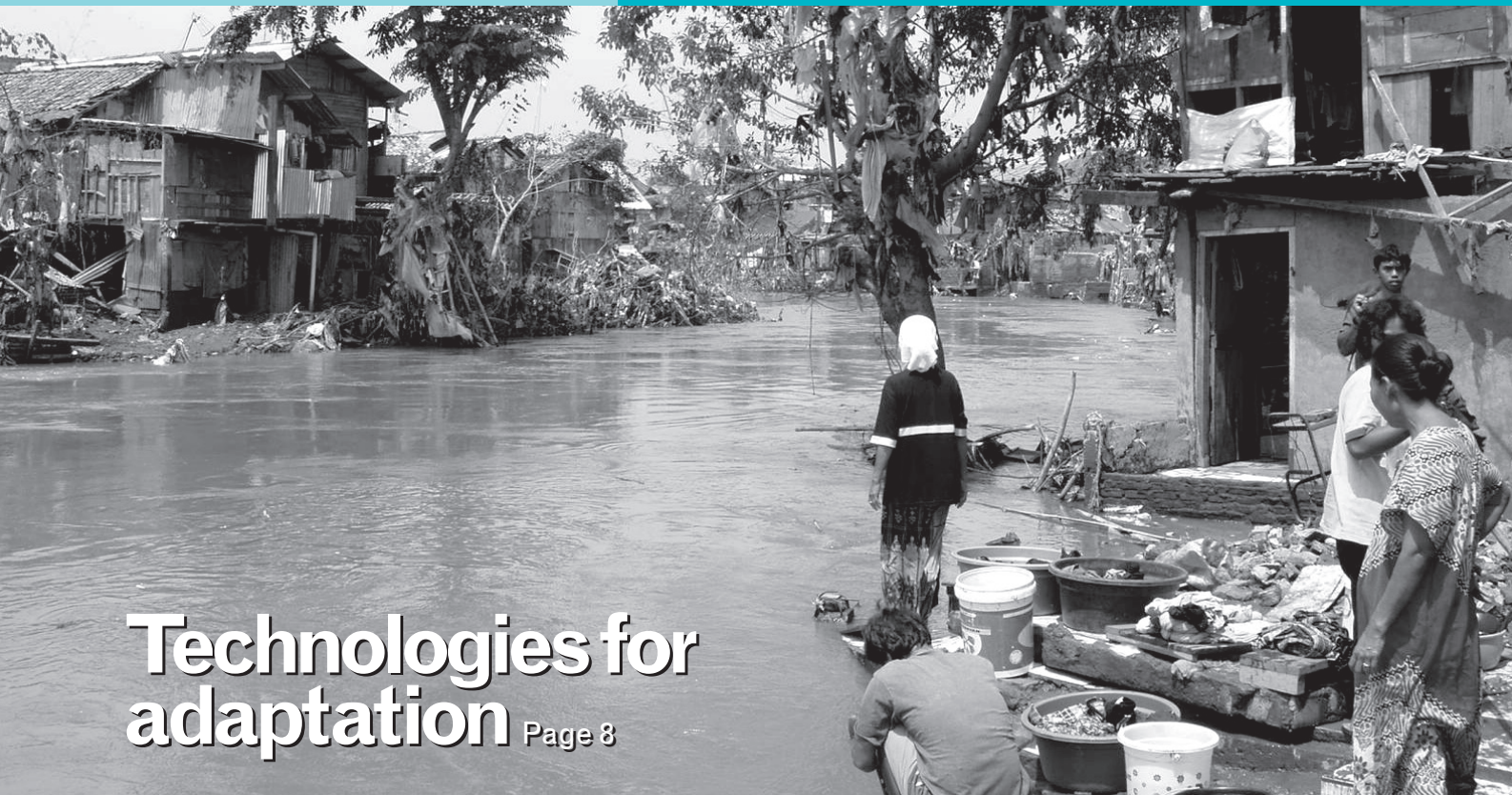
Tiempo

#67

A bulletin on climate and development Issue 67 April 2008



Technologies for adaptation

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Tiempo

Issue 67 April 2008
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Children in Soweto, South Africa

Photo: © Jim McIntosh

Urban adaptation planning

Pierre Mukheibir and Gina Ziervogel present a ten step methodology for municipalities to develop an integrated Municipal Adaptation Plan

In recent years, reducing vulnerability to climate change has become an urgent issue in low- and middle-income countries, and is at the forefront of any sustainable development policy agenda. The process of adapting to climate change - whereby individuals and communities seek to respond to actual or expected climatic stimuli or their effects - is not new. Throughout history, people have adapted to changing climatic conditions. What is new, however, is the incorporation of climate change and its potential impacts into policy making and planning at a range of scales.

National Adaptation Programmes of Action have been developed recently for the Least Developed Countries under the United Nations Framework Convention on Climate Change. To date, however, there has been no consolidated or coordinated approach to adaptation to projected climate impacts at a municipal scale. This needs to be addressed urgently because it is at the municipal level that many people are directly affected by climate-induced impacts and institutional solutions can be introduced that target large numbers of people. This article presents an overarching framework developed for a municipal-level approach to adapting sectors to climate impacts.

MAIN POINTS

- **The authors explain** how municipal level adaptation policy making and planning has, to date, been minimal, despite the urgency.
- **They present** ten steps needed, in conjunction with stakeholder engagement and an adaptive capacity assessment, to develop an appropriate municipal-level adaptation strategy.
- **They describe** methods to prioritize adaptation actions, the importance of ongoing monitoring, and key barriers to integrating climate change into developing planning.

