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Knowledge is power

Unlocking the potential of science and technology to enhance community resilience through knowledge exchange

Annex

ODI

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Cover photo: Discussions with communities at risk of flood and drought in Kaffrine district, Senegal, June 2012. ©Emma Visman.

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Introduction

Since 2006 the Humanitarian Futures Programme (HFP) at King's College London has been employing a range of approaches to support strengthened dialogue between scientists and humanitarian actors. Since 2009, this work has included an extended exchange between climate scientists, humanitarian and development organisations and community decision-takers. In 2011 HFP received a Knowledge Exchange Fellowship from the UK Natural Environment Research Council to collate and identify emerging learning about those approaches which support effective dialogue between scientists and humanitarian actors. This annex to Network Paper 76 provides the full case study reports of a number of knowledge exchange approaches which have resulted in tangible benefits for at-risk people.

Learning from across the case studies has been used to identify and illustrate the types of interaction and key characteristics of knowledge exchange approaches enabling science and technology to enhance community resilience (see Table 1 in the accompanying Network Paper (p. 4)). Each case study illustrates a knowledge exchange methodology which seeks to strengthen dialogue between scientists, communities at risk and those with 'humanitarian responsibilities'. A number of the case studies also describe the creation of channels and frameworks for sustained dialogue.

Each case study includes:

1. An overview of how the approach supports the knowledge exchange processes of access, understanding and appropriate application.
2. An outline of why the dialogue approach was employed: why it was necessary, the context and geographic location(s) in which the dialogue process was employed, the risks it was seeking to address and the decision-making process which it intended to support.
3. The methodology employed, and how it was developed.
4. The impact and how this was measured.

The case studies are drawn from across different regions, scientific disciplines and decision-making levels. It is recognised that this is just a sample of the many approaches which have been employed to enable science to better support community resilience. While acknowledging that the majority of case studies included here stem from efforts to strengthen appropriate use of climate science within at-risk communities, there are also examples of knowledge exchange approaches enabling new technologies (including nanotechnology), seismology and cross-disciplinary engagement to enhance community resilience.

It should be noted that many knowledge exchange activities have not included the development of baseline data or systems for ongoing monitoring and evaluation to assess impact. Moreover, in many cases the methodologies employed and the process through which they were developed were not, at the time of use, formally documented. Overviews of the 12 case studies precede more detailed accounts of each knowledge exchange approach.

Overview of the dialogue case studies – the methodologies employed and impact achieved

A *Systems Approach* to dialogues about new technologies in Zimbabwe, Peru and Nepal demonstrates the importance of creating channels which can enable new technology to deliver on human needs, rather than being driven by consumer wants or technological development. The engagement enabled community input into the design and prototyping of new technologies that are appropriate to meet community needs.

Focus Groups for participative climate risk communication, undertaken with separate groups of researchers, disaster risk managers, local leaders and members of directly affected communities within the Climate Project in Brazil, allowed participants to better understand each other's sources for and use of risk knowledge. The groups elicited a number of determinants in disaster risk response not previously recognised within risk communication efforts, and allowed participating scientists to better understand a range of obstacles to collective decision-making processes.

The Building Disaster Resilient Communities Learning Circle in the Philippines enables collaboration between people at risk, national and international humanitarian and development practitioners and national scientific institutions and local sources of expertise. Bringing together experiential and scientific learning through processes of community practice peer review with scientific validation, co-implementation and joint monitoring and assessment, the wide range of partners have created and synthesised learning to support the mainstreaming of DRR and CCA within local government planning processes, and instigated new approaches to research within their own organisations.

The Decision Support System (DSS) guided the development of community-based flood early warning systems in Bangladesh. Combining relevant scientific data with participatory flood risk assessment and management planning, the DSS translates scientific understanding of risk into information which can save lives and is tailored to support specific livelihood decision-making options.

Efforts to build tsunami preparedness in Padang, Indonesia, have developed from informal connections with scientists to more targeted approaches to build awareness and

Table 1A: Overview of how knowledge exchange approaches within case studies have supported the process of dialogue (access, understanding and appropriate application) and the impact they have had (on at-risk people, humanitarian and development planning and scientific research)

Case study	Access		Understanding	Appropriate application		Impact		
	Bridging local and scientific knowledge sources	Co-production of useable information	Supporting literacy and mutual understanding	Support appropriate application	Ongoing dialogue channels	Tangible benefit for at-risk people	Informed humanitarian & development decision-making	Informed scientific research
Systems Approach	√	√	√	√	√	Not yet	√	√
Focus Groups	√	Not yet	√	Not yet	√	Not yet	Not yet	√
Collaborative learning circle	√	√	√	√	√	√	√	√
Decision Support System	√	√	√	√	√	√	√	√
Informal connections and key individuals	X	√	√	√	√	√	√	x
Participatory games	√	√	√	√	√	√	√	√
Participatory game design	√	√	√	√	√	√	√	x
Early Warning›Early Action workshops	√	√	√	√	√	√	√	√
Knowledge Timelines and participatory downscaling	√	√	√	√	Linked with wider exchange	√	√	√
Blending local and scientific knowledge sources	√	√	√	√	√	√	√	√
Participatory scenario planning	√	√	√	√	√	√	√	√
Mentoring	X	X	√ between scientists	Not yet	√	Not yet	Not yet	√

capacities to cope with earthquake and tsunami risks. Identifying key community leaders and employing a range of communication channels, these efforts have led participating groups to take effective action in the event of large earthquakes and increased awareness of the shared community and government responsibilities for disaster risk preparedness.

The use of gaming approaches within efforts to strengthen urban risk reduction within informal settlements in Nairobi, Kenya, enabled participatory assessment of flood early warning systems and response planning, as well as offering opportunities for directly affected people to suggest how these processes can better address their concerns.

Participatory game design has created dialogue approaches which better represent and support decision-making within the complex systems in which resilience-building takes place. Employed within a wide range of contexts, including a river basin in Nicaragua and Guatemala, the process has resulted in concrete opportunities for community collaboration, with rapidly increasing demand testament to increasing recognition of the benefits of this approach.

The Early Warning-Early Action workshop provides a framework for bridging the gap between the providers and users of climate information to develop user-driven climate information services. Encompassing modules tailored to support specific decision-making processes, development of a road map to communicate and apply climate information, joint scientist-policymaker-community decision-taker forecast scenario exercises and community visits and piloted within ten East and West African countries, the approach offers a process through which to identify scientific information relevant to different levels of decision-making and create channels for ongoing dialogue which engage and reach directly-affected communities.

Knowledge Timelines and Participatory Downscaling build understanding of the value of both local and scientific weather and climate information and knowledge, as well as the inherent uncertainties within these. Recognition and acceptance of these uncertainties has supported increased trust and use of climate information within the exchange demonstration studies in Kenya and Senegal in which these approaches have been employed.

Piloted to support small-scale farmers in drought-prone areas of Kenya and Tanzania, blending combines local and scientific knowledge source, building on the respective strengths of each. It has created links between local weather stations and farmers' groups, increased trust in and uptake of scientific information and identified concrete ways in which the complementarities between these knowledge sources can better support climate information for at-risk groups.

Participatory Scenario Planning creates space for sharing local and scientific knowledge from across a wide range of stake-holders in order to discuss and agree options for different forecast scenarios. The approach supports more flexible planning to better deal with the uncertainties and risks presented by both short- and long-term changes in climate and develop advisories tailored to the needs of specific user groups.

Responding to demands for strengthening in-country adaptation capacities, the Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) Program created a mentoring scheme to support extended exchanges between scientists in Australia and the Pacific. This has proved beneficial for both mentored and mentoring scientists and institutions. In fostering a more collaborative research community, the programme has enhanced potential for sustainability and provides an approach scaleable to other regions and disciplines.

Case Studies

Case Study 1: A Systems Approach to dialogues about new technologies in Zimbabwe, Peru and Nepal

David Grimshaw, ICT4D

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Provides a platform for knowledge to be shared between scientists leading research on emerging technologies and at-risk groups who could benefit from these.

Understanding – Strengthens participants' levels of understanding about nanotechnology, and scientists' understanding of the socio-economic context in which such technology is to be delivered.

Appropriate application – Creates a channel for two-way dialogue, enabling directly affected groups to inform the focus of research and develop integrated solutions to addressing community concerns.

Why the dialogue approach was employed

A collaboration between researchers from the UK think tank Demos, the University of Lancaster and Practical Action in 2006 used a process designed to engage Zimbabwean community groups and scientists from both the North and South in debates about new nanotechnologies.[1] Collectively referred to as the 'nanodialogues', the dialogue was one of four experiments in public engagement with nanotechnologies undertaken in Zimbabwe, Nepal and Peru.

Water treatment was selected as a focus for the dialogues, first because, in development terms, it is a well-established priority and second, because technology is at a stage where it may be able to make a significant contribution to filtration and decontamination.[2] The dialogue sought to introduce the views and values of people for whom clean water is an everyday problem into debates about responses that might involve nanotechnology. Involving scientists leading research enabled the debate to move 'upstream'. One of Practical Action's hopes was for a sustained dialogue between scientists and users that enables new technology to deliver on human needs, rather than be driven by market wants or technological developments, and consider the cultural, political or managerial issues within the delivery process.

The methodology employed: A Systems Approach

Building upon experience of engaging people in the global South in debates about new technologies,[3] Practical Action employed a Systems Approach[4] in a series of workshops undertaken in Zimbabwe in 2006, in Peru in 2007–8 and in Nepal in 2009. During the first day of the workshop in Zimbabwe a rich picture (see Figure 1A, p. 6) was drawn by the organisers as a reflection of the problem situation so as to convey relationships and connections much more clearly than narrative.

The Figure shows that there is a need to bridge the knowledge gaps between local and global scientists, listen to local people and understand the context and dimensions of need, and develop new business models to produce products that will provide for human needs. Areas of potential conflict are also illustrated; the main areas being the affordability of 'solutions' and the 'not invented here syndrome' which can easily lead to a lack of ownership and adverse consequences for the sustainability of the technology.

