decades in the Amazon, leaving communities without water and food. Navigation was suspended in several areas. Destruction by forest fires increased by 300 per cent in the month of September. The rain only returned in October.

Months later, the Amazon was exposed to other climate extremes. Very intense rainfall at the beginning of 2006 caused a strong flood that invaded the homes of thousands on the riverside. Older residents say that they had never seen such a great drought followed by a 'deluge'. Climate change now threatens the system of Amazonian rivers, whose water levels rise during the rainy season and fall during the dry season.

Threats to the quilombo

Like the other traditional populations of the Amazon, the quilombo of Oriximiná face the consequences of global warming and need to prepare for the process of adaptation to this new reality.

The quilombo of Oriximiná also face a series of attacks

The quilombo communities of Oriximiná are among the traditional peoples of the Amazon who may have a strategic role in the protection of forests and the reduction of global warming.

against their territory, without any effective support from the Brazilian government in the surveillance and protection of these areas. Among the various threats is the assault on timber. Because of the depletion of productive capacity in neighbouring regions, the timber industry is now pursuing interests in the region of Oriximiná and, more particularly, in the quilombo territories. Throughout 2008, the quilombo were repeatedly approached by companies interested in exploring the potential of the timber in their territories, but ultimately rejected the partnership.

Other threats come from mineral exploration. Oriximiná is located in an area which has the largest reserves of bauxite in the country. Brazilian mining company Mineração Rio do Norte has operated in the region since 1979 and is currently the largest domestic producer of bauxite. The company has plans to expand the extraction area, reaching territory occupied by quilombo communities. Furthermore, the quilombo still experience serious difficulties in achieving fair prices for the nuts that they extract sustainably from the forest. Extractive activities ensure the livelihoods of artisanal communities, but generate much lower incomes than are required.

Potential solutions

Preventing the destruction of the Amazon should be Brazil's main contribution to the battle of reducing global warming. The Amazon rainforest stores carbon equivalent to a decade and a half of global anthropogenic emissions and, therefore, has a key role in regulating the global climate. The Amazon is also a priority for global conservation of biodiversity.

The latest IPCC report states that about 65 per cent of the total mitigation potential is located in the tropics and 50 per cent of this potential is associated with reduction of deforestation. The IPCC states, further, that the protection of forests can provide other benefits – such as job creation, increased income, conservation of biodiversity and water sources – and can contribute to the production of renewable energy and to reducing poverty.

Most of the difficulties in controlling deforestation stem from the lack of resources for enforcement and programmes that put a monetary value on the living forest. Therefore, there is a large movement by NGOs, experts and governments to define and implement mechanisms that are capable of giving value to the forest peoples and recognise their contribution to environmental services.

This process must recognise the importance of traditional populations. According to Christian Aid partner Instituto de Pesquisa Ambiental da Amazônia (IPAM), in the Amazon, the one million km^2 of indigenous and extractive reserves store 15 billion tonnes of carbon. IPAM also claims that while just one per cent of the conservation units of integral protection and indigenous lands has been deforested, this rate is 20 per cent in the rest of the Amazon.

The quilombo communities of Oriximiná are among the traditional peoples of the Amazon that may have a strategic role in the protection of forests and the reduction of global warming. For this, however, it is essential to guarantee the rights of quilombo communities. This includes recognition of:

- their right to their land and natural resources and the traditional uses of their forests
- their role in forest conservation and in combating global warming
- the need to ensure their participation in the definition of public policies on climate change mitigation
- their right to prior consultation and to be kept informed of all decisions that involve legislative or administrative measures able to affect them directly.

Quilombo communities also require promotion of:

- rapid agrarian regularisation of their lands
- involvement in the supervision and protection of their territories
- alternative ways of generating income in a manner which is ecologically and economically viable
- social policies of investment in public services (education and health)
- initiatives to assess and mitigate the impacts of climate change for this population
- planning a national policy for environmental services (a mechanism for avoiding deforestation) with participation of traditional populations in a way that benefits them.

CONSERVATION FARMING – CLIMATE-PROOFING AFRICA'S DRYLAND SOILS

Kato Lambrechts

Climate scientists confidently predict that the world's oceans will continue to heat up as a result of human-induced GHG emissions. The nature of atmospheric circulation over eastern and southern Africa makes the regional climate highly sensitive to small changes in the global climate. Droughts and flash floods will become more frequent, temperatures hotter and rainy seasons shorter, a continuation of trends already evident since the early 1990s. Economists predict that yields in southern Africa could halve by 2080 as a result, causing a further six million people to go hungry.[41]

The natural resources vital to the livelihoods of Africa's 600 million micro-scale farmers – soil and water – are the most sensitive to these predicted changes in weather patterns. Food and livelihood security on the continent demands a new approach. Donors and humanitarian agencies need to move away from their focus on food and input distribution and instead address the root cause of much of Africa's poverty – unsustainable and unprofitable agriculture. Unless there is an urgent effort to help farmers adjust their soil- and water management practices in response to climate change, the continent's diverse ecosystems will become unable to provide them with sufficient food and income.