Towards a municipal framework for adaptation

The political discourse on climate change has been debated under the United Nations Framework Convention on Climate Change. Historically, the agenda has focused mainly on mitigation of greenhouse gas emissions. Recently, there has been a shift in focus, whereby policy makers and academics have begun to debate the issues surrounding adaptation to future climate impacts and to consider the implications for the future. All parties to the Convention agreed to adopt national programmes for mitigation and adaptation and describe these in 'national communications'. These, however, have mainly focused on the national level. Local-level resources and capacity to deal with implementation and operational issues are not always considered.

Developing a framework for adaptation to climate change at the municipal level is

needed to prioritize the most urgent local adaptation activities and identify the human and financial resources required to tackle them. If climate variability is to increase, it is necessary to understand how climate affects different sectors and where they are most vulnerable. This process will focus attention on where priority intervention might reduce the impacts of climate change and help urban areas to adapt to climate change, rather than react to it when the damage has already been done.

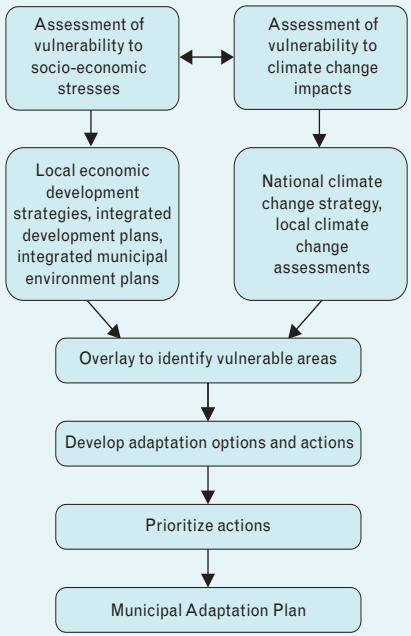
The Adaptation Policy Framework developed by the United Nations Development Programme is structured around four major principles from which actions to adapt to climate change can be developed: first, adaptation to short-term climate variability and extreme events is included as a basis for reducing vulnerability to longer-term climate change; second, adaptation policies and measures are assessed in the context of development; third, adaptation occurs at different levels of society; and, fourth, both the strategy and the process by which adaptation is implemented are equally important. Continual reflection on these principles should ensure that adaptation activities achieve their desired goals.

Ten steps for local- or city-level adaptation planning

A number of methodologies have been developed which operate at either a national level, such as the National Adaptation Programmes of Action, or a project level, such as the SouthSouthNorth Adaptation Project Protocol. But these methodologies do not institutionalize the approach at a local-level. In order to develop an appropriate local level or municipal adaptation strategy, the following ten steps and the figure, right, are presented.

1 Assess current climate trends and future projections for the geographical region.
2 Undertake a climate vulnerability assessment of the municipal area. This will include sea-level rise, drought and flood prone areas. Many cities will not have collected and analysed this information and will, therefore, have to develop the assessment from scratch. This vulnerability assessment has three components: identifying current sectoral and cross-sectoral vulnerabilities based on current climate variability risks and trends; identifying potential future vulnerabilities based on projected climate scenarios and climate risks; and, capturing this information on local vulnerability maps using Geographical Information Systems and other tools.
3 Review current development plans and priorities. Most municipalities have this information in their various strategic plans.
4 Overlay development priorities, expected climate change, current climate vulnerability and expected future climate vulnerability, using Geographical Information Systems and other participatory and quantitative assessment tools. These various overlays will help identify 'hotspots' on which adaptation activities can focus.
5 Develop adaptation options using new and existing consultative tools. These options should integrate climate-sensitive responses with development priorities as well as focusing on areas that are highly vulnerable to climate variability.

STEPS FOR ADAPTATION



6 Prioritize adaptation actions using tools such as multi-criteria analysis, cost-benefit analysis or a social accounting matrix.
7 Develop programme and project scoping and design documents, together with associated budgets. This document will be the Municipal Adaptation Plan (MAP).
8 Implement the interventions prioritized in the MAP.
9 Monitor and evaluate the interventions on an ongoing basis.
10 Regularly review and modify the plans at predefined intervals.

Stakeholder engagement and adaptive capacity assessment

Stakeholder engagement should be used to identify vulnerable sectors and existing and potential adaptation initiatives. It is also necessary to bring politicians and decision makers on board and give them insight into projected climate change impacts and potential adaptation options. Since some of the options will be capital intensive or politically unpopular, it is necessary to build political will to fund and support adaptation. Furthermore, some actions may require trade-offs that stakeholders would need to deliberate.

Various products would be produced when developing a MAP, including a vulnerability assessment, a climate impacts assessment and a vulnerability map highlighting hotspots where development priorities intersect with climate impacts. It is important that a broad range of expertise is drawn on to gather this evidence.

An adaptive capacity assessment of the various sectors that would be affected by climate change impacts is also needed. Adaptive capacity can be defined as the ability of a system to adapt to climate change impacts. There are currently no methodologies for assessing the adaptive capacity of a sector, and this is a gap that should be addressed in the future. This assessment should also include an evaluation of local government capacity to implement adaptation actions in terms of budgetary and personnel constraints, with and without explicit climate change adaptation strategies.

Assessing vulnerability to current climate variability is challenging because of the range of factors that contribute to vulnerability in addition to climate. Assessing vulnerability to climate change is even more challenging, especially because of the dynamic nature of vulnerability. Although attempts to evaluate adaptive capacity can provide an indication of the ability to adapt to future change, it is impossible to definitively characterize future vulnerability. Some tools, however, such as scenarios, may help to evaluate future vulnerability pathways.