The impact

One outcome of the meeting in Zimbabwe was a call for poor communities to be involved in debates about whether nanotechnologies can contribute to social and economic development. Discussion recognised that future developments will need to take account of the risks and costs in addition to the opportunities for real benefits to poor people. As this dialogue has taken place before many products using nanotechnologies have become established in the market, the hope is that such early discussions with scientists will enable them to take account of the needs of the poor. This might go some way to delivering public value from science.[5] The workshop also made clear that such dialogues are an appropriate method for building ownership and consensus, which are important elements in sustainable interventions.

Discussion in Peru considered, amongst other areas, the pollution of water courses caused by mercury as a by-product of gold-mining activities. The main workshop outcomes were a series of community-driven goals, including identifying priority water problems that might be assisted by an application of nanotechnology; establishing a network of scientists involved in nanotechnology in the

1 Grimshaw, D.J., Stilgoe, J. and Gudza, L.D. (2009) How Can New Technologies Fulfill the Needs of Developing Countries? in: Nanotechnology Applications – Solutions for Improving Water, Mamadou Diallo, Jeremiah Duncan, Nora Savage, Anita Street & Richard Sustich (Eds.), pp. 535-550.

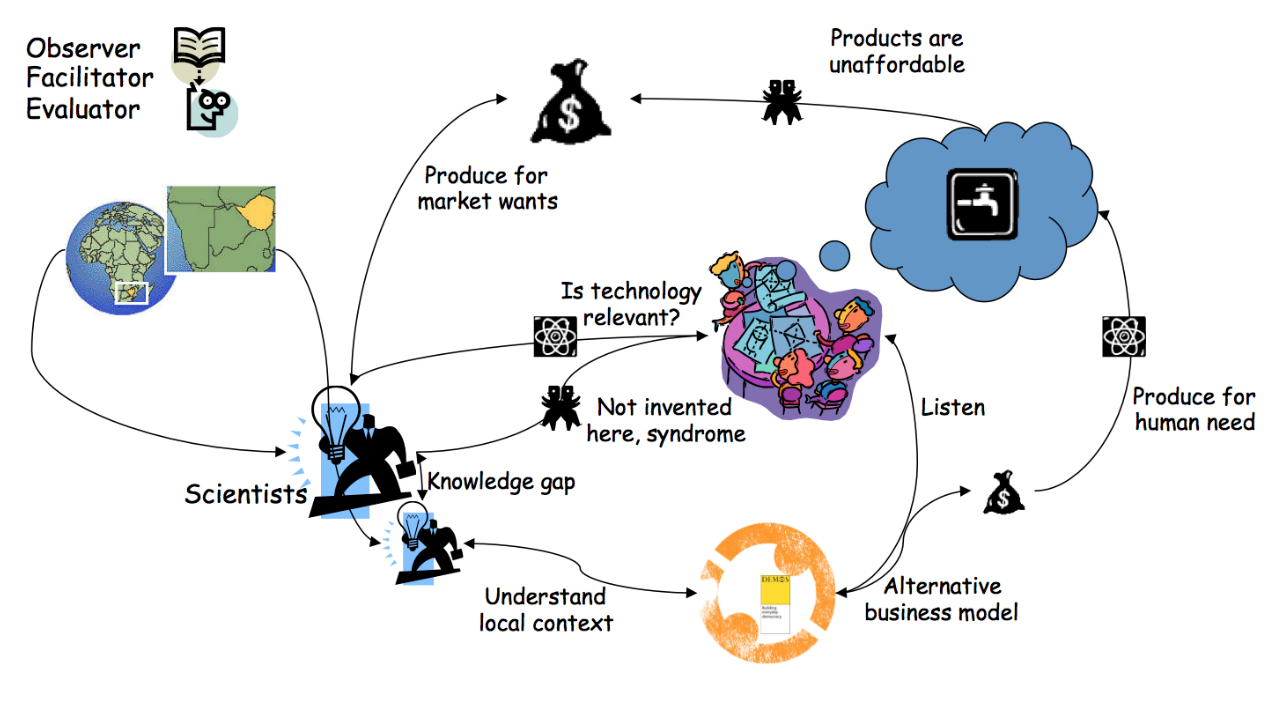
2 Hille, T. Munasinghe, M. Hlope, M, and Deraniyagala, Y. (2006) 'Nanotechnology, Water and Development', Meridian Institute, Washington.

3 Rusike, E. (2005) 'Exploring Food and Farming Futures in Zimbabwe: A Citizens Jury and Scenario Workshop Experiment', in: Science and Citizens, Melissa Leach, Ian Scoones & Brian Wynne (Eds.), pp. 249-255.

4 Checkland, P.B. and Scholes, J. (1990) 'Soft Systems Methodology in Action'.

5 Grimshaw, D J, The Role of New Technologies in Potable Water Provision: A Stakeholder Workshop Approach, October 2006, Available at: http://www.eldis.org/assets/Docs/45506.html.

Figure 1A: A holistic picture of the problem situation



Andean region of Latin America; and developing a website to foster a community of interest about nanotechnology and water in Peru.[6]

The Nepal workshop focussed on the widespread issue of arsenic contamination of drinking water, and has led to a Wellcome Trust-funded project led by Cambridge University to develop an arsenic biosensor over the period 2012–2015.[7] The project has made clear that technology to address identified needs may come from a number of scientific disciplines, and it is important to remain technology-agnostic. While initially focused on nanotechnology, the work in Nepal is, for example, now focused on applying synthetic biology. The work has also made clear that engaging with scientists and developing appropriate new technologies is a long-term process that only begins with dialogue. Sustaining that conversation over many years is a key element of success.

On its own, dialogue and involvement will not deliver meaningful results without a process of innovation by key stakeholders. Practical Action brought those key stakeholders together and facilitated processes that allowed community input into the design and later prototype testing to ensure technologies are appropriate. Three phases emerged from the work: dialogue (Zimbabwe) and engagement (Peru) to delivery (Nepal).

6 Soluciones Practicas (2009) 'Nano Technologia en el Peru'. Available online: http://www.nanotecnologia.com.pe/. Accessed 29 May 2013.
7 Bailey, P. (2013) 'The biggest poisoning in history', Wellcome Trust. Available online: http://www.wellcome.ac.uk/News/2013/Features/WTP051176.htm accessed 29 May 2013.

Case Study 2: Focus Groups for participative climate risk communication[8] in Brazil

Gabriela Marques Di Giulio, University of São Paulo, Brazil[9]

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Enables policymakers and at-risk groups to actively engage in climate research.

Understanding – Builds scientists' understanding of the different disaster risk knowledge sources which at-risk groups and policymakers use, and the complex contexts in which they use this.

Appropriate Application –N/A

Why the dialogue approach was employed

The north part of the São Paulo coastline is an area of heightened vulnerability. Irregular and unsafe settlements, scarcity of drinking water and poor sanitation are coupled with the socio-ecological dilemmas of economic development, including the combined pressures of tourism and extraction and transportation of offshore oil and natural gas. Climate change is likely to exacerbate current vulnerabilities, with increased frequency and intensity

8 This study is benefited from the financial support provided by FAPESP (Grants 2010/51849-8, 2012/02125-2, 2008/58159-7).
9 Di Giulio, G.M.; Figueiredo, B. R.; Ferreira, L.C.; Macnaghten, P.; Manay, N. & Anjos, J.A.S.A. (2012), 'Participative risk communication as an important tool in medical geology studies'. Journal of Geochemical Exploration. Available online: http://dx.doi.org/10.1016/j.gexplo.2012.06.005.

of extreme weather events, including long and intense rain (causing landslides and floods), increases in air temperatures (heightening health risks), sea level rise and storm surges.

Climate Project is a four-year (2009–2013) research project, involving more than 70 researchers and focused on the relationship between urban growth, vulnerability and adaptation on the São Paulo coast. It includes investigation of how solutions may require better understanding of local and regional government stakeholders' knowledge, concerns and actions related to climate change.[10]

Many risk communication initiatives have been based on a knowledge deficit model, assuming that lack of scientific input is the main obstacle to more effective risk management and underestimating potential input from at-risk people. Yet policymakers and local people obtain evidence from a variety of sources beyond scientific materials, and have to make decisions in contexts of political, economic and social complexity. Efforts to strengthen disaster risk management through improved dialogue between the providers and users of science need to recognise that production of risk knowledge takes place in different social domains, and that these domains and their characteristics influence not only the dialogue among the social groups, but in particular how they deal with risks and disasters. Recognising that climate change and extreme weather events are characterised by considerable uncertainty and controversy, the Climate Project has emphasised the importance of employing participative risk communication for supporting strengthened dialogue amongst experts/academic scientists, policymakers and community users.

The methodology employed

Between August 2011 and June 2012, the project undertook a series of eight small focus groups in order to analyse how 'those who make science' and 'those who use science to make decisions' engage in dialogue, and how scientific information is or is not useful in the decision-making processes in contexts of urgency and pressure. Four types of focus groups were undertaken: a) science-based group involving researchers representing four major themes: population studies, public policies, social conflicts and biodiversity; b) practitioners' group involving local technicians and policymakers dealing with risk assessment and management; c) neighbourhood leaders' group involving people considered to be living in areas at risk by emergency management authorities; and d) youth group involving 12-to-17-year-olds considered to be living in areas at risk.

Combining elements of individual interviews and participant observation,[11] Focus Groups offer an opportunity to both observe a large amount of interaction on a specific topic in a limited period of time and develop understanding of public perceptions and attitudes to risks, including consideration of the formal and informal knowledge sources which people are likely to draw upon in developing their responses.

10 Ferreira, L. C.; Joly, C.; Ferreira, L. C; Carmo, R. L. (2012). 'Urban Growth, Vulnerability and Adaptation: Social and Ecological Dimensions of Climate Change on the Coast of São Paulo', Annual Scientific Report, July 2011–August 2012.

11 Morgan, D.L. (1988), 'Focus groups as qualitative research'. Krueger, R.A. (1998), 'Moderating focus groups'.

The impact

Participants considered that the Focus Group approach was a relevant participative method to investigate risk situations, and expressed their intention to continue to attend such meetings and collaborate with the research team. While this was the first time the majority of participants had had the opportunity to engage in a participatory research process, the collected narratives highlighted that they felt very comfortable sharing their experiences and concerns within the focus group format. They understood and appreciated the dynamics and goals of the approach, including the fact that the research team was not trying to convince, teach or scold people, but generating opportunities for people to speak and be listened to.