Between 60 and 80 per cent of working adults in Africa grow crops or graze cattle to earn a living, often on very small plots of land. They are no strangers to enormous risk, given that the health and productivity of their crops and cattle have always been dependent on rainfall patterns. The numerous stresses they already face – such as income poverty, living with HIV, low soil fertility, and the inability to sell their surplus crops or cattle for a fair price – deepen their vulnerability to weather shocks. Since the early 1990s, for example, a combination of irregular droughts and floods in eastern and southern Africa has triggered a three-fold increase in the number of food crises. Their inability to grow enough food and earn sufficient income from crops or cattle have driven households to coping strategies that further degrade the natural resources on which they so crucially depend for their livelihoods, creating a vicious cycle of poverty, in which they remain trapped today.

Although farmers in Africa have built up a wealth of strategies to adapt to irregular weather patterns over centuries, the predicted intensity and speed of changes in future weather patterns will require outside assistance to help them adjust. Regrettably, the flash floods and dry spells experienced in recent decades have not prompted large-scale and sustained changes in land management practices; instead it has led to further erosion and depletion of already infertile soils.

Soil structure degradation and water stress are problems that those living in the Sahel and parts of southern and eastern Africa have been familiar with for many decades. Forty per cent of all arable land in sub-Saharan Africa is located in semi-arid or dry areas. Added to this, as little as ten per cent of the total rainfall is actually used by crops – the rest drains away, evaporates or runs off. Sustainable land management practices have been proven to successfully revive degraded soils and retain soil health. Nevertheless, until now, governments and donors have committed very little financial or political support to scaling up the implementation of sustainable land management by farmers.

'Business as usual', however, is clearly no longer an option. The extreme vulnerability of most of Africa's rural population to erratic weather patterns requires scientists, politicians and development practitioners to step up their collaboration with farmers to help them re-build or protect climate-resilient ecosystems through sustainable agricultural practices. Without this, their livelihoods are at risk of disappearing.

Conservation agriculture: building resilience to dry spells and droughts

Conservation agriculture comprises a set of sustainable land management techniques that rebuild soil structure over time. This, in turn, maximises the infiltration of rainwater into the soil and increases its water-holding capacity. Crop roots, therefore, have more water available and can better absorb it. As a result, crops can survive sustained periods of excess rain or drought. Improved soil structure also increases the ability of the soil to build up organic soil carbon, which would otherwise have oxidised, causing further global warming.[42] Poor internal soil drainage and compaction also cause significant emissions of GHGs such as nitrous oxide and methane – both more potent GHGs than carbon dioxide. Conservation agriculture therefore helps farmers not only to mitigate and adapt to climate change, but also to revive degraded soils.

Conservation agriculture encompasses a set of very simple social technologies. It requires careful planning and working with the local ecosystem. The exact practice varies depending on the local ecology, but it is based on the following basic principles:

Farmer Albert Nkomo overlooks his green fields in the drought-prone province of Matabeleland, Zimbabwe. Like many farmers, he has seen a huge improvement to his crops since adopting conservation farming and soil fertility management techniques

- minimum soil disturbance (no ploughing or tillage)
- maximum soil cover to retain moisture through mulching
- stimulating biological activity in the soil by mixing and rotating crops
- precise planting operations
- efficient use of labour, time, seeds, fertiliser and water.

In recent trials, farmers in the dryland areas of Tanzania, Sudan and Madagascar increased crop yields by 200 per cent when using conservation agriculture techniques combined with soil fertility management. The yield differences between conservation and conventional farming in these trials were greatest in the driest years.[43] Farmers who have adopted these techniques in southern and eastern Africa have seen a huge improvement in the resilience of their crops when compared to agricultural and meteorological droughts.

Learning from successful adaptation in Zimbabwe

In the Matopo area of Matabeleland South, a semi-arid zone of Zimbabwe, the rainy season used to start around October and last until April or May. However, in recent years, the first rains have started arriving later – often in November or December – and have sometimes only lasted until February or March. Most of central southern Africa, and large parts of eastern Africa, are predicted to experience similar changes, becoming drier and warmer, with shorter rainy seasons.

The Copenhagen agreement needs to ensure sufficient funding to help African farmers rebuild soil structure. [If that happens] Africans will be able to feed themselves instead of relying on food aid and imports, and the next generation will inherit the most prized asset of all: fertile soil.