Forming an adaptation strategy

Once the key vulnerabilities are identified, it is necessary to formulate an adaptation strategy consisting of a range of adaptation actions. These adaptation actions need to be developed for the local context in conjunction with key stakeholders, including those directly impacted, sectoral experts and climate specialists who can comment on the nature of the climate variability. This is necessary in order to assess the secondary impacts of pursuing certain adaptation actions and to ensure there is equity and sustainability despite the complex institutional arrangements of the city and its inhabitants.

Once adaptation actions have been identified, they need to be prioritized. One method of doing this is multi-criteria analysis. This enables options to be evaluated using a range of criteria including unquantifiable analysis, which is particularly important when distributional implications need considering. The purpose of using multi-criteria analysis is to aid decision making rather than to evaluate options in monetary terms. It is useful for assessing options for adapting to climate change as there are many factors that need to be considered, including equity, efficiency, short- or long-term benefits as well as many other non-monetary issues. Tools such as cost-benefit analyses and a social accounting matrix are useful when determining the financial implications of an intervention, both in terms of cost and benefit to society. Issues such as the impact on Gross Domestic Product and employment levels can also be assessed.

At the same time, the limitations of these methods should be addressed. For example,

Collecting water in informal settlements with limited supplies, Cape Town, South Africa

Photo: © Gina Ziervogel

although multi-criteria analysis might enable non-cost factors to be assessed, the stakeholders defining the criteria and evaluating them may be biased. More flexible methods can, therefore, also be explored for choosing priority adaptation actions.

One of the first steps towards developing a MAP is to consolidate and integrate existing adaptation initiatives to avoid duplication and to work within budgetary and capacity constraints. A holistic approach to developing a MAP should also include reviews of both the direct impact on natural resources, as well as secondary impacts on the socio-economic environment and community livelihoods. Through stakeholder consultation and prioritization, these and other sectors can be included.

An integral part of the MAP is the inclusion of an early warning system, through which daily and seasonal weather forecasts are monitored to identify any pending impacts and potential disasters. A communication protocol is required to ensure that early warnings from the relevant entities are effectively communicated to the affected authority and communities so that appropriate interventions can be initiated.

Another key component of the MAP is the ongoing monitoring of the programmes and the projects that are prioritized and implemented. The effectiveness of the interventions should be regularly assessed and modifications made if necessary. Adaptation to climate change is not an event; rather, it is an ongoing process of social learning.

While this article presents a methodology for municipalities to develop an integrated adaptation plan, the MAP should not be seen as a once-off process. It should be used, initially, to educate planners about potential impacts and develop sectoral and cross-sectoral interventions. But, with time, the development of the MAP should lead to adaptation actions being integrated into development policy and planning at every level. The MAP should not be an add-on or an afterthought. Development itself is key to adaptation, since adaptation should be an extension of good development practice and should thus reduce vulnerability. The integration of climate-sensitive actions into development planning should become

commonplace in all municipal departments and their strategic plans.

All levels of government should ensure that policies, programmes, budget frameworks and projects take account of climate change, since critical economic, social and ecological challenges can only be effectively addressed at regional scales. There is little evidence of this, however, since low- and middle-income countries face two key barriers to integrating climate change into development planning: institutional constraints and technical capacity.

Key challenges

A number of potential barriers to implementing a MAP exist. Some of the more obvious obstacles include low local human capacity to undertake the necessary planning, and limited knowledge and understanding of climate issues at local and municipal levels. Limited financial resources and competing priorities often result in medium- to long-term planning being sidelined, and projects that do not fit into the short political life of decision makers do not get implemented. Furthermore, it is difficult to convince decision makers to consider the need for a climate strategy, when climate projections cover a longer time horizon than most political and development timeframes and are associated with high uncertainty. Finally, without a legislative framework, comprehensive and consistent adaptation planning will not be done by all municipalities.

Developing a thorough methodology will require integrating the expertise of government stakeholders, researchers, civil society and the private sector. This integration may prove challenging and depend on the level of support available.

Conclusions

This article serves as an initial broad overview of the problem posed by projected climate change at the municipal level, and requires further attention to detail in many areas before clear municipal adaptation strategies can be developed. Further focused study is required, mainly to reduce uncertainties about the climate projections themselves, but also regarding climate change impacts and sectoral and cross-sectoral vulnerabilities. More detailed assessments of the vulnerability of key threatened areas, together with likely timelines of impacts, should be undertaken. Along with this is the need to better understand how institutions might adapt to enable climate-sensitive development to become standard practice, both when responding to projected climate impacts but also when ensuring resilience to current climate variability. ■

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Technologies for adaptation

Anna Taylor, Steve Thorne and Lwandle Mqadi explain how technologies for adaptation require more emphasis on processes and institutions than on hardware

Approaches to technological intervention need to change from those developed during the recent era of mitigation-focused climate change projects. While hardware has taken centre stage in activities to reduce greenhouse gas emissions, processes and institutions are central to building capacity to adapt to the impacts of climate change.

This article focuses on the methodologies or process, hardware and institutions by which adaptation projects are introduced, designed and executed. It draws on experience from 16 international adaptation-related projects working to reduce vulnerability to climate threats, such as flooding, drought and landslides, in the six countries that the capacity-building SouthSouthNorth Project operates (namely Bangladesh, Brazil, Indonesia, Mozambique, South Africa and Tanzania). A checklist for technology transfer, and specifically technology reception in adaptation projects, provides the key ingredients for a process by which technologies can effectively be received when building community capacity to deal with the impacts of climate change and variability.