The collected narratives highlighted that the social and economic contexts, such as deficient economic and government support as well as the influence of religion, are determinants in the way people respond to risk threats. Additionally, practitioners indicated that, despite efforts to make climate science more useful, communication with scientists remains challenging. The research also confirmed the limitations of local governments in implementing adaptation strategies due to limited resources and political interests. Problems associated with collective decision-making were also detected, as there has been limited previous public participation in formal consultation exercises.

Participating scientists valued the initiation of two-way communication channels involving scientists, practitioners and community users. They recognised such channels were important for improving their understanding about how stakeholders perceive risks, as well as fostering bilateral cooperation for both the identification of knowledge gaps and dissemination of available knowledge.

Case Study 3: The collaborative Learning Circle: Bringing Disaster Risk Reduction and Climate Change Adaptations to Local Government Planning in the Philippines

Jessica Dator-Bercilla, Manila Observatory and Ateneo School of Government, Ateneo de Manila University, Antonia-YuloLoyzaga, Manila Observatory, Miguel Magalang Marinduque Council on Environmental Concerns and Shirley Bolanos, Building Disaster Resilient Communities Learning Circle and Coastal Core Sorsogon, Inc.

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Enables community-based practitioners and local government access to expertise from across scientific institutions. Collates and assesses local knowledge. Brings together local and scientific knowledge.

Understanding – Translates science to support specific local government and community decision making processes. Enhances policymakers'/practitioners' appreciation of relevant scientific understandings of risk.

Application – The learning circle provides a channel for ongoing, two-way dialogue, enabling community concerns to inform research focus and supporting more trans-disciplinary approaches.

Why the dialogue approach was employed

Over the past decade, natural hazards have consistently challenged the capacity of Filipinos to cope. They witness yearly devastation from rainfall-induced debris flow, increasing typhoon intensity and climate-associated geological hazards, such as flooding from extreme rainfall. As the frequency of these events continues to rise, partners of one international humanitarian and development NGO, Christian Aid, began to ask 'Why is this happening to us?'. Many partners believed it was not enough to say that disasters caused by these hazards were the destiny of their people. The question was brought to the attention of the Manila Observatory, a scientific research institution working on, amongst other areas, atmospheric science, regional climate systems, geophysics, environmental geomatics and disaster risk analysis.

The methodology employed

In 2007 community-based practitioners started working with the Manila Observatory and the University of the Philippines College of Social Work and Development to co-develop an intensive course on DRR. This served as a vehicle for knowledge sharing and led to the development of the Building Disaster Resilient Communities (BDRC) Learning Circle and the Scientists and Community Practitioners' Dialogue, co-organised by the Province of Albay and allowing engagement with a wide range of eminent Filipino scientists.

Management of experiential and scientific knowledge is central to 'dialogue' within the BDRC Learning Circle. This includes processes of: a) knowledge generation from initiatives and experiences in the field; b) knowledge sharing and peer review, with scientific validation or enhancement; c) knowledge co-implementation by practitioners and scientists; and d) knowledge monitoring and assessment to support continuous improvement. Impact of the initiative has been measured by examining how exposure and vulnerabilities to hazards have been reduced.[12] Inventories and evaluations of coping and adaptive capacities developed using the interventions were also conducted.

Deeper understanding of risks gave partners the confidence to craft their policy advocacy agenda for DRR and climate change adaptation (CCA) and elevate this to local, sub-national, national, regional and international platforms. In 2008, the Marinduque Council of Environmental Concerns (MACEC) represented the BDRC Circle to mainstream DRR in national development planning. Following a national policy for DRR and CCA mainstreaming, issued by the Department of Interior and Local Government, MACEC explored ways to test a simplified mainstreaming process at the barangay or village level using initial BDRC learning.

The impact

The initiative encouraged a wide range of community practitioners to open spaces for discourse with scientific institutions and local experts. As a result, the University of the Philippines National Institute for Geological Sciences and Manila Observatory were engaged by the Community Organization of the Philippines Enterprise Foundation (COPE) to explore work on community-based early warning systems. The University's Visayas School of Technology informed the food security initiatives of the Philippine Network of Rural Development Initiatives and the Panay Rural Development Center. The Philippine Rice Research Institute helped the Social Action Center of Zamboanga Sibugay to identify flood-resilient rice varieties. MACEC worked with Marinduque State College to inform food security strategies for Marinduque Island. Coastal Core Sorsogon sought the help of scientists from the Bureau of Fisheries and Aquatic Resources and the Department of Science and Technology to develop climate-resilient livelihoods.

Continuous dialogue between scientists of Manila Observatory and practitioners focused on ways to make risk analysis of current and future hazards more understandable to community practitioners. Scientists and practitioners, for example, developed proxy indicators where downscaled climate projections were unavailable. Further collaboration through an Adaptation Knowledge Platform[13] enhanced understanding of: the nexus of DRR and CCA; the relationship of the IPCC formula to vulnerability assessment; the appreciation of the types of scientific data necessary for risk analysis; and the value of risk assessment in crafting risk reduction and adaptation options. The Platform also helped identify priority issues for Local Government Units (LGUs) in pursuing local climate change adaptation.

The Ateneo School of Government, Manila Observatory, MACEC, the BDRC Learning Circle and AksyonKlima worked to transform the knowledge accrued through the extended period of partnership into a 12-step DRR and CCA mainstreaming toolkit to support LGUs' current development planning platform. Designed with significant inputs from the Provinces of Albay and Iloilo, the toolkit responded to LGU requirements for a low-cost decision-support tool that utilises the assets and resources of the LGUs, national agencies and other stakeholders towards achieving resilience and sustainable development within Philippine DRR and CCA policy frameworks.

12 Efforts to understand which elements to examine were informed by the 'Characteristics of Disaster Resilient Communities' developed by several humanitarian organizations and supported by John Twigg. Further impact analysis is included in the BDRC partners' 2012 publication.

13 A mechanism supported by the UNEP-collaborating agency Regional Climate Change Adaptation Platform.

While the process significantly increased and deepened the understanding and appreciation of evidence-based DRR and CCA among community practitioners and policymakers, it also allowed scientists at the Manila Observatory to develop new approaches to risk research and DRR and CCA options which are more enabling and empowering for community partners. Moreover, engagements with practitioners facilitated the development of inter- and trans-disciplinary approaches which support deeper understanding of the complex interactions between the physical, social, economic and institutional systems which create or reduce risk. Scientists at the Manila Observatory have now brought this approach to their work with a range of other institutional partners.

Case Study 4: Decision Support System to develop community-based flood early warning systems in Bangladesh

SHM Fakhruddin, RIMES

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Develops useable, accessible information, collating local knowledge sources, combining information from across relevant local, national, regional and international scientific sources and providing this in relevant formats through trusted channels.

Understanding – Supports at-risk communities' understanding of the probabilistic nature of flood forecasts and scientists' understanding of the information requirements of at-risk groups.

Application – Translates probabilistic forecast to support a range of livelihood decision-making processes.

Why the dialogue approach was employed

Advances in meteorology, hydrology and engineering are generating a range of new methodologies for forecasting weather and flood events. Yet there remain significant challenges in translating these advances into societal benefits for those most at risk, chief amongst which are appropriate communication and application of probabilistic information by communities at risk and disaster risk managers.

Amongst the five flood-prone communities in the Brahmaputra river basin of Bangladesh in which the development of community-based flood early warning systems was piloted, 'normal' floods are an annual occurrence, severe floods occur every 2–5 years, and the existing 24–72-hour forecasts were insufficient to enable the community to undertake effective preventative measures. Furthermore forecasts provided in official languages and employing the metric system did not readily support local decision-making.

The methodology employed

The Decision Support System (DSS) is designed to interpret, translate and communicate science-based risk information into location-specific, user-friendly products which can better meet the needs of particular users. A collaboration between the Regional Integrated Multi-Hazard Early Warning System (RIMES), the Climate Forecast Applications Network (CFAN), the Bangladesh Met Office and the local community employed the DSS to support the development of community-based flood early warning systems.

Scientific data from across relevant local, national, regional and international sources was combined and the flood early warning needs of at-risk communities identified through Participatory Flood Risk Assessment. A process of Participatory Flood Risk Management Planning then assessed the most suitable lead time for the early warning system – with community groups identifying different lead times for different types of decision making (as detailed in Table 2A) – and produced a strategy for communicating the early warning information.

Participants identified the agents (imams and teachers) and channels (microphones in mosques, beating of drums, flags, door-to-door communication) through which they would prefer to receive forecasting information. Some community

Table 2A: Community-level decisions and forecast lead time requirements

Target groups	Decisions	Forecast lead time requirement
Farmers	Early harvesting of B.Aman, delayed planting of T.Aman	10 days
	Crop systems selection, area of T. Aman and subsequent crops	Seasonal
	Selling cattle, goats and poultry (extreme)	Seasonal
Household	Storage of dry food, safe drinking water, food grains, fire wood	10 days
	Collecting vegetables, banana	1 week
	Withdrawing money from micro-financing institutions	1 week
Fisherman	Protecting fishing nets	1 week
	Harvesting fresh water fish from small ponds	10 days
Disaster Management Committees	Planning evacuation routes and boats	20–25 days
	Arrangements for women and children	20–25 days
	Distribution of water purification tablets	1 week
Char households	Storage of dry food, drinking water, deciding on temporary accommodation	1 week

members volunteered to receive flood early warning information through SMS for onward dissemination.

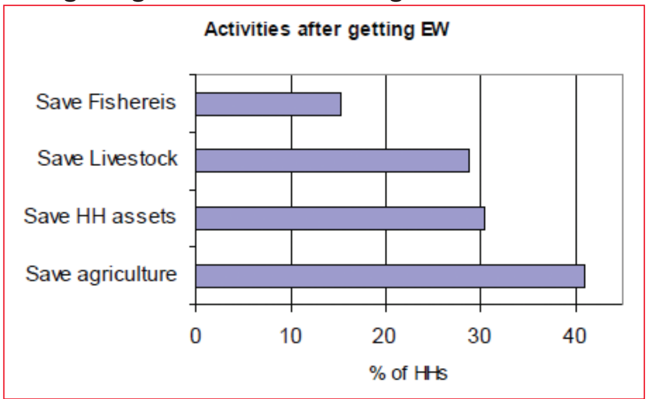
The community identified that i) the danger level of river flow needed to be worked out for every village, ii) flood warnings needed to be area-specific and delivered in the local languages employing channels accessible to those who are unable to read, and iii) further training was required to support understanding of the flood early warning system.