Communities in the semi-arid areas of Zimbabwe generally make a living from rearing cattle and planting crops. Although they have lived with drought for many generations, older farmers all report that the rainy season has become shorter and growing crops harder. Nevertheless, farmers using conservation agriculture techniques in recent years have managed to increase their yields.

Since 2005 Christian Aid partners in Zimbabwe have been working with communities in a number of districts to introduce them to conservation agriculture techniques. Farmers use open pollinated varieties of seeds, which means they can re-use the seeds for up to five years. Most projects started small, training fewer than 100 farmers. By 2009, however, at least 5,000 farmers have been trained, mostly by their peers. Farmers are reporting increases in yields of sorghum, millet and maize from an average of about 0.5 tonnes to between three and four tonnes per hectare. Exceptionally, some farmers are even reporting yields of up to eight tonnes per hectare.

Many farmers are single mothers or families affected by HIV. They farm between 0.5 and one hectare of land, and they find this technique much less labour-intensive than ploughing. Although digging precisely spaced planting holes is hard work when first preparing the land, holes can be dug over several months before the rainy season, and families often get help from members of the community. Once the holes are dug, they only need to be retouched for the next planting season. Farmers have no access to artificial fertiliser, and generally use liquid manure, mulch or legumes to supply nitrates to the soil. When using manure, they place small amounts near the roots of the growing plants in each hole. By intercropping and rotating maize, which is more nutritious, with drought-resistant indigenous crops such as millet and sorghum, farmers stimulate biological soil processes, helping nutrients to build up over time. Crop residues are used as mulch to trap moisture in the soil, control weeds and maintain cooler soil temperatures. When broken down by insects, the mulch cover also fertilises the soil.

How can conservation agriculture be scaled up?

Conservation agriculture techniques require small-scale dryland farmers to change farming practices previously learned from outsiders. These changes include preparing planting holes long before instead of after the first rains arrive; using crop residues as soil cover instead of cattle feed; and using precise measurements. To do so, they need support from fellow farmers, researchers and extension workers. This, in turn, requires governments and non-profit service providers to scale up and improve the quality of agricultural advice and research they provide and to tailor these to the specific requirements of each agro-ecological zone.

Therefore, the major investment needed to help small farmers adopt conservation agriculture techniques is public funding to expand and improve currently depleted government extension services, or other non-profit agricultural service providers. Farmers need initial and follow-up advice and demonstration of the techniques from both extension workers and fellow farmers. They also need more and improved assistance from national agricultural researchers to help them breed seeds that are adapted to the local climate, understand local soil structure, manage soil fertility through natural processes, and adapt general conservation principles to their specific agro-ecological context.

At present, most donor and government initiatives to support smallholder farmers in Africa are pouring money into supplying them with inputs such as inorganic fertiliser and hybrid seeds, in an effort to help them increase yields. However, not only are oil-based fertilisers unaffordable and polluting; they do not work unless there is a minimum amount of moisture in the soil and their composition is precisely tailored to the type of soil.

Blanket fertiliser application will not build soil structures that are resilient to the unavoidable drying and warming of eastern and southern African drylands. On the contrary, many inorganic fertilisers can actually reduce soil fertility, especially if used incorrectly.

Almost three-quarters of Zimbabweans live in rural areas. Farming and cattle-rearing are their main means of earning a living. They, and the millions of micro-farmers living in drylands across Africa, need to be compensated for the additional stress of unavoidable climate change. The Copenhagen Agreement needs to ensure sufficient funding for more and better public research and extension services to help farmers rebuild soil structure. This, rather than chemical inputs and transgenic seeds, will build resilience to climate change in a sustainable and cost-effective way, and at the same time double or treble yields. In turn, farming will become a viable livelihood again, Africans will be able to feed themselves instead of relying on food aid and imports, and the next generation will inherit the most prized asset of all: fertile soil.

CLIMATE CHANGE RESILIENCE

Between 1995 and 2004 a total of 2.5 billion people were affected by natural disasters, which caused 890,000 deaths and US$ 570 billion worth of losses. Three-quarters of all recorded natural disasters are related to weather extremes such as wind storms, flooding and drought. Of particular concern is the fact that disasters and, in particular, climate-related disasters, have been increasing over recent decades.

More than 250 million people are directly affected by desertification and one billion people are at risk. These people include many of the world's poorest, most marginalised and politically weak citizens.[44] By 2010, the UN estimates that there could be as many as 50 million refugees as a result of the effects of environmental deterioration. But the human cost is incalculable: some 135 million people – the combined populations of France and Germany – are at risk of being displaced.[45]

The main reasons for this include increased populations living in hazard-prone areas, unplanned settlements and environmental degradation. Climate change is increasing the strength of hurricanes and cyclones, the frequency of drought and flooding episodes, the occurrence of higher rainfall intensities and the severity of heatwaves. However, it is also altering the face of risk management, not only through increased climate-related disaster risks, but also through the slower onset of long-term changes in climate trends, such as changing seasonality, sea level rise and temperature change, which increase vulnerability through incremental stresses on water availability, food security, health and ecosystems.