Technology transfer

Adaptation to climate variability and change involves a change in behaviour and a consequent shift in activities as a result of changing environmental conditions. This often requires the procurement and adoption of new technologies. Using environmentally-sound technologies in the field of adaptation to climate change is, therefore, increasingly occurring and being explored.

The process of transferring technologies for adaptation provides an opportunity to redress some of the global imbalances in access to resources and facilitate sustainable development. Technology transfer should not, however, be confined to being from the 'north' to the 'south'; it can often be 'south' – 'south' (both between and within countries) or maybe even 'south' – 'north'.

Technology transfer has many drivers. Profit and markets are the most common, but recently climate change has also become a driver. Technology transfer has been on the agenda of both the United Nations Framework Convention on Climate Change and the

MAIN POINTS

- **The authors explain** that, whilst technologies focusing on the transfer of hardware may be appropriate for climate change mitigation, adaptation requires more emphasis on processes and institutions.
- **Engaging with the local context**, participation and building on indigenous knowledge will lead to ownership of the process and are critical to adaptation project success.
- **A checklist** for adaptation technology transfer is provided.

subsequent Kyoto Protocol. The Convention notes that technology transfer is a key area of engagement and collaboration between developed countries, which have contributed most to greenhouse gas emissions, and developing countries, which are very vulnerable to climate stresses and shocks. Article 4.5 of the Convention states: "The successful development and transfer of environmentally sound technologies and know how requires a country driven, integrated approach at a national and sectoral level. This should involve co-operation among various stakeholders (the private sector, governments, the donor community, bilateral and multi-lateral institutions, non-governmental organizations, academic and research institutions), including activities on technological needs assessments, technology information, enabling environments, capacity building and mechanisms for technology transfer."

Hand water pump in Debipur camp, Jammu, India Photo: © Antoine Lemasson/EC/ECHO

The institutions charged with implementing the Convention have tended to use top-down approaches. This has been to the detriment of the receiving end of the technology transfer debate. Technological interventions for climate change mitigation have tended to be hardware intensive, centralized and supply-side oriented. The focus of the Intergovernmental Panel on Climate Change Working Group III and the Expert Group on Technology Transfer, among others, has also been on creating enabling environments at the national level in terms of governments developing appropriate macro-economic conditions for technology transfer.

The problem is that top-down processes do not necessarily engage with the project-specific context, which is critical to the success of an adaptation project. In the case of technology transfer in the field of adaptation, increasing emphasis is needed on the 'software' (process) and 'orgware' (institutional) elements of technology, focusing on receptivity and the use of technologies that are decentralized in their application. The idea is to get bottom-up processes to engage with top-down processes so that micro- and macro-level environments foster local skills with environmentally-sound technologies developed and used. Here, technology recep-

tivity is discussed in terms of the process by which the people adapting, and those using or managing the technology, are placed at the centre of decision-making for the selection, adoption and innovation of adaptation technologies.

Establishing a shared understanding of the language is essential for the effective communication of these ideas. For this article, technology is understood to consist of three elements: hardware, software and orgware. Hardware is actual manufactured objects (sometimes known as artefacts). Software is a process, involving the knowledge required to design, manufacture, select, transfer, use, adapt or maintain the hardware. Orgware then refers to the institutional context in which this process occurs.

“achieving successful technology transfer needs participation and building on indigenous knowledge”

Elements necessary for facilitating sustainable technology receptivity

Achieving successful technology transfer needs participation and building on indigenous knowledge. This will lead to ownership of the process, institutions and outcomes, and facilitate empowerment and self-defined development. Central to this is a people-centred approach, shifting away from issue-driven approaches that often lead to the imposition of externally-defined problems and solutions historically associated with technological interventions. The following checklist will help project development teams ensure sustainable receptivity of adaptation technologies.

Fostering orgware. Informed participation is fundamental to the process of technology reception. This needs to start with the identification and inclusion of suitable people at appropriate stages of the project, right from the problem identification stage through to monitoring and evaluation. Getting people connected, supporting the creation of social networks and expansion across places, scales and sectors is important for success. It also has enormous value beyond the scope of the project in building adaptive capacity to deal with climate and other stresses. Harnessing both public and private resources increases transfer opportunities, and connecting government and local stakeholders helps to reconcile short-term needs with long-term goals, hopefully avoiding any ‘maladaptation’.

Trust between different individuals and groups (including development agents, local individuals, government officials, non-government organizations, scientists, commercial enterprises) needs building (see box on this page). This forms the basis of open sharing of information, knowledge, experiences, perspectives and decision-making power. Technology transfer is a people-oriented phenomenon, which depends on close relations between the donor, recipient and intermediary. Key to ownership of the adaptation activity is the early articulation of the problem, and later of the possible solutions, by those directly affected.

Recognising that people perceive their own and others’ vulnerability differently, and adopt and use technologies differently based on their experiences and the roles they fill, one of the first steps within the participatory process is to work on developing a shared understanding of the problems faced and creating a common vision of

Building trust in Indonesia

One Indonesian project managing peatland to address climate change mitigation and adaptation and incorporate sustainable livelihood options for local communities illustrates the importance of trust building. The project has struggled due to the lack of local community trust in the government and outside agencies as a result of the failures of large, top-down government rice projects in the 1990s.

change (see box below). This involves sharing knowledge between local individuals, policy makers, scientists, donors and non-government organizations about climate variability and change and current coping strategies, including existing indigenous technologies. This sets the foundation on which adaptation needs can then be identified and prioritized.