Community engagement also made clear that farmers need to make decisions based on the fact that various kinds of floods bring differential damage. This led to the co-production of an impact/response matrix, identifying the various kinds of floods, the crops exposed during these floods, their impacts, forecast times required and alternative management plans based on forecasts.

The impact

The initiative has increased the lead time of local-level flood forecasting. During the 2007 and 2008 floods, its ten-day forecasts were used within national- and community-level disaster emergency response planning. As indicated in Figure 2A, people in the communities where the approach was piloted undertook a range of activities when they received the flood forecast message. They stored dry food and safe drinking water, protected household assets, vegetable patches and fish ponds, harvested rice and jute crops early and prepared to evacuate themselves and their livestock to higher ground. At the same time, they planned alternative livelihood options for immediately after the flooding, including revised rice planting and undertaking fishing and boat-making.

Figure 2A: Major activities performed by households after getting flood forecast message



A household survey revealed that an estimated average of Tk. 18,637 per household was saved by early warning in the pilot areas.[14] According to a World Bank analysis,[15] every US dollar invested in the approach realised a return of $40.85 in benefits over a ten-year period.[16]

The DSS provides an important framework for enabling scientific information to appropriately inform life and livelihood decision-making processes. It also highlights that accuracy and lead time of forecasts are very important for the community to establish confidence in the practical utilisation of probabilistic information.

As people within the demonstration sites began to realise the benefit of the forecasts, a growing number became interested in getting involved in the system. RIMES is continuing to provide ten-day forecasts and the government of Bangladesh has asked it to extend its support to additional areas. RIMES is also assessing the community benefits of providing 20–25-day forecasts within a number of pilot sites.

Case Study 5: Informal connections and identifying key community leaders to build tsunami preparedness in Indonesia

Patra Rina Dewi, KOGAMI, Indonesia

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Utilises media outlets, key community leaders and engagement with secondary schools to support at-risk groups in accessing reliable information on tsunami risk.

Understanding – Engages local, national, regional and international scientific expertise to enhance understanding of tsunami risk within local government and at risk groups.

Application – Ensures local preparedness measures meet scientific understandings of risk.

Why the dialogue approach was employed

Padang City was not affected by the tsunami of 26 December 2004. However, some young people from the city provided voluntary aid and medical treatment for tsunami-affected people in Simeulue Island, the place nearest to the epicentre of the earthquake which generated that event. The volunteers who participated in this tsunami relief initiative were shocked by a subsequent *National Geographic* magazine article citing Padang City as at highest risk of tsunami threat in the world. Having seen the devastation caused by the tsunami in the neighbouring Sumatran province of Aceh, the volunteers decided to create an organisation called Komunitas Siaga Tsunami (Kogami) or 'tsunami alert community'.

It was initially difficult to convince the government and the community about the tsunami threat in West Sumatra, since Kogami had no knowledge about earthquakes,

14 Fakhruddin, S et al. (2008), 'Post-Flood Forecasts Assessment 2008: Community response to CFAN forecasts', *ADPC.*

15 Subbiah, A R, L Bildan, R Narasimhan, RIMES, (2009), 'Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction'. *Joint World Bank-UN Project on the Economics of Disaster Risk Reduction.* Available online: http://risk.earthmind.net/files/World-Bank-2008-Economics-Early-Warning-Systems.pdf.

16 Webster, P, J Jian, T M Hopson, C d Hoyos, P A Agudelo, H Chang, J A Cury, R Grossman, T N Palmer, A R Subbiah (2010), 'Extended-range probabilistic forecasts of Ganges and Brahmaputra floods in Bangladesh', *BAMS*, November 2010, pp. 1493-1514.

tsunamis and disaster management. Fear coupled with lack of direct experience caused the community to reject the organisation's initiatives. While TV shows about the impact of the recent tsunami in Aceh caused fear, the government decided to calm people by saying there would be no tsunami in Padang City.

Connections were made with seismologists from the California Institute of Technology and the Indonesian Institute of Sciences (LIPI) who had been undertaking extended research in the Mentawai Islands, situated just off the coast of Padang City, as well as scientists from the city's Andalas University. While these scientific connections supported the organisation's work in the short term, there remained a need for longer-term activities to enable people to become better prepared. The government at that time lacked a disaster preparedness institution, having only bodies to coordinate disaster response at the provincial (Satkorlak) and district (Satlak) levels.

It became clear that community preparedness would not be successful if the efforts of the government and the disaster management practitioners, including NGOs, were not aligned. While the two actors shared a common aim of calming fears amongst the population, the different methodologies would result in different behaviour within the at-risk population. When the population believe that the threat is not there, they will not do anything because they think they are safe. When they know that they are facing a risk and are supported in developing ways to manage this, the population will be calm and aware, but also prepared.

The critical issues then become: What is the message? Who should deliver the message? To whom and how should the message be delivered? And how should the at-risk population respond to the message?

Methodology employed

KOGAMI identified its target audiences as comprising the community, schools, the government, the private sector and the media. While different audiences require different forms of engagement, the overall approach remains similar: finding the key person in each community. The key person is someone who is trusted by the people in that community and has influence to make others follow them. Once the key person understands and supports the objectives, efforts generally progress well.

However some people still believe that the government has sole responsibility for risk reduction efforts. It has been important to raise public awareness that it is everyone's responsibility to save lives and no one can depend on others. It has also been necessary to raise awareness amongst government bodies that they should develop specific disaster risk preparedness regulations. Where direct communication has proved difficult, KOGAMI has employed various forms of media, with newspapers and TV talk shows proving effective.

Impact

KOGAMI usually conducts assessments both before and after undertaking preparedness activities, while aware that there may be other vulnerabilities, such as inappropriate evacuation infrastructure or ineffective early warning systems, which prevent effective response when a disaster occurs. The real evaluation is after strong earthquakes. If the community implemented their preparedness plan and reached a safe place within the time which seismologists estimate an earthquake-generated tsunami may take to reach the city, then the organisation can consider they have been successful in supporting people's preparedness decision-making. Indeed, no one died or was injured in the areas where KOGAMI has been undertaking community- and school-based preparedness activities when the earthquake struck on 30 September 2009.

While KOGAMI has strong cooperation with the government and legislators, this remains reliant on personal relationships rather than institutional partnership. Recognising that efforts to strengthen infrastructure are important in helping those at risk survive, the organisation is also heightening awareness that infrastructure without education is not effective, and that achieving tsunami preparedness requires building a shared vision among donors, scientists and disaster management and preparedness practitioners and institutions.

Case Study 6: Gaming approaches to support urban risk reduction in Kenya

Erin Coughlan, Red Cross Red Crescent Climate Centre, Daniel Mutinda, Kenya Red Cross, Anne Mette Meyer, Danish Red Cross

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Gaming provides a platform for knowledge sharing and, in this example, supported participatory assessment of the current early warning information system.

Understanding – Enabled participating scientists, local government and community decision- makers to better understand the complex decision-making environment.

Application – Opened a channel for multi-stakeholder collaboration in jointly developing an early warning information system tailored to meet the concerns of at-risk groups.

Why the dialogue approach was employed

Efforts to address climate risks have, to date, focused disproportionally on rural areas, with very few initiatives located in urban settings. The largest city in Kenya is Nairobi, where approximately 60% of the population live in crowded, informal settlements.[17] Funded by the Danish Red Cross, Kenya Red Cross is working to reduce disaster

17 Da Cruz, Fernando, Kerstin Sommer and OmbrettaTempr. 2006. *Nairobi Urban Sector Profile*. United Nations Human Settlements Programme (UN-HABITAT). http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2791.

risk in these areas, taking into account the variety of hazards faced by their residents.

To design interventions which address the climate risks faced within these populations, the Kenya Red Cross and the Red Cross/Red Crescent Climate Centre carried out a Climate Risk Assessment in December 2012. Targeting seven informal settlements, the organisations undertaking the risk assessment were faced with what was for them a novel task: bringing urban stakeholders together to discuss climate risk and what can be done about it. To address this new and complex decision-making environment, the Red Cross team held a series of unconventional focus group discussions featuring a new tool: participatory games for stakeholder dialogue and action.

The methodologies employed

Focus group participants included representatives of disaster risk reduction groups, the provincial administration and the Kenya Meteorological Department, in addition to a cross-section of slum residents. In previous surveys, flood risk was shown to be a key concern in these areas, and model projections for climate change in East Africa indicate that the risk of extreme rainfall is likely to increase, as is average rainfall. While focused primarily on floods, other risk factors were included in the assessment.

The first game played by focus group participants is called 'Ready', designed by Ramiro Corbetta of Parson's School of Design. Players form three competing teams, each identifying a variety of actions that they could take based on a flood risk in their neighbourhood. Each team prioritises eight actions, and draws each action on an index card. Teams are then given 20 dice, and asked to divide the dice amongst the actions according to how difficult it is to complete the action (more dice correspond to increasing difficulty levels). Gameplay lasts for 90 seconds, during which team members scatter around the room to 'complete' their actions by rolling the dice repeatedly to attain a certain number combination. The group that completes the most actions before the deadline wins a prize.

Debrief on this participatory exercise solicits a wide range of opinions about which actions were completed during the game, and how this is similar to or different from actions that are completed by the community in real life. Teams are able to consider the actions that were generated by others, and identify common issues and priorities. In particular, this game encourages participants to focus on their capacities: what they are able to do to reduce the risk of disaster. The discussion enables the identification of key enabling factors, such as the existence of an early warning system which gives the community sufficient time to prepare, which can be included in future programming.