The scale and complexity of climate change and the multifaceted challenge it presents to development as a whole requires a shift in the strategic approach to poverty reduction and livelihood resilience. Climate change adaptation, environmental sustainability, DRR and long-term sustainable development share a common area of concern: reducing the vulnerability of communities and achieving sustainable development.

DRR must be a key component of adaptation to climate change and needs to be a major part of all development policies and programmes. Development agencies should strengthen the capacity of local and national governments in developing countries to integrate climate change adaptation and DRR measures in relief, reconstruction, development programming and poverty reduction plans. This will require the integration of disaster risk management into national development strategies (especially the PRSPs) and ongoing planning processes.

It is essential in planning climate change responses to consider the implications for the wider environment, the inclusion of people with low incomes in the benefits of the programmes, and minimising the negative impacts on marginalised populations.

The case studies in this section demonstrate how local communities can work alongside climate scientists to better understand and respond to the impacts of climate change to achieve climate change resilience.

REDUCING RISK AND ADAPTING TO CLIMATE CHANGE IN CENTRAL AMERICA

Richard Ewbank

Central America is vulnerable to a variety of both fast- and slow-onset climate changes, the most well known being the regular occurrence of hurricanes. Although there is no clear trend in the annual numbers of tropical hurricanes, based on a range of models, it is likely that future hurricanes will become more intense, with larger peak wind speeds and increasingly heavy precipitation. Predictions of average rainfall are less certain, but the trend since 1960 in Nicaragua has been a decrease of five-to-six per cent of average total rainfall per decade. Despite the decreasing trend in total rainfall, the proportion that occurs in 'heavy' events has increased, with the observed maximum one- and five-day rainfalls showing significantly positive trends. Increasingly erratic rainfall patterns, coupled with rising temperatures, will impact negatively on both staples such as maize and export crops such as coffee, reducing productivity and increasing soil erosion. Downstream siltation of river systems (as seen in the River Lempa) increases the likelihood of floods and reduces the effectiveness of flood protection measures. In 2005, Hurricane Stan destroyed 50 per cent of the coffee crop from the area near the Llamatepeque volcano in Santa Ana, El Salvador, representing five per cent of the total national coffee crop. In lowland coastal areas, a sea level rise of 13-55cm by 2015 will erode protective mangrove forests and increase the risk of inundation from storm surges.

With a history of vulnerability to tropical storms and cyclones, Christian Aid partners in both El Salvador and Nicaragua have supported risk reduction and adaptation at both local government and community levels. In El Salvador, Unidad Ecológica Salvadoreña (UNES) has been working with the municipality of San Francisco Menéndez, on the border with Guatemala, to develop a municipal adaptation strategy. Their engagement with the municipality started in 2006, following the impact of Hurricane Stan in October 2005. Although relatively distant from the epicentre over Mexico, Hurricane Stan killed 49 people in El Salvador through widespread flooding and mudslides related to associated rain storms. In San Francisco Menéndez, 1,816 families were directly affected, losing 850 acres of maize in mainly lowland areas. Although evacuation to emergency shelters and other measures were implemented, Mayor Narciso Ramirez described the municipality as 'not well prepared, so the response was stressful'.

The municipal response has been to establish a risk management network, bringing together all government and NGO stakeholders to cover all parts of the municipality rather than just the low-lying coastal areas (which did have a loose structure of civil protection groups pre-Stan). Smaller-scale floods in 2006, which resulted in 16 families losing housing and land, and wind-related emergencies and forest fires in the 2008-09 dry season (winds have caused two deaths and destroyed 1,497 houses, with five wind-accelerated fires ravaging 170 acres of forest) have reinforced the need for a municipality-wide early warning and response system linked to an overall strategy.

UNES facilitated initial training in 2006, including risk and environmental management, training for civil protection committees, tools and techniques to reform civil protection law and formulating proposals to Congress. UNES also established links with the meteorology department of Servicio Nacional de Estudios Territoriales (SNET) to establish an early warning system around flood risks in the River Paz valley (together with three other municipalities), training a network of local leaders to collect information and interpret/publicise forecasts to their communities. This system uses phone and shortwave radio links to enable local leaders to relay information to SNET, which processes this into a forecast and relays it back to communities.

More recently, the focus has broadened from flood-risk reduction to developing a municipal strategy for climate change, initially focusing on the next five years, but moving towards a longer-term mapping and strategy process. This has involved gathering both scientific and local knowledge, including scientific climate information gathered through downscaling and assembling information from global circulation models, focusing on the years 2020, 2050 and 2080. In addition, community meetings have involved a total of 576 people discussing issues such as risk and vulnerability, water use and management, disasters and poverty, climate change and other environmental issues, infrastructure, agriculture and employment to identify the main causes of climate and environment-related problems and likely future solutions.