Sharing information in Bangladesh

One successful community flood preparedness project in Bangladesh brought local builders and fisher people together with external experts to share knowledge on house-building and fishing techniques and then adapt these traditional technologies to better suit climate extremes. Raised houses are now being built using more durable, cheap and locally-available materials. Pens are used to protect pond embankments and stop fish escaping. Considering gender-differentiated needs has also been important. Men and women fill different household roles and thus have different knowledge of and requirements for house design and construction.

Including policy makers in this process helps foster a supportive policy environment. Government involvement is important in many instances, in terms of building government capacity in weak, under-resourced systems, reconciling short-term needs with long-term goals and ensuring project sustainability. This process often has to start with awareness raising and education around climate change issues and facilitating improved communication between different levels and departments of government, which must all take an integrated approach to adaptation. An integrated approach is often difficult due to competition between different government bodies and cumbersome bureaucratic processes (see box below).

Administrative difficulties in Tanzania

Institutional conflicts and overlapping roles were problematic in one large Tanzanian water management project addressing climate stresses such as reduced rainfall and increased temperatures. Relationships were strained between central government, regional government, the Pangani River Water Office, village natural resource committees, water users' associations and village governments, making collaboration difficult. It was, therefore, decided that representatives from each of these institutions would sit on the Pangani River Water Board and attempt to develop an integrated basin-wide approach.

Throughout the participatory process and the project cycle as a whole, appropriate support (scientific, technical, managerial, process facilitation, financial, and so on) is needed from local or international project partners. This should be provided in a way that allows people to request and direct such support. Having power and responsibility are integral to ownership.

Developing software. Developing software means building the knowledge required to design, manufacture, select, transfer, use, adapt or maintain selected hardware. Having identified adaptation service needs, the next step is to identify suitable technologies to satisfy these needs. This is the crux of the service *versus* technology led approach. It again needs input from a range of stakeholders who can share ideas and information on different types of technologies available locally, nationally or regionally. These might be traditional types of technologies, modern technologies or a combination of the two (for example, photovoltaic pumps where the pump and well are traditional). It may sometimes be necessary for trusted intermediaries to act on behalf of the users and help identify and expose them to competing technology options that meet their needs. This role is

Reducing risks in Brazil

In a project reducing risk from heavy rainfall in Rio de Janeiro, Brazil, retaining walls were built from tyres to protect low-income and informal dwellings from destruction by landslides. The walls are cheap and easy to replicate but there is a danger that the resulting increased sense of security may lead to further in-migration, generating new risks from fire and lack of access to safe drinking water.

often filled by non-government or community-based organizations. The feasibility of transferring technologies needs considering and the various impacts assessed to ensure activities are sustainable and don't result in maladaptation (see last box on page 11).

Having identified the most appropriate technology for the specific need and context there then needs to be a phase of skills development (see box below). This will build the capacity of local users and managers to adopt the new technology, adapt it to better suit their needs where necessary, maintain its functioning in the long-term and possibly even facilitate its replication elsewhere.

Communicating climate information in Indonesia

The Climate Field School in Indonesia is part of a wider project aiming to increase the resilience of farming systems exposed to climatic risk. The project has two phases: the first increases farmers' knowledge of climate issues, the second helps farmers use this new knowledge in their farming. Training modules are developed in consultation with all stakeholders. Field facilitators are trained and farmers' groups are formed or adapted. In the next cycle, the field facilitators become the module developers and train another group of field facilitators. Farmers are encouraged to share and analyse their experiences together, reach conclusions, take action and gain new experiences.

This may involve the use of hardware, but in some cases it may use software or orgware. For example, effective early warning systems need people to know how to use information about an impending cyclone and an institutional network to effectively pass on this information.

Showcasing hardware. The technologies needed to achieve adaptation objectives should then be showcased. This will help people see the potential benefits of these new technologies and confirm that they do indeed help with adaptation. Where setting up local demonstration sites is difficult, exchange visits can occur, enabling people to visit other locations and see if the technologies used there could work for them (see box, right).

Sometimes it may be necessary or beneficial to adapt the transferred technology to meet local situations. It is, therefore, important that the technology selected can be modified, and that the skills necessary to do this are available. Showcasing the hardware can help identify who else could adopt it, who might be interested in and capable of modifying it to suit local circumstances, and who might then share their knowledge and experience with others. Some people may even go on to become champions of the new technology. Broader technology uptake is more likely with appropriate technical, managerial or financial support. And once widespread uptake has occurred, there needs to be a sustained process involving constant maintenance, monitoring, evaluation, learning, re-assessment and modification.

The value of exchange visits

Most of the projects reviewed highlighted the importance of exposure to new technologies. For example, a South African project aimed at increasing the resilience of small-scale Rooibos tea farmers to climate change involved visits to other local Rooibos farms. This helped farmers learn about local technologies developed to limit wind erosion, conserve moisture and maintain biodiversity, such as establishing mulch strips on which belts of natural vegetation were grown to act as wind breaks.

Moving forward

This article outlines the new direction taken by the SouthSouthNorth Project in its practices. The approach is still being developed. There are a number of questions emerging that may form the basis of continued dialogue.

- What does the idea of technology transfer, and specifically receptivity, mean for adaptation practice? Is it a new angle on what is already happening or a different way of doing things?
- How does this type of work fit with high-level activities such as the decision frameworks developed by United Nations agencies (for example, the Adaptation Policy Framework, Technology Needs Assessment

and the National Adaptation Programme of Action process)?