The second game played in this context was the conventional game of 'Telephone', in which participants are split into three teams, each person lined up one behind the other. The person at the front of the line is given a nearly incomprehensible message about the probability, lead time, location and amount of a forecasted rainfall event. The information is then transferred from one person to the next until it reaches the end of the line. The team reaching the end of the line with the correct information first is the winner.

During the debrief from this game, participants are asked to describe the existing early warning information system within their community, and are quick to offer parallels with the game, with messages becoming garbled during the process of communication, and ways in which the long 'telephone' line can be shortened to deliver clearer messages.

Impact

The games have supported improved humanitarian programming and decision-making. As a result of their participation, the Kenya Meteorological Department has expressed interest in developing a flood early warning system for Nairobi based on upstream rainfall and river levels, and the Kenya Red Cross indicated its interest in disseminating such alerts. Moreover the approach highlighted that the provincial administration is a main player in the existing early warning system and has an integral role in risk reduction programming for this area.

Games as a tool for participatory learning can be easily tailored to a variety of contexts. The games detailed here do not require that participants are literate, but encourage group discussion and creativity amongst participants as peers. As a tool for gathering information about a new context and engaging stakeholders to discuss problems and solutions, games can be catalytic in defining novel approaches to real-world problems.

Case Study 7: Participatory game design to nurture learning and dialogue[18]

Carina Bachofen and Pablo Suarez, Red Cross Red Crescent Climate Centre

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Participatory game design provides a fun way of learning, bringing together different actors and knowledge sources and building confidence through collective action.

18 This work is the result of collaboration with numerous partners in humanitarian, development and academic organizations, our gratitude to them (especially the American Red Cross and the Parsons School for Design/PETLab). It was part of a research grant to the Red Cross/Red Crescent Climate Centre from the Climate and Development Knowledge Network (CDKN Action Lab Innovation Fund). As such, it is an output from a project funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of the Climate and Development Knowledge Network, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them.

Understanding – Capturing complex 'real world' systems, participatory game design provides the opportunity to support transformative, experiential learning.

Application – The locally-specific, real world system dynamics, which participatory game design provides, promotes ownership and more context-relevant solutions.

Why was the dialogue approach employed?

All too often, traditional approaches to dialogue and learning are unidirectional: presentations treat audiences as passive recipients of information and fail to engage people's minds and emotions throughout the learning process. Consequently, opportunities for eliciting deeper insights and interactions among key stakeholders and for generating constructive learning are missed.

Since 2009, the Red Cross/Red Crescent Climate Centre has been investing in innovative alternatives to such traditional forms of communication: participatory games to spur serious learning and dialogue processes, on topics ranging from flood preparedness and dengue prevention to gender inequality.[19]

Serious games can provide a compelling, memorable and fun way of learning about adaptation and disaster risk reduction, moving players from 'Huh?' moments of confusion to 'A-ha!' moments of discovery and understanding. Games can capture the essence of complex systems where decisions can lead to a range of plausible futures, engaging players in likely trade-offs, feedbacks, delays and thresholds experienced before, during and after disaster events. What is more, participatory gameplay creates a fruitful atmosphere of collaboration amongst stakeholders with different languages, perspectives and priorities.

The methodology employed

The Climate Centre has begun to engage decision-makers directly in participatory game design processes, whereby they are invited to reflect on complex real world systems and disaggregate these elements into essential building-blocks for game design. Strong facilitation by experts familiar with the methodology for participatory game design is vital to this process. Technical expertise, especially regarding the representation of risk, is also integrated into game design. For example, the game 'Paying for Predictions' specifically mimicked the seasonal forecast for extreme rainfall issued for West Africa in 2008.

The process for participatory game design can be outlined in the following six steps:[20]

19 For more information on this approach, see "Games for a New Climate: Experiencing the complexity of future risks" - available online at http://www.bu.edu/pardee/publications-library/2012-archive-2/games-climate-task-force/.

20 For full description of the process, see 'Can games help people manage the climate risks they face? The participatory design of educational games' - available online at http://www.climatecentre.org/downloads/File/Games/AW-wps-games-v5.pdf.

1. Define the communication challenge
What conversation should game play elicit? What types of decision-making strategies should emerge during game play? What is the 'A-ha!' moment players should experience?

2. Define what needs to be represented in the game
What are the key elements that will be used to construct the rules, process and emotional triggers of the game? Who can make decisions in the game? What are possible actions? What dynamics should players face during game play?

3. Define the emotional triggers of the game narrative
What feelings should the game process elicit? How will *information* lead to different individual or collective *decisions* that have one or more emotional *consequences*? What tensions should arise during game play as both expected and unexpected consequences present themselves?

4. Refine the game's dynamics
Boil the narrative down to its essential elements related to information, choices, decisions, actions and consequences.

5. Develop rules
Create a game system that captures the desired learning and dialogue experience in a way that is engaging and memorable. The rules of play need to be simple, but lead to the emergence of a complex and rich system. At this stage it is usually necessary to engage professional game designers.

6. Play!
Try out the game prototype. Discuss with participants the consequences of different actions and how to improve the prototype. Tweak game dynamics, rules and emotional triggers. Iterate.

Impact: applying participatory game design for Central American communities

In February 2012, as part of the Partners for Resilience Programme (PfR),[21] partners were seeking ways to engage vulnerable communities in a dialogue about climate, disasters and ecosystems pertaining to upstream decisions and downstream consequences in a river basin. Applying the six-step methodology a couple of hours per day over the course of a five-day workshop, about 30 programme staff co-designed a participatory game called 'Upstream–Downstream'. The game uses dice, beans and a few other simple materials to portray the relationships between deforestation, floods, drought, food security and the changing climate affecting local communities.[22]

21 In 2011, five humanitarian, development and environment organisations, with support from the Dutch Ministry of Foreign Affairs, formed an alliance called 'Partners for Resilience' (PfR) to reduce the impact of hazards on vulnerable communities in nine countries around the world and generate lessons on best practices for strengthening community resilience.

22 See a four-minute video at http://vimeo.com/45150733, and a video to train game facilitators at http://vimeo.com/45097866.

The game was tested in rural Nicaragua. Participants from both the upstream community El Chichicaste and the downstream community of Moropoto joined the game session, and during debriefing remarked on how successful strategies during game play paralleled the importance of shared risk management strategies in real life. Collective action during gameplay boosted the confidence of players, and was reflected in increased willingness to invest in a dialogue about ways to take action in reality. Dialogue emerging from gameplay centred on the potential of creating schemes for payment of ecosystem services to manage players' real-life flood and drought risks; participants also discussed how to make disaster risk reduction more ecosystem- and climate-smart in their local contexts.

As the game was shown to have reflected the reality faced by particular communities in Nicaragua, PfR teams' interest and sense of ownership boosted their commitment to continuing to improve and scale up the programme, using the game as a tool for promoting dialogue and learning about managing changing risks.

Scaling up the participatory game design methodology

Experience to date indicates that engaging decision-makers in a participatory game design process offers three significant benefits: (a) the game better reflects a real world system when designed by those most familiar with the context, (b) greater ownership and enthusiasm about the game can emerge, and (c) better insights can be generated amongst the participants regarding the systems' dynamics that the game mimics. This in turn can contribute more deeply than game play alone to the higher objective of climate risk management.

To date, over ten game sessions have been held in local communities, with potential for scale-up a key added value of the game as a learning tool. While the impact of this approach is the subject of ongoing research, there is rapid acceleration in demand. However, to fully understand the capacity, value and potential risks of game-based approaches to climate risk management, there is a recognised need for a stronger evidence base.

Case Study 8: Early Warning-Early Action workshops: Bridging the gap between climate scientists and communities at risk

Arame Tall, CCAFS

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Enables direct dialogue between providers and users of disaster risk information.

Understanding – Develops a series of modules engaging expertise from across sectors/disciplines on issues of concern to at-risk groups. Bridges gaps in perceptual understanding between the providers and users of disaster risk information.

Application – Translates relevant scientific understandings to inform specific decision-making processes. Tasks participants with defining and jointly agreeing a plan of action to communicate timely, accurate and actionable early warnings tailored for specific user groups. Supports an ongoing, two-way channel for dialogue, integrating cross-sectoral expertise.

Why the dialogue approach was employed

Advances in climate forecasting increasingly enable national authorities to alert communities to climate and weather-related risks with sufficient lead time for communities to mobilise appropriate preparedness measures.[23] While such forecasting has enhanced well-established emergency response mechanisms in high-income countries, improved forecasting ability rarely translates into better climate risk management in the developing world. Indeed, instances of the successful transmission and subsequent use of available climate forecasting by policy-makers and communities at risk are rare in Africa, where the potential benefits of such forecasts are high, but capacity to exercise their full utility remains low.[24]

The Early Warning-Early Action (EW›EA) approach strengthens dialogue between those that can provide climate information (i.e. experts directly involved in producing, packaging and relaying climate forecasts to serve user needs) and climate information users (including communities sensitive to climate risks, national policy planners and disaster management agencies). Seeking to bridge the gap between national climate information providers, boundary organisations and community users, ten pilot EW›EA workshops were conducted in Senegal, Kenya, Uganda, Ethiopia, Niger, Burkina Faso and Mali between 2009 and 2012 with the aim of:

- Initiating dialogue between climate service providers, communicators and users.
- Exploring perceptual gaps between the two communities of practice and building common ground as a basis for partnership.
- Narrowing the gaps and identifying means to sustain a bridge between the communities of practice in order to enable more effective communication and use of existing climate forecast information to enhance community resilience.

Methodology

Each EW›EA workshop consists of a three-day facilitated dialogue bringing together climate forecasters, boundary organisations and community users in a non-hierarchical environment. Workshop participants are

23 Stern, P C and W E Easterly (1999) Making Climate Forecasts Matter, National Research Council, p175; Cane, MA, SE Zebiak and SC Dolan (1986) Experimental forecasts of El Nino, Nature, 321:827-832.
24 Tall, A (2010) Climate forecasting to serve communities in West Africa, Procedia Environmental Sciences 1: 421-431. Available at: http://www.sciencedirect.com/science/journal/18780296; Patt, A (2000) Communicating probabilistic forecasts to decision makers: A case study of Zimbabwe, Belfer Center for Science and International Affairs Discussion Paper 2000-19..

tasked with defining and jointly agreeing a plan of action to communicate timely, accurate and actionable early warnings to vulnerable communities.