Integrating the science and community understanding aims to produce an adaptation approach that works with the community and can be replicated in other municipalities. As well as rehabilitating flood protection infrastructure such as drainage ditches and cyclone shelters, the municipality has supported a number of pilot projects, including promoting climate-resilient agriculture (through organic fertilisers, native crop varieties, pasture improvement, fruit tree planting and productive gardens), fuel-efficient stoves and reforestation along the River Paz to reduce flood vulnerability.

Further south, in the River Lempa valley, Christian Aid partner Procares has worked at community level to reduce

Christian Aid/Sian Curry

Matagalpa, Nicaragua: Silvia Castro Mendoza (27) outside her new home, which she and her husband built with help from Christian Aid partner MCM. Their old house used to get flooded every year

flood risks and promote climate-resilient agriculture in a land reform and resettlement scheme on the southern side of the river, established through the peace agreement in 1991. Twenty-nine communities of about 1,940 families (both demobilised soldiers and former guerrillas) are settled on approximately three hectares per household, growing mainly maize, sesame, vegetables and plantain with some poultry and cattle production. As in San Francisco Menéndez, the major short-term climate risk is flooding caused by tropical storms and cyclones, a vulnerability that was particularly exposed by Hurricane Mitch.

The response has been both to address the infrastructure protecting the area (flood protection banks and drainage ditches) and to implement an early warning system incorporating local community development associations (ADESCOs), SNET and Acudespal (a CBO working with smallholder farmers). The link with SNET is two-way, as community radio operators pass information back on the local situation and receive information on rainfall, the likely speed of the onset of flooding and time available for evacuation. This also incorporates information from the dam on river flow levels and links to both the municipality and the civil protection unit for practical assistance if needed. The early warning system is graded from green (situation normal) to orange to yellow to red (evacuate to storm shelter). As the flood banks alongside the river are able to withstand most situations but would be overwhelmed by a Hurricane Mitch-level event, they are checked regularly if level yellow is triggered.

Adapting to more gradually changing conditions is at a relatively early stage, but significant change is recognised as important if small-scale farming is to remain productive. Communities highlighted the main climate risks as rainfall, temperature and wind, specifically: the more erratic onset of rains in May and an increased dry spell at the end of July that puts pressure on crops; increased temperatures, particularly in the second half of the dry season (February to April); and an increased occurrence of strong dry seasonal winds (January to April), which have destroyed mango trees and watermelon plantations.

So far the focus has been on diversifying into rice production in areas that are vulnerable to flooding, particularly after the

There is an acknowledged need for communities and researchers to collaborate to combine the best of local knowledge with the best science.

widespread failure of maize in these areas over the past two years. Where maize is grown, and local leaders referred to the difficulty of changing an ingrained culture around maize production, there has been a focus on local varieties which are better able to tolerate dry spells, are more resistant to disease, store well and give good yields without expensive chemical fertiliser. Rice varieties are also chosen for their ability to yield well without expensive chemical inputs. Other agricultural adaptations include short-season vegetables that can be cultivated before the onset of either major flood or extended mid-season droughts and planting more fruit trees (especially coconut, cashew, lemon and mango). Women's groups in particular have been driving this livelihood diversification and a network of 21 groups has now been established.

Farmers highlighted both access to technical advice on agricultural adaptation and seasonal and long-term information on likely future climate change as priority needs to support their adaptive capacity. Although they have received no formal advice from government agricultural advisers, community members referred to specific older farmers known for their skills in experimenting with different crops as their main source of expert advice. This informal networking extended to local agricultural fairs, where farmers exchange and/or sell seed. Community leaders highlighted the importance in both climate and livelihood support of an integration of local knowledge with the best available science.

In the Matagalpa region of Nicaragua, Movimiento Comunal Nicaragüense (MCN) has focused on building 35 disaster-resilient communities and improving food security. Disaster resilience has encompassed planning, training and infrastructure development. Flood-risk mapping (both community and GPS-guided) has enabled communities to develop response plans and identify priority projects to increase resilience to cyclones, including terrace construction, cyclone shelter construction, bridge renovation, sandbagging river banks, relocating risk-prone houses and planting trees in flood-prone areas (river banks and eroded gullies). A key factor has been to coordinate this work with local government, especially education and health departments, to connect communities with the relevant public sector offices and ensuring that response plans are signed off by the mayor.