- What kinds of innovative financing mechanisms are needed to support such activities? How do these fit within funding mechanisms such as the Adaptation Fund and the proposed Multilateral Technology Acquisition Fund?
- What mechanisms could link local and national level adaptation activities?
- Are there other examples in the field of adaptation that have applied these principles? If so, how have they been applied, what has worked, what has not worked and why?
- How can those using the adaptation technologies be characterized so as to inform technology receptivity and ownership?

If a technological approach to adaptation occurs, it should not be based on centralized hardware supply. It requires a move away from the assumption that scientists and engineers know what will serve people best and can thereby develop and deliver perfect technologies that simply need to be fine-tuned to local contexts. Focus is needed on how technologies are received. They have to meet collectively identified adaptation needs and instil a sense of ownership by developing the software and orgware elements necessary to adopt and manage the hardware. Adaptation then becomes a form of development that supports self-defined positive change. ■

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FURTHER INFORMATION

● **On the Web:** Further details of the work of the SouthSouthNorth Project are available at www.southsouthnorth.org.

CONFERENCES

EVENTS

CHAOS2008: Chaotic Modeling & Simulation International Conference

Crete, Greece:
03-06-2008 to 06-06-2008
Topics include: chaos and nonlinear dynamics; chemical chaos; stochastic chaos; hydrodynamics, turbulence and plasmas; chaos, ecology and economy; geophysical flows; biology and chaos; chaos in climate dynamics; chaos in astronomy and astrophysics; and, optics and chaos, amongst other general topics.
Details: Anthi Katsirikou, Conference Secretary, Data Analysis and Forecasting Laboratory, Technical University of Crete, 73100 Chania, Crete, Greece.
Email: anthi@asmda.net
Web: www.chaos2008.net

3rd International BioEnergy Conference & Exhibition

Prince George, Canada:
03-06-2008 to 05-06-2008
Conference will begin with a forum discussing the issues and opportunities in the global wood pellet industry. Main themes will include: policy influences on the development of a bioenergy economy; a sustainable bioeconomy; technologies, energy and transportation issues; and the challenges and opportunities in future directions. There will be a forests and resorces exhibition as well as options on taking industry tours.
Details: Cam McAlpine, 850 River Road, Prince George, BC V2L 5S8, Canada.
Fax: 1-250-7640533

Intersolar 2008

Munich, Germany:
12-06-2008 to 14-06-2008
One of Europe's largest solar technology trade fairs to be held at the New Munich Trade Fair Centre. Intended that the conference, exhibitions and fringe programmes will allow participants access to the latest information for the planning, installation, financing and marketing of solar technology. Will include the 4th PV Industry Forum and the Solar Thermal Industry Forum, both of which will present the latest information on their relevant technologies.
Details: Trade Fair Organizer, Solar Promotion GmbH, PO Box 100 170, 75101 Pforzheim, Germany.
Fax: +49-7231-5859828
Email: info@intersolar.de
Web: www.intersolar.de

International Conference on Groundwater & Climate in Africa

Kampala, Uganda:
24-06-2008 to 28-06-2008
Intends to bring together water and climate scientists from a broad range of sectors to discuss and share knowledge and expertise in order to improve understanding of the impact of climate and development on groundwater resources in Africa.
Details: No mailing contact details have been provided by the conference organizers.
Email: info@gwclim.org
Web: www.gwclim.org

7th World Wind Energy Conference & Exhibition

Kingston, Canada:
24-06-2008 26-06-2008
Working theme of the conference will be "Community Power" and will focus on renewable energy technologies for electricity generation. Keynote speakers are Hermann Scheer and David Suzuki. Will include an exhibition as well as training sessions on project management, financing, governance and community engagement.
Details: 2008 Conference Organizer, WWEA Head Office, Charles-de-Gaulle Str 5, 53113 Bonn, Germany.
Fax: +49-228-3694084
Email: wwwec@ontario-sea.org
Web: www.wwec2008.com

Global Governance for Sustainable Development

Geneva, Switzerland:
24-06-2008 to 28-06-2008
Organized by the European Association of Development Research and Training Institutes. Working subtheme of the conference is "The Need for Policy Coherence and New Partnerships". Intended to present the perceptions of leading European development experts and associates in the developing regions on global challenges and on possible policy options or governance models to meet those challenges.
Details: Conference Organizer, EADI, Kaiser Friedrich Strasse 11, 53113 Bonn, Germany. Fax: +49-228-2618103
Email: postmaster@eadi.org
Web: www.eadi.org|gc2008

16th Annual Conference of the European Association of Environmental & Resource Economists

Gothenburg, Sweden:
25-06-2008 to 28-06-2008
Conference will be general in topics but will include a special focus on environmental and climate issues in developing countries. Format will be plenaries, discussion sessions and poster displays. Participants expected to come from disciplines including the general public, ecological and behavioural economists, climate, fisheries and, environmental and climate researchers.
Details: Conference Organizer, EAERE, Castello 5252, I-30122 Venice, Italy.
Fax: +39-041-2711461
Email: eaere@eaere.org
Web: www.eaere2008.org

International Energy Workshop

Paris, France:
30-06-2008 to 02-07-2008
Topics for discussion and paper presentations include: energy and the environment; energy policy; energy supply; energy demand; uncertainty and probabilities in E-3 (energy-environment-economy); scenarios and projections; and the UNFCCC second commitment period.
Details: Conference Organizer, International Energy Agency, 9 rue de la Federation, 75739 Paris, Cedex 15, France
Web: www.internationalenergyworkshop.org|Pre_announcement_2008.html

Pacific meteorological services

Penehuro Lefale reports on the progress being made in developing the self-sufficiency of meteorological services in Pacific Islands

For over fifty years, New Zealand has played a leading role in the provision and the development of meteorological services in the Southwest Pacific. Since 1984, support has been realigned towards development, which means that New Zealand now has a reduced or only back-up involvement in the actual provision of meteorological services. The focus has moved from directly managing meteorological services to providing advice and assistance on a project basis with funding from various sources, including bilateral and multilateral agreements as well as from the funds of the Meteorological Service of New Zealand (MetService).