The three-day Early Warning›Early Action workshop format[25] comprises five principal elements:

1. Preparation amongst both the climate forecasters and users of climate information.
2. A series of modules focused on topics relevant to climate risk management and tailored to inform a specific decision-making process.
3. Mediated dialogues between providers and users to agree a roadmap to communicate and apply salient climate information services for local users.
4. A forecast scenario game which requires participants to conceptualize EW›EA, putting participants in the role of a vulnerable farmer/community member who has to trigger an early action on the basis of a received warning message from the national meteorological service.
5. A joint community visit.

Rarely are providers and users of climate services afforded an opportunity for direct dialogue. Separate preparation with each group is undertaken in advance of the workshop. This builds providers' understanding of the types and formats of information which will be relevant for users, while users are encouraged to consider how they currently use climate information within decision-making, and where more relevant information could enhance resilience-building.

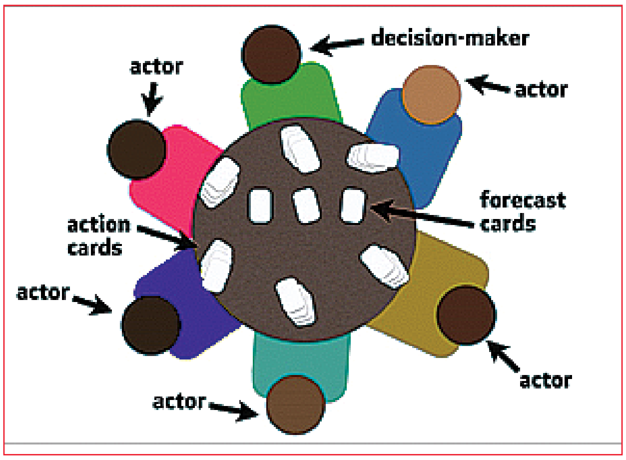
For the modules, users are divided into small groups, with each group visiting a series of 'module tables' for 20 minutes each. Module topics are selected which are relevant for the community under consideration (for example discussion on agrometeorological applications for farmers, and on mapping and hydrology for communities at risk of flooding). At each table, a scientist or expert presents a particular piece of climate science learning, a risk management tool or relevant sectoral expertise and explains what it can and cannot do, and how it could be relevant for users. In an effort to avoid overreliance on complex materials, presenters are not permitted to use PowerPoint. Once the small groups have visited each of the module tables, the scientists then move between each of the user groups to learn what they found useful from the modules and to clarify any points of uncertainty or confusion.

The groups are then tasked with developing a roadmap for providing, communicating and applying climate information for at-risk communities, and formally commit to support their role within this process.

In the early warning-early action scenario game:

1 Participants are divided into small, mixed scientist-user groups.
2 The groups are presented with a series of probabilistic forecasts over different time periods relevant to the decision-making process which the exercise is seeking to support (for flood early warning, for example, forecasts may be given for ten days, 48 hours, 24 hours and three hours), and participants have to individually think up what they consider the most appropriate action given the forecast timeframe and information provided.
3 Participants take turns to act as the decision-maker, who is tasked with deciding between the series of possible preparedness actions proposed by the other participants.
4 The other participants get the opportunity to challenge the decision-maker and engage in a discussion on their preferred actions.

Figure 3A: In the early warning › early action game, participants take turns to play the role of a decision-maker having to select an early action based on a received early warning



Source: Pet Lab & Red Cross/Red Crescent Climate Centre[26]

25 The early warning-early action methodology has been developed by Arame Tall in collaboration with Pablo Suarez of the Red Cross/Red Crescent Climate Centre and PETLab based at Parsons The New School for Design, New York. Its development was funded by a grant from the Africa Climate Change Fellowship Programme funded by START, the UK Department for International Development, and Canada's International Development Resource Centre. Full instructions for the scenario game are available at http://petlab.parsons.edu/redCrossSite/rulesBTS.html.

26 This game and others can be found here: http://petlab.parsons.edu/redCrossSite.

A joint provider/user visit to the at-risk community is hosted by community members who share their experiences, insights and questions with disaster risk managers and scientists (who in turn share the main ideas derived from the previous three-day workshop). The visit ends in a village meeting during which collaboration and commitments reached are publicly shared.

Impact

As a result of EW›EA workshops, participating national climate providers better understand the type, content, format and contexts of climate information required by at-risk communities and disaster management agencies. Forecasters are also able to identify more appropriate channels for the communication of early warnings, as well as the value of enabling two-way channels for community concerns to drive ongoing and future climate science research.

The EW›EA approach provides a framework for developing user-driven climate information services at regional, national, district and community levels. In each country where EW›EA workshops were undertaken, communication between national disaster management actors and national meteorological agencies has improved. In Uganda, EW›EA activities led to the development of a national institutional framework for climate service provision and communication, as well as the definition of a coherent plan of action for its implementation. In Senegal and Kenya, where EW›EA activities were incorporated within existing in-country NGO projects,[27] EW›EA workshops have contributed to yield increases, strengthened farmers' capacity to anticipate and prepare for predicted climate shocks and supported protection of life and livelihood assets in response to early warnings.

Case Study 9: Knowledge Timelines and Participatory Downscaling to build understanding of the value and uncertainties within local and scientific climate information

Dominic Kniveton, University of Sussex

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Gives scientists and at-risk groups access to each others' knowledge sources, enabling comparison and building trust.

Understanding – Supports understanding about the levels of confidence and uncertainty across both community and scientific knowledge sources. Enables scientists to better appreciate the impact of uncertainties in weather and climate information on specific decision-making processes.

Application – supports consideration of the potential for local information to guide appropriate application of scientific information currently provided at geographic and time scales which cannot effectively support local decision-making.

Why the dialogue approach was employed

These approaches have been used within climate science-humanitarian policy exchange demonstration studies in Kenya and Senegal[28] aimed at assessing how climate science can better support humanitarian, disaster risk reduction and development planning. The two approaches stem from recognition that knowledge from scientists and local communities are both valuable and can complement each other in an integrated manner.

Key to such efforts at integration is the understanding of the inherent uncertainty in the information and knowledge of climate and weather. Acceptance and understanding of the inherent uncertainties in climate information serves as a fundamental basis for the uptake of forecast information and the making of appropriate decisions according to the priorities of the decision-maker.

The methodologies

Knowledge Timelines

Communities are asked to compare their understanding of local weather and climate with knowledge available from the scientific community. The approach aims to explore the different types of knowledge which are available and that people use to make decisions; to understand the similarities and differences in these knowledge sources and build understanding about the levels of confidence and uncertainty across both community and scientific knowledge sources.

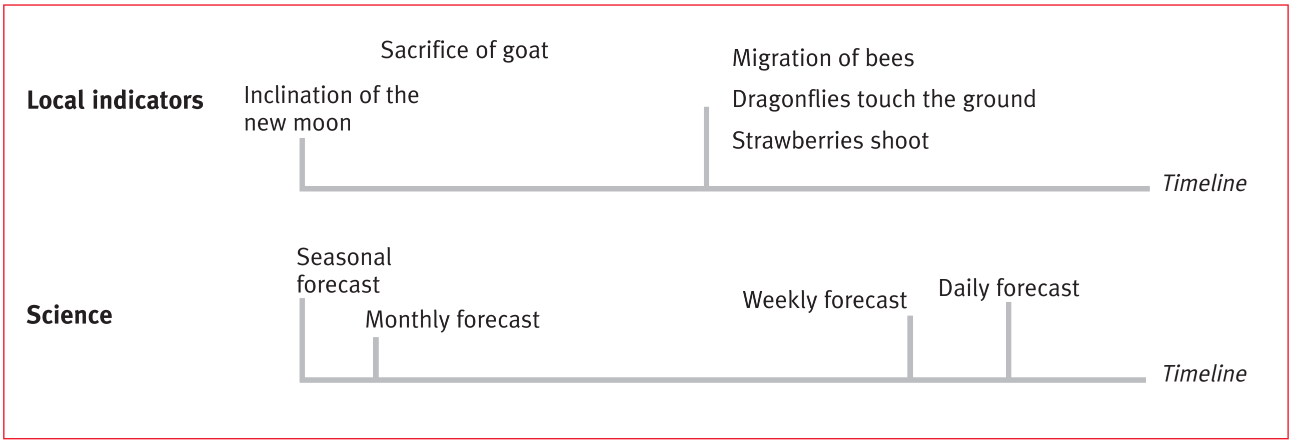
- The audience is encouraged to remember a past climate event using non-climate events to jog their memory (for example, a significant political or social event).
- The participants are then asked to discuss the climate or weather information people had before the climate event occurred.
- The scientific information available for this event is then detailed and the uncertainty and confidence in this scientific information is described in terms of spatial and temporal scale.
- The audience then describes the confidence and uncertainties they have in the information which they currently use.
- The group then compares and contrasts the features of each knowledge type.

The exercise revealed that both scientific and local knowledge types share the characteristics of being accurate sometimes and inaccurate at other times. Figure 4A depicts discussion from the use of the Knowledge Timelines amongst farmers' groups in Mbeere District, Kenya. Clearly findings will be specific to each community. The Timeline could also be extended to consider climate information at longer time frames.

27 Christian Aid's SALI project in Mbeere, Kenya, and Senegal Red Cross activities within Kaffrine, Senegal. See Box 2 (p. 5) in the Network Paper.

28 See Box 2 in the Network Paper (p. 5), which outlines the exchange demonstration studies.

Figure 4A: Knowledge Timelines discussion, undertaken within Christian Aid's Strengthening Agricultural Livelihoods Innovation project in Mbeere District, Kenya, in September 2011



Participatory Downscaling
Participatory Downscaling supports users to better understand how information can be 'right' at a regional or national level and yet not translate into local experience/observations. The approach aims to develop a shared understanding of the uncertainties in climate and weather information and the impact of these uncertainties on humanitarian and development risk management decisions. It also seeks to support local capacity to translate national and regional climate and weather information to a range of climatic and weather outcomes at local spatial and higher temporal scales relevant to local decision-making processes.