Longer-term threats to livelihoods are more related to a variety of changing climate factors, including drought and, more recently, dry season winds. Community leaders in San Isidro have developed a community-based assessment of past climate change to inform options for adaptation, highlighting particularly severe cyclones (such as Mitch in 1998 and Felix in 2007), drought episodes (mid-1970s) and recently emerging strong dry seasonal winds (removing house roofs, eroding soil, increasing sickness and headaches) from the northeast. Impact was assessed according to the effects of the phenomenon, the resulting losses and the duration of the event.

Food security support has targeted 291 families, selected by community committees to prioritise the very poor, female-headed households, particularly those with no other sources of support. With an emphasis on diversification, this has included provision of seeds (maize, sorghum and beans) and local vegetable varieties (*ayote*, peas, cucumbers and peppers) selected for their local resilience, with some use of community maps for cultivation recommendations (such as growing maize on flat areas and beans on slopes). Livestock (poultry, dairy cows and pigs) are an asset particularly valued by poorer households and dairy cows, piggeries and poultry units are provided on credit.

Local crop varieties have been selected as they are less likely to be affected by dry spells during the rainy season; there is also less likelihood of rotting if the crop matures before the harvest and more scope for farmers selecting resilient strains for the subsequent season. Other agricultural livelihood adaptations include tree planting, particularly in vulnerable catchment areas, together with education about the importance of trees (cut less, burn less) soil conservation using dead barriers (rocks), live barriers (soil banks planted with perennial crops/trees) and terracing; and ditches to capture water and recharge ground water.

Although there is a perception that local people know how to adapt better than scientific research does, there is also an acknowledged need for communities and researchers to collaborate to combine the best of local knowledge with the best science. While the emphasis has been on cyclones and related flood risks, community analysis reveals a more complex mix of climate features that require a short- and long-term response that integrates reduction of disaster risk with longer-term adaptation to drought, dry season winds and erratic rainfall patterns. In particular, in both El Salvador and Nicaragua, community leaders highlighted the need for integrated climate and agricultural advisory support that can be used to complement local knowledge and for channels to both local and national government structures and processes that can provide funding to put local adaptation plans and strategies into practice.

INNOVATIVE APPROACHES TO TACKLING CLIMATE CHANGE IN DROUGHT-PRONE EAST AFRICA

Richard Ewbank

Christian Aid's Climate Change Innovation Fund was established to both raise awareness of climate change and support innovative adaptation approaches in Africa to increase community-level resilience. Now in its second phase, it has funded 24 projects across the continent on issues as diverse as: mobilising civil society in Nigeria to develop a national plan of adaptation; raising awareness of climate change through schools and local leaders in Rwanda; developing community-based adaptation plans in Burkina Faso; and working on water, sanitation and climate change in poor urban areas in Kenya.

Particularly prone to drought are the semi-arid areas of east Africa, extending along the 'drought corridor' from central Tanzania, through eastern parts of Kenya and into southern Ethiopia and Somalia. Small-scale crop production and livestock herding are the main livelihoods in these areas, both characterised by their vulnerability to climate change. Drought is the most critical climatic constraint to development in semi-arid Tanzania, its impact aggravated by low soil moisture retention capacity, highly variable rainfall and the low adaptive capacity of farmers. Christian Aid partner Institut Africain pour le Développement Economique et Social (INADES) has been implementing an adaptation initiative in Manyoni and Chamwino districts in central Tanzania, to increase the resilience of vulnerable communities to cope with and adapt to climate change and variability by using reliable information on climate forecasting and prediction.

This work involves linking up with meteorology stations to collect, analyse and assess meteorological information, data and trends on climate forecasting relevant to the project's target villages. This is then combined with community perceptions of changes in weather patterns over time (past and future) and the impact of this on livelihoods. A key step is to process climate science information to make it accessible to community members in an easily understood format and language suited to their needs. Given the uncertainty involved in estimating future local climate change, farmers are also trained at this stage in the interpretation of probabilistic forecasts.

Assessment of local knowledge in climate and weather forecasting is achieved by involving community representatives in activities such as: the collection of local indicators of weather patterns; building timelines of past climate events to determine emerging trends; and participatory climate information ranking to establish what type of climate information is most important for the farmers. This then warns communities of the likely impacts of climate change – a process that aims to identify both the vulnerabilities to the climate forecast and the capacities of the community to respond. Key to this are climate risk maps, ensuring that particularly vulnerable groups are included in the exercise and understanding the institutional framework in which adaptation occurs.

Both the community assessment of climate change and the risk assessment process feed into the key focus of planning and implementing viable community-based adaptation strategies. This involves identifying improved adaptation options, assessing these options based on their constraints and opportunities and validating and prioritising the most suitable into an adaptation options menu. Finally, these plans are used as the basis for interaction with relevant district authorities in order to influence policy and mainstream adaptation plans into district development plans.