Some of the projects are in the form of long-term consultancies and may last a few years. Others are one-off specific projects such as the United Kingdom Foreign and Commonwealth Office-, United Kingdom Met Office- and New Zealand MetService-funded project, REStoring aging weather, Climate and Upper air Equipment in PACific Islands (RESCUE-PAC).

New Zealand's present assistance to meteorological services in the South Pacific is predominantly bilateral in nature. The necessary funding to provide this assistance continues to be secured through both a supply contract with the New Zealand Government for "public good" services and through other New Zealand agencies on a project basis. In addition to the support provided with New Zealand funding, the MetService also provides substantial technical resources for routine operational support and project implementation in the South Pacific region, which is funded from agencies outside of New Zealand.

In 2006, for example, New Zealand continued to advise and assist the Pacific countries of the Cook Islands, Kiribati, Niue, Samoa, Tokelau, Tonga and Tuvalu. All these countries received remote on-going advice and assistance for computer and other operational problems, as well as an annual re-supply of meteorological forms.

The MetService continues to monitor surface and upper air observations reporting performance for the assisted countries, together with providing an email gateway to the Global Telecommunications System,

MAIN POINTS

- **The author describes** an evolution in New Zealand's support for meteorological services in the Pacific Islands.
- **Effective progress is being made** in developing self-sufficiency through assistance from New Zealand and other international development partners.
- **Support has been realigned** towards development, with the focus moving from directly managing services to providing advice and assistance on a project basis.

Upper air observational programme, Kiribati Meteorological Service, Betio, Tawara, Kiribati

Photo: © Penehuro Lefale

which ensures they can participate in the international exchange of data. Country visits have been made to the Cook Islands, Niue, Kiribati, Tuvalu, Samoa and Tokelau. New Zealand is also responsible for providing temporary backup, which is usually up to about a week, for weather warnings and very limited marine and aviation services under the terms of the World Meteorological Organization Tropical Cyclone Plan for the region. The Tropical Cyclone Plan ensures effective coordination and cooperation in the provision of meteorological information, forecasts and warnings of all tropical cyclones affecting the area.

New Zealand continues to manage and technically support the upper air programmes at Tarawa (Kiribati), Funafuti (Tuvalu), Penrhyn (Cook Islands), Bauerfield (Vanuatu), Port Moresby (Papua New Guinea) and Honiara (Solomon Islands), as part of its contribution to the Global Upper Air Network (GUAN) and the Pacific Island Global Climate Observing System (PI-GCOS). This also includes some financial support, although consumables and operating costs for these programmes are primarily funded by the United Kingdom Met Office (UKMO) and the United States National Oceanic and Atmospheric Administration's Global Climate Observing System (US NOAA GCOS) programme.

Another role New Zealand has taken in assisting in the enhancement of meteorological services in this region has been as co-initiator of the RANET project in the Pacific region. The RANET - Radio and Internet for the Communication of Hydro-Meteorological and Climate Related Information - project aims to improve access to information and support of rural communities. The RANET project work was undertaken in collaboration with Australia, the United States and the United Kingdom. This included installation of high frequency/very high frequency (HF/VHF) radios for local communities in Vanuatu, Tuvalu and Niue.

New Zealand has also funded the restoration of the fire-damaged Wind Finder Radar at Rarotonga Airport, Cook Islands. In June 2005, a fire in the radar equipment room extensively damaged the wind finding radar facility at Raratonga. The New Zealand MetService was contracted by the Cook Islands Public Service Commission, the Cook Islands Meteorological Service, the New Zealand International Aid and Development Agency (NZAID) and the UKMO to restore the fire-damaged facility. In response, the New Zealand MetService carried out a technical evaluation in July 2005. The aim was to ascertain, as far as practicable, the extent of the damage both visible and hidden, and to scope and cost the repair of the facility. The technical evaluation formed the basis for the Rarotonga Wind Finding radar restoration project (RaWFind).

Upper air measurements are now back to normal at Rarotonga after the restoration of the radar facility. However, installation and

Upper air observational programme, Kiribati Meteorological Service, Betio, Tawara, Kiribati

Photo: © Penehuro Lefale

replacement of vital equipment needs to be carried out immediately so as to ensure the longevity of the wind finding radar facility. Much of the equipment in need of replacement, including the dehumidifier that is used to keep the antenna dome dry, is at least 20 years old.

As part of its commitment to enhancing the meteorological services in the Southwest Pacific, New Zealand continues to fund the preparation and publication of the monthly *Island Climate Update*, which is managed and implemented by the National Institute of Water and Atmospheric Research (NIWA). The *Island Climate Update* is a multinational monthly climate bulletin. Its primary goal is to assist Small Island Developing States of the South Pacific make informed planning and management decisions relating to climate-sensitive sectors like agriculture, water, tourism, fisheries and energy through the provision of timely and accurate seasonal climate forecasts. New Zealand also actively contributes to the PI-GCOS and other communications solutions such as HF radio and satellite email and the Emergency Managers Weather Information Network.