The approach is based around a simple event history technique.

- Starting with a time series of observed atmospheric data, a sample of years are selected that represent different atmospheric-related events.
- For each event one or two non-climate culturally, politically or economically important events are selected to provide a mental trigger to participants of the year of the event being referred to.
- For each year, starting with the most recent, and without revealing the flood or rain conditions that year, participants are asked to discuss whether the location where they were in that year experienced a wet, dry or average rainy season, and whether the communities where they lived experienced the weather-related hazard of interest.
- The national and regional picture of the rains and weather-related hazard is then revealed to the participants, and the range of experiences collated for years which were similar in terms of rainfall at a national and regional level.
- The seasonal rainfall forecast is then revealed for each year.
- A group discussion is then held about the humanitarian and development implications of this range of outcomes at the local scale for the same national event.

Impact
The approaches were employed within a wider exchange process, bringing together a range of activities which collectively contributed to a range of impacts, including supporting life and livelihood decision-making amongst participating at-risk groups and the development of channels for developing more relevant climate information services.

A baseline questionnaire on the current state of climate science-humanitarian policy dialogue undertaken before the workshop in which these methodologies were employed made clear that participating community decision-takers and humanitarian policymakers had very little prior access to or understanding of scientific weather and climate information. A parallel questionnaire conducted with climate scientists highlighted that they had little existing knowledge of the range of local indicators which communities were currently employing.

The approaches built trust in and understanding of respective community and scientific sources of weather and climate information and increased awareness that local indicators could help supplement and guide appropriate application of weather and climate information where current observations and weather stations are minimal.

Case Study 10: Blending local and scientific knowledge sources to support small-scale farmers in drought-prone areas of Kenya and Tanzania

Richard Ewbank, Christian Aid

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Provides local farmers with access to scientific climate information. Collates local climate information. Identifies complementarities between local and scientific sources of information.

Understanding – Explores the levels of confidence across both local and scientific sources of information.

Application – Identifies opportunities for employing blended information within specific decision-making processes. Creates channels for regular, post-seasonal review and engages at-risk groups in collecting and validating scientific data, building trust and ownership.

Why the dialogue approach was employed

In order to develop climate information services which better support small-scale farmers in drought-prone areas of Tanzania and Kenya, Christian Aid and its partners have proposed a blending approach.[29] Blending, strongly complementary to participatory downscaling, offers the opportunity to combine scientific forecasts with local indicators, to develop projections which are more relevant, tailored, contextualised and acceptable to the specific decision-making processes of small-scale farmers dependent on rain-fed agriculture. The approach has two main justifications:

1. To bring potentially useful local information together with the scientific forecast, increasing the local relevance of the latter and the scientific basis of the former.
2. Even where local indicators are becoming less reliable and/or their use is diminishing, bringing the scientific information into the local environmental, socio-economic and cultural context increases the likelihood that it will be understood, accepted and used.

Methodology employed

Blending involves eight basic steps, encompassing:

- Identification of climate information requirements and local climate information sources, including prior use, ascertained through focus group discussion, interviews with key stakeholders and the development of community charts and timelines.[30]
- Assessment of local (bio/cultural) indicators, including perceptions of their reliability and whether this has changed due to changes in average climate, land use, culture, etc.
- Identification of any information confirming the scientific basis for these local indicators (e.g. research on bird migration – rainfall pattern or El Nino – atmospheric condition linkages).
- Identification and assessment of the reliability of scientific climate information sources including from local weather stations, national meteorological services and regional and international climate institutes.
- Consideration of appropriate approaches for blending local indicators (especially those assessed as reliable and/or science-based) with scientific sources of climate information to best support specific livelihood decisions. This reduces uncertainty where they complement each other (either through mutual confirmation or filling a gap) and facilitates a decision on which to use where they do not.
- Translating this conclusion into resilience-enhancing livelihood decisions, including identification of what inputs and advisory services are required to enable these decisions.
- Establishing systems for the provision of decision-enabling climate services, including a regular uninterrupted supply of short-term forecasts communicated to farmers using easily accessible means (such as village notice boards and mobile phone), as well as rain gauges for farmer groups to increase local data collection and validate the forecasts provided (citizen science).
- Evaluation of the blending process and its impact on livelihood outcomes.

Blending also recognises that supporting farmers' resilience requires an integrated approach, combining meteorological and climate services with agricultural and marketing support, including assurance of quality and increased choice of seed/crop variety; soil testing services to manage soil fertility; and support for sustainable agriculture (such as conservation agriculture and agroforestry).

Impacts

While the approach has only been undertaken to date on a pilot basis and over a small number of seasons,[31] it has supported:

Increased access to climate information and willingness to employ national meteorological information: In Tanzania, links were made between the local weather station and farmers' groups, supporting collation and local use of information from farmer-managed rain gauges.[32] Farmers were surprised to discover that they received much of the full scientific forecast, having previously assumed that the government knew how seasons would turn out but rationed this information. They were also very interested in the scientific basis of their local indicators. Where employed in a similar initiative in Kenya, reviews found that farmers' confidence in the scientific forecast had increased and this substituted for diminishing reliance on local indicators, which were focused primarily on the onset of rains at the start of each season.[33] In both countries, this process improved farmers' ability to make decisions on when to plant, what varieties and crops to plant, how to enhance conservation of soil moisture and fertility management and how to conduct on-farm trials into drought-resilient techniques.

29 These pilots were undertaken by two sustainable livelihoods projects. The Sustainable Agricultural Livelihoods Innovation (SALI) project is being implemented by CCSMKE (Christian Community Services Mount Kenya East) in Mbeere District, Kenya, while work in Manyoni and Chamwino districts was implemented by INADES Tanzania (African Institute for Economic and Social Development).
30 'Case Study: Blending Community and Scientific Sources of Climate Information'. Available at the Dialogue for Disaster Anticipation and Resilience online resource: http://www.elrha.org/dialogues/case-studies/case-study-10-blending-community-and-scientific-sources-climate-information.

31 Within the work in Mbeere, Kenya, it was employed in combination with a number of different dialogue approaches, see Box 2 on exchange demonstration studies in the Network Paper (p. 5).
32 Christian Aid (2011),'Review of the Innovation Fund Projects on Climate Change Adaptation 2008- 10'. Available at: http://unfccc.int/files/adaptation/application/pdf/christian_aid_review_of_the_innovation_fund_projects_on_climate_change_adaptation_2008-10_160811.pdf.
33 Ewbank, (2012).

Increase in agricultural yields: In Kenya, participating farmers groups confirmed having made new types of decisions about cropping practices, with planting nearer to the anticipated start date of the rains as the most important of these. This ensured that early-maturing varieties could take maximum advantage of the rains, reducing the risks associated with early cessation and/or extended dry spells. This also mitigated the need to replant, which would increase seed-related expenditure. As a result of using the forecast for the 2012 long rains, 96% of farmers attributed an increase in yield of greater than 5%, and two-thirds attributed a greater than 15% increase in crop output to decisions made differently as a result of blending the scientific forecast with their local indicators.[34]

Identification of complementarities between local and scientific sources of information: Similar to the findings from CARE's use of Participatory Scenario Planning in Garissa, Kenya (see Case Study 11), blending has identified areas in which local information may be able to complement and strengthen meteorological information. Local knowledge may, for example, provide information on the local onset and potential impact of the rains, while scientific sources may only be able to provide higher-level information about the onset, as well as the cessation, distribution and quality of the rains. The approach has identified a number of ways in which the complementarities between scientific and community indicators can better support climate information for communities at-risk, including:

- Scientific research on bio-indicators to assess which local indicators have a scientific basis.
- Verifying and/or challenging community perceptions of climate variability and change through comparison with climate records and forecasts.
- Enhancing user understanding of the probabilistic nature of forecasting and how this can be applied, reducing unrealistic expectations of meteorological science.
- Empowering communities to manage rain gauges – this can extend the reach of observation systems, offering the potential to validate scientific forecasts and promote local ownership of climate data. It also has very practical applications for the gauge managers, e.g. planting once a local rainfall threshold has been passed and more precise identification of micro-climate conditions that can advise agricultural recommendations.
- Creating dialogue linkages so that community priorities for enhancement of scientific climate services can be fed back to meteorology and other relevant departments and stakeholders.

34 Ibid.

Case Study 11: Participatory scenario planning bringing together local and scientific knowledge to agree locally relevant options relating to seasonal forecast scenarios, used in Kenya and Ghana

Fiona Percy, CARE

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Engages local community and government decision-makers and meteorologists to share and discuss local and scientific sources of climate information and co-produce more relevant, tailored information.

Understanding – Provides a platform to discuss with users seasonal forecasts and the uncertainties across sources of climate information. Supports decision-making across a range of scenarios and actors.

Application – Creates a channel for ongoing, two-way dialogue to develop user-driven services, which integrates expertise across sectors.

Why was the methodology employed?[35]

Effective adaptation to climate variability and change is dependent on access to climate information for the coming seasons and years. Flexible planning in the face of a continuously changing climate is a key element of adaptive capacity and needs to be informed by climate forecasts and the effects of uncertainties and risks on different vulnerable groups and socio-economic sectors. Developing scenarios of probable climate impacts contributes to supporting more resilient and flexible decision-making, enabling communities to live with the uncertainties and risks presented by both short- and long-term changes in climate.

In the past, much government planning has been undertaken at the individual line ministry level. Meteorological forecasts have been transmitted at the national and international levels, with little use at the local level, and many of those agencies engaged in supporting livelihoods have focused on DRR and response.

Participatory Scenario Planning (PSP) develops information that is locally relevant and useful. The process provides a common platform which helps people at risk and local governments discuss and agree on options for supporting climate-resilient livelihoods and disaster risk reduction.

The methodology

PSPs are undertaken as soon as the seasonal forecast is available from national meteorological services, in advance of each local rainy season. In a workshop setting over one or two days, PSP brings together a wide range of stakeholders – including the district meteorological department, local and traditional forecasting experts, community members, district officers from key ministries

35 CARE (2012) Decision-making for climate resilient livelihoods and risk reduction: A Participatory Scenario Planning approach, http://www.careclimatechange.org/files/adaptation/ALP_PSP_Brief.pdf.