The project has used a strongly participatory approach to these activities – action research to assess the potential role of seasonal forecasts, participatory risk assessment to assess climate risk – together with the sustainable livelihoods framework to explore the links between climate and livelihoods. This has brought together a range of stakeholders, including agricultural extension workers, the Tanzania Meteorological Agency, the Hombolo Research Institute in Dodoma and district authorities. Although the work is ongoing, preliminary findings have confirmed the influence of climate change on wind, rainfall and temperature. Wind, particularly increased wind strength, is the most frequently mentioned change. Communities felt that generally temperatures were getting warmer, but two villages suggested the cold period in June and July was getting colder.

Later onset of rains, earlier ending of rains, less predictable rainfall and reduced rainfall were the most commonly cited changes to precipitation. Seasonal rainfall data from 2000 showed that community understanding correlated closely with statistical data, showing levels of 300-665mm per year. Based on this assessment, communities predicted a shift from a historical pattern of one bad year in four and one serious drought per decade to three bad years in five. Due to the inaccessibility of meteorological data at community level, emphasis was placed on the use of local forecasting methods using tree, insect and bird behaviour.

Communities stressed their resilience in the face of these changes including their energy, endurance and agricultural skills; the diversity of crop varieties they have developed (including drought-resistant varieties); and the innovations they have developed (such as water harvesting technology

Assessment of local knowledge in climate and weather forecasting is achieved by involving the community to establish what type of climate information is most important for the farmers.

and food storage). However they also highlighted factors that undermined these characteristics, such as lack of access to credit and markets; insecure land rights; difficulties associated with women running businesses; and the need to use scarce financial resources for school fees rather than investing in their livelihoods. As well as providing the basis for the development of adaptation plans to be implemented through 2009, those involved felt that translating and communicating information on adaptation and facilitating interaction between communities and other actors to increase awareness, understanding and responsiveness were vital preconditions.

In drought-prone eastern Kenya, Christian Aid partner Ukamba Christian Community Services (UCCS) has been working with Ndaki CBO to address problems around water availability and agriculture. Farmers confirmed a number of aspects of climate change that have characterised the past ten years, including:

- reduced rainfall in both long (March to June) and short (October to January) rainy seasons
- changing dates for the start and finish of both rainy seasons – the long rains tend to start properly in April rather than March and end in May rather than June
- when it does come, rainfall tends to be concentrated in more intense episodes lasting for several days followed by extended spells of hotter dry weather – if a dry spell coincides with germination of the maize, this can have a severe effect on yields
- increased temperature in the January to March dry season. With the exception of 1997-98, all seasons were characterised by food deficit, with most households needing to purchase food.

In response to these changes, farmers have changed their cropping patterns, although they have not as yet introduced any completely new crops. They used to divide cultivation into sorghum and millet during the short rains and maize, pigeon peas, pumpkin and cassava during the long rains, but now sorghum and millet have been reduced and maize is grown in both seasons. Cassava and pigeon peas are grown over 12 months (that is, both rainy seasons) before harvesting, but whereas they used to be planted before the onset of the long rains, this has now been shifted to the start of the short rains, which are viewed as less erratic.

A further response has been the development of a programme of sub-surface dams, constructed to improve water supplies in the area, seen as a key adaptation strategy if the situation gets worse. Currently 12 are planned, three of which have been constructed by the project. These are built into the beds of seasonal streams so that when the rains arrive, water is diverted into the water table and provides more sustainable supplies for shallow wells sunk around the dam. The existing main source of drinking water is the River Thika 5km away, which is polluted from passing through Thika town and irrigated pineapple schemes. Each dam will provide for a catchment of about 630 people. Benefits include closer and more convenient sources of water for both domestic and livestock use, water collection times reduced from three hours to one and water supplies available to support tree nurseries and kitchen gardens.

The most common coping strategy when faced with short-term food shortages is charcoal burning. About two-thirds of the community confirmed they engage in this activity, despite knowing that trees are important to improving the local microclimate and that deforestation has increased soil erosion and intensified the impact of climate change. One of the key priorities for the community when planning the network of sub-surface dams is the provision of water for tree nurseries that can promote reforestation of the area and reduce the pressure on existing forest resources from fuel wood collection and charcoal burning.

In terms of adapting to climate change, farmers raised a number of other challenges they faced, apart from water availability. The most important of these was access to reliable weather and seasonal forecasts. Without a local climate station, farmers point out that their access to weather forecasts relevant for their location is minimal and they often receive the seasonal forecast in a format that is difficult to interpret and too late to act on when making decisions about which crops to plant and when. As in Tanzania, they have a wealth of local knowledge but also need technical advice on both climate and climate-resilient livelihood options that will enable them to adapt to the drought-prone future they face.

COMMUNITY RESPONSES TO CLIMATE RISK MANAGEMENT IN NAGA, THE PHILIPPINES

Jessica Bercilla, with input from Dr CP David and Dr Celine Vicente

The Bicol river basin is located in the Bicol region of the Philippines – an area that sits in the pathway of tropical cyclones entering the country. It is an area that is often within the sphere of a cyclone threat and vulnerable to heavy rainfall, particularly during the wet season. Over the past years, Bicol has witnessed unusual downpours of heavy rain that have caused destructive landslides and flooding in different parts of the region. This devastating rainfall is often accompanied by other natural hazards that have caused the loss of many lives, the destruction of essential infrastructure and agricultural produce, loss of livelihoods and the displacement of many.

Manila Observatory and the University of the Philippines' National Institute of Geological Sciences, in partnership with UP College of Social Work and Development, Naga Colleges Foundation, Ateneo de Naga and Community Organizing for Philippine Enterprise (COPEBicol), initiated a project to help reduce flood risk in the downstream communities of the Bicol river basin.

The work brings together the expertise of scientific institutions and community development workers to enable capacities for the reduction of climate-related risks. The problem with flood forecasting in the Bicol river basin to date is that it has been carried out on a regional scale, wherein flood-prone areas are designated on the sole basis of local topography.

While it is true that floodwater will eventually accumulate in the lowest part of the basin, the root cause of flooding is when streams overflow. A better approach was to subdivide the Bicol river basin into individual river basins and evaluate every stream's flood potential. Determining an impending river overflow can be done through monitoring the relationship between rainfall and flood height (from both historic and current data). Numerical modelling was also needed to correlate this relationship as well as current geohazard mapping for other weather-related hazards. Lastly, grassroots involvement through home-based stations (HBS) in this monitoring was considered as imperative in order for local communities to recognise that scientific information is a vital component in their decision-making processes. This engagement involved local experts and community leaders in scientific data gathering, which eventually may form the basis of a localised early warning system for flooding. The entire system was meant to benefit those who live in the low-lying areas along the river basin rather than the volunteers managing the HBS.

The project is considered as consistent with the guidance from the Bali Plan for Action on Adaptation on:

- cooperation on research and development of current, new and innovative technology
- continuous engagement with the scientific community to develop strategies to address specific climate-related risks
- ways to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies.

The approach included: the development of local weather data using HBS covering nine municipalities and 11 *barangays* in Naga; weather and flood modelling; timely weather bulletins through SMS; and a novel information campaign on flooding. The initiative led to the development of more user-friendly rain gauges, yielding rain gauge volunteers in the upstream of the river basin; an environmental data management software (including a satellite image fetcher, an SMS data manager, and a text message alert console); a basin model (to generate a rainfall-runoff relationship) and a channel flow model; and the establishment of a typhoon and flood preparedness centre.

The project was considered as a low-cost initiative with a budget of approximately £16,000. It is a system that can be replicated within the region as long as there are volunteers for the HBS; a network of academic/scientific institutions willing to create a system for local climate forecasts and local climate forecast applications; the willingness to set up a network of disaster coordinating councils; and coordination among and between local government units. Since HBS volunteers do not directly benefit from the initiative, an incentive system to encourage their support to guarantee the sustainability of the data-gathering process should be set in place.

Those directly engaged in facilitating community involvement outlined the following concerns about the project implementation process:

- the commitment to institutionalise local climate forecasts and set up early warning systems should be manifested through local government investment and support
- the partnership interface must be made clear through clarification of roles
- the transfer of knowledge and capacity building must be across the whole institution, not just with individuals
- better data collection methodologies are needed to guarantee data accuracy
- various modes of interaction between community volunteers, the scientific team and other stakeholders must be facilitated.

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ACRONYMS

ARTC: area resource and training centre
CB-CRM: community-based coastal resource management
CBO: community-based organisation
CDM: clean development mechanism
COP: Conference of the Parties (to the Convention)
CSO: civil society organisation
DRR: disaster risk reduction
GHG: greenhouse gas
HBS: home-based stations
HIPCs: highly indebted poor countries
IPCC: Intergovernmental Panel on Climate Change
LDCs: least developed countries
MRV: measurable, reportable and verifiable
NAMAs: nationally appropriate mitigation actions
NAPs: national adaptation plans
NAPAs: national adaptation plans of action
NGOs: non-governmental organisations
PRSP: poverty reduction strategy paper
PVCA: participatory, vulnerability and capacity assessment
R&D: research and development
SD-PAMs: sustainable development policies and measures
SDIF: sustainable development innovation facility
SMEs: small and medium enterprises
TAP: technology action plan
TNA: technology needs assessment
UNFCCC: United Nations Framework Convention on Climate Change
WADE: World Alliance on Decentralized Energy
WBREDA: West Bengal Renewable Energy Development Agency

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