Table 3A: An example of advisories for the March to April season, with a below normal rainfall probability, developed during a PSP workshop in Garissa, Kenya, in March 2012

Possible Impact of below normal rainfall	Advisories (Agro Pastoralist Community)	Advisories (Pastoralist Communities)	Lead government department
Crop Failure and Seed loss	-Preserve last years' harvest -Increase area under irrigated agriculture -Early land preparation and planting of early maturing and drought tolerant seeds -Diversify crop production -Diversify livestock production (e.g.include bee keeping)	Early land preparation and planting of early maturing and drought tolerant seeds (for rain fed agriculture) e.g. sorghum, millet, green grams, and cowpeas	Ministry of Agriculture
Poor Livestock body conditions	-Off-take of weak and old animals -Supplementary feeding for lactating &young animals -Herd diversification (include emerging stock) -Timely vaccination / mass treatment -Fodder production and preservation under irrigated agriculture	-Off-take of weak and old animals -Supplementary feeding for lactating & young animals -Herd diversification(include emerging stock) -Timely vaccination / mass treatment	Ministry of Livestock Development
Natural Resource based conflict (e.g. over water sources	-Adhere to water users by laws, practice proper hygiene -Enhanced irrigation farming to ensure better harvest	-Adhere to water users by laws, practice proper hygiene -Enhanced irrigation farming to ensure better harvest	-Ministry of Northern Kenya and other Arid Lands -Ministry of Water
Migration (loss of labourers; reduced numbers of decision makers)	-Diversification of crop and livestock production (longer term) -Enhanced irrigation farming to ensure better harvest	-Diversification of crop and livestock production (longer term) -Enhanced irrigation farming to ensure better harvest	-Ministry of Agriculture -Ministry of Livestock
Higher incidence of school drop outs	-Food for school fees campaigns -Government sponsored bursaries	-Food for school fees campaigns -Government sponsored bursaries	-Ministry of Planning (CDF) and Ministry of Education
Human wildlife conflict	-Fence farms -Develop separate water troughs for domestic animals and wildlife	-Fence farms -Develop separate water troughs for domestic animals and wildlife	-Ministry of Livestock Development -Kenya Wildlife Service

and local NGOs –to share and compare their knowledge on climate and forecasts.

Participants exchange and combine local and scientific sources of seasonal forecast information to develop three probabilistic hazard scenarios. They assess the hazards and risks within each of these to develop impact scenarios, and discuss the opportunities which each impact scenario presents for the coming season.

Discussing the local implication of each impact scenario, participants identify actions and develop locally-relevant, livelihood-tailored, actionable advisories (see Table 3A). These advisories are then communicated to local communities through a wide range of channels, including radio and other media, community leaders and extension services.

The advisories addressed information needs for the two major livelihood groups in Garissa, pastoralists and agro-pastoralists.

The impact

PSPs support discussion on a range of possible scenarios to support more flexible planning and risk management. The approach supports planning for most likely and alternative scenarios, in case the season turns out to be different from the forecast with the highest probability. They support communities and local governments to take advantage of opportunities, and prepare for challenges, which the seasonal climate presents and make or modify their plans. The multi-stakeholder discussions also raise issues for longer term landscape wide plans. Participating communities in Garissa, Kenya, were able to take advantage of the increased rainfall in the October to December 2011 season to plant improved maize, expand cultivation areas and harvest water for dry periods.[36] When the forecast is for insufficient rainfall, the PSP can support identification of mutually supportive activities amongst different livelihood groups. For example, agro-pastoralists living near rivers can cultivate more irrigated fodder, assured of a local market from pastoralist communities. Forecasts have also supported efforts to address animal and human health associated with drought or high rainfall.

The approach enables meteorological departments to learn about and better respond to the changing information needs of different user groups. It also highlights the need for developing ongoing channels for dialogue and integrated approaches to climate services and broader risk management, bringing together relevant sectoral expertise to support decision-making at local, county and national levels.

Case Study 12: Mentoring to support extended exchange between scientists in Australia and the Pacific

Lily Jade Frencham, PACCSAP and Jill Rischbieth, CABI

How this case study addresses the issues of access to and understanding and appropriate application of knowledge

Access – Supports direct access and ongoing collaboration between national meteorological services and international climate centres.

Understanding – Allows for difference of scientific opinion, building respect of different knowledge sources.

Application – N/A

Why the methodology was employed

Efforts to unlock the potential of science to enhance capacity-building are not limited to approaches designed to strengthen dialogue between at-risk people, policymakers and scientists. They also involve capacity-building through bringing together scientists from different countries. The mentoring approach described by this case study was instigated in response to a demand from Pacific climate scientists and students for longer-term collaborative learning opportunities.

The Pacific Climate Change Science Program (PCCSP) (2009–2011) provided a platform for scientists in Australia and scientists and decision-makers in 14 Pacific countries and East Timor to work together to increase scientific understanding and capacity with regard to climate change and variability in the region.

The programme included training workshops for partner country stakeholders both in-country and in Australia. Feedback from these activities was very positive, and indicated a desire for opportunities to spend extended periods of time working more closely with Australian scientists.

The mentoring programme was initially developed in response to ad hoc requests from Pacific scientists to work with specific Australian scientists on particular projects of interest. Drawing on the long-standing traditions of mentoring and international collaboration that already existed in the scientific community, PCCSP supported three Pacific partner country scientists to travel to Australia and spend a period of between four and six weeks collaborating on a project with an experienced scientist in a chosen field. The expectation was that these increased skills would assist Pacific scientists in undertaking their work upon returning home, and in turn would result in more effective use of climate science to inform in-country adaptation decision-making.

In 2012, the PCCSP became part of the Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) Program, and feedback from the PCCSP mentoring collaborations was used to develop a more strategic programme. The resulting Climate Change Science Mentoring and Attachment Program developed by CSIRO and the Australian Bureau of Meteorology (BoM) combined ‘attachments’ (visits from partner country representatives to Australia) and ‘mentoring visits’ (which see PACCSAP science mentors spend time in the partner country). Such arrangements allow mentor and partner country representative to form a more productive, mutually beneficial collaborative working relationship over an extended period of time, and to enhance research capacity in the partner country offices.

The methodology

Projects designed under the mentoring and attachment programme model normally contain the following elements:

1. Scientist/s in PACCSAP working with a colleague from a partner country as a mentor on a particular project over a 12–18-month period.
2. At least one attachment of the partner country representative to BoM/CSIRO to work alongside their mentor (for approximately four weeks).
3. At least one mentoring visit from a PACCSAP scientist

36 Canadian Coalition on Climate and Development, Building multi-stakeholder processes for climate change adaptation in Africa, http://c4d.ca/wp-content/uploads/2013/03/2013-CaseStudy-CARE-Kenya.pdf.

to the agency of the partner country representative (for approximately 2–4 weeks), enabling both further project-specific collaboration as well as wider engagement with other colleagues and agencies in the partner country.

4. Ongoing communication and collaborative research over the 12–18 months of the project via email and over the phone.
5. Written output (including report, co-authored journal paper and technical note).

This model was designed to provide a solid basis for collaboration, while also providing plenty of flexibility with regard to duration, spacing and number of visits. The most important aspect is that the relationship between the partner country representative and the PACCSAP science mentor forms the basis of ongoing research collaboration in which long-term and sustainable capacity-building is the main priority.

The impact

A key challenge for PACCSAP in delivering this programme has been trying to meet the high demand for participation from the Pacific, and ensure that mentoring relationships are suitably matched so as to be mutually beneficial for the parties involved. To date, nine collaborative relationships have been developed under the PCCSP and PACCSAP programmes. Establishing a baseline for analysing the impact of this approach to capacity-building has presented a challenge, and has so far relied heavily on personal feedback from those involved.

This feedback has been overwhelmingly positive, particularly with regard to impact on the participating Pacific scientists. The opportunity to learn from, and establish professional relationships with, leading Australian scientists, has been welcomed. For many of the Pacific scientists the mentoring programme provided their first opportunity for presenting at international science conferences and co-authoring peer-reviewed journal papers.

Importantly, the approach has supported two-way learning. Australian scientists participating in the programme feel that the integrity of the scientific research is enhanced by this scientist-scientist mentoring. As Dr Debbie Abbs (CSIRO) explains, 'I asked David Hiriasia, the Director of the Solomon's Meteorological Service, to "laugh-test" the results coming from our models. The local meteorological knowledge that David brings to the research partnership is critical to building a better understanding of their country's climate'.

While broader impacts on capacity and associated climate change resilience at the local community level have been harder to establish, it has been suggested that engagement in the programme has led to a higher calibre of work and innovation upon participants' return to work and in their dealings with local stakeholders.

One of the strongest benefits of the mentoring and attachment programme is that it seeks to encourage long-term partnerships, providing an introduction into a pre-existing collaborative research community, which then outlasts any particular project. Accordingly, the approach has a high potential for scaling up and transferability both within and beyond the PACCSAP programme and into other scientific disciplines, sectors and the region more generally.

Humanitarian Practice Network

The Humanitarian Practice Network (HPN) is an independent forum where field workers, managers and policymakers in the humanitarian sector share information, analysis and experience.

HPN's aim is to improve the performance of humanitarian action by contributing to individual and institutional learning.

HPN's activities include:

- A series of specialist publications: Good Practice Reviews, Network Papers and *Humanitarian Exchange* magazine.
- A resource website at www.odihpn.org.
- Occasional seminars and workshops to bring together practitioners, policymakers and analysts.

HPN's members and audience comprise individuals and organisations engaged in humanitarian action. They are in 80 countries worldwide, working in northern and southern NGOs, the UN and other multilateral agencies, governments and donors, academic institutions and consultancies. HPN's publications are written by a similarly wide range of contributors.

HPN's institutional location is the Humanitarian Policy Group (HPG) at the Overseas Development Institute (ODI), an independent think tank on humanitarian and development policy. HPN's publications are researched and written by a wide range of individuals and organisations, and are published by HPN in order to encourage and facilitate knowledge-sharing within the sector. The views and opinions expressed in HPN's publications do not necessarily state or reflect those of the Humanitarian Policy Group or the Overseas Development Institute.

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