The ultimate goal of New Zealand's support is to assist the meteorological services of Pacific island countries to become self-sufficient in managing and operating their own services. There will, though, always be advice and specialist assistance available when required. ■

ABOUT THE AUTHOR

● **Penehuro Lefale** is manager of the International Cooperation and Development Unit in the National Weather Service department of the Meteorological Service of New Zealand. He has worked extensively on the research and development of meteorological and related climate change issues in the Pacific region.

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FURTHER INFORMATION

● **In the Cyberlibrary:** The Tiempo Climate Cyberlibrary maintains a listing of key websites covering small island states at www.tiempocyberclimate.org/portal/t3637web.htm.

● **On the Web:** *Island Climate Update* is available at www.niwa.cri.nz/ncc/icu/. The production of the bulletin is discussed at www.tiempocyberclimate.org/newswatch/feature040730.htm.

Tiempo interview: Rob Allan

Rob Allan discusses new work aimed at extending the instrumental climate record that should benefit the scientific community and policy makers

We now have weather stations covering most parts of the world, all reporting regularly and contributing to the global climate data bank. Why do we need additional data for the historic past?

With the growing concern about climatic change, variability and extremes, there is an equally growing demand for reliable, high-quality and high-resolution historical instrumental observations of past weather and climate. These data are essential, as they vastly improve the statistical sample of the global climate system we can examine, thus enhancing our capacity to assess ocean-atmosphere model integrations and ultimately their simulation of anthropogenic effects on the climate. As a result, the global community will be far better placed to develop robust strategies for managing and responding to climate- and weather-related risks, and to better adapt to climate change.

Is there much data available that hasn't already been incorporated in the major climate data banks?

In seeking observational evidence for climate change, large amounts of historical observational data have been addressed. Even so, equally large amounts of data remain untapped. In fact, there are considerable terrestrial and marine data around the world which are still in hard copy form and have not been digitized and taken into international climate data banks.

MAIN POINTS

- **The author discusses** a new international initiative aimed at extending the instrumental climate record.
- **Innovative techniques** should make available considerable amounts of new data for use in climate applications.
- **Tiempo readers** can assist by providing information about data sources.

Many developing countries are not fully aware of the extent of colonial observations made across their territories in the past, or do not have the finances, personnel or infrastructure to have such data imaged and digitized. In fact, the climate of remote areas of the planet has been severely undersampled until very recently. This is even more evident with regard to the upper air structure of the atmosphere. The overall situation is highlighted by the line in the figure (page 19), which illustrates the percentage of the globe covered by the most abundant data, digitized surface observations, back through time.

How far back in time can you go?

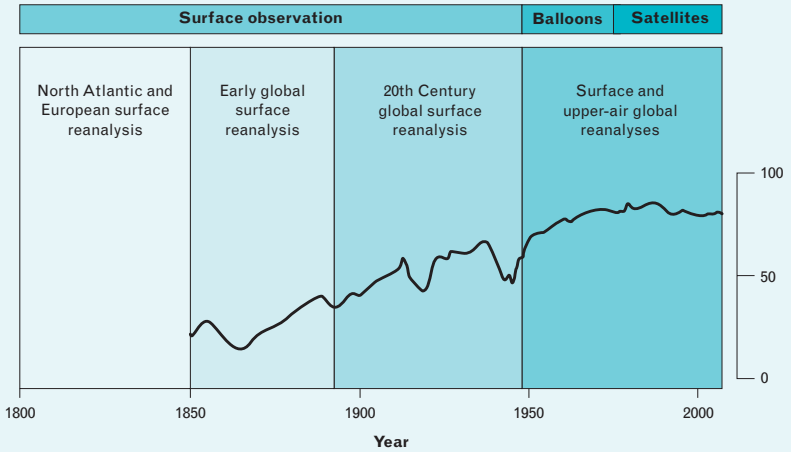
For major instrumentally-measured variables, such as air temperature, precipitation and atmospheric pressure, it is possible to find records for individual sites in the 'old world' that can be extended back to cover the

past 300 years or so. Some of these have been measured on daily to sub-daily timescales. Other variables, such as cloudiness, wind and humidity, have not received the same amount of attention, usually because they are very challenging to either measure consistently back through time, quality control or homogenize. Nevertheless, projects such as the Climatological Database for the World's Oceans 1750-1850 have shown the immense potential of both historical instrumental and non-instrumental wind observations over the globe.

Over the North Atlantic-European region, it is possible to recover enough high-resolution instrumental observations from terrestrial and marine sources to produce gridded data sets of the major variables going back into the early to mid-18th century. Near-global data coverage is possible back to the 1830-50s, though large parts of the interiors of the major Southern Hemisphere continents have little or no observations. Certainly, the longer marine coverage allows for gridded sea surface temperature and atmospheric pressure to be reconstructed over much of the world's oceans for the past 150 to 170 years.

Complicating this situation further, is that often the focus for data recovery and digitization has been on observations of air temperature and precipitation made solely by National Meteorological Services (NMS), the earliest which began in the early to mid-1800s. Even so, there are large amounts of such NMS data, particularly from the old colonial domains of the major European nations, which have received little or no attention - particularly observations taken on daily to sub-daily timescales. With variables such as atmospheric pressure, the situation is most acute.

SCHEMATIC OF DATA AVAILABILITY AND REANALYSIS EFFORTS



Notes: The line shows the percentage of the globe covered by digitized surface observational data (%), with prominent dips during the 1940s and the 1910s, during periods of widespread conflict, and little data prior to 1850.

It sounds like the developing world warrants considerable attention, with data available but paper records often decaying in archives. Are we devoting enough resources to "data rescue" in developing nations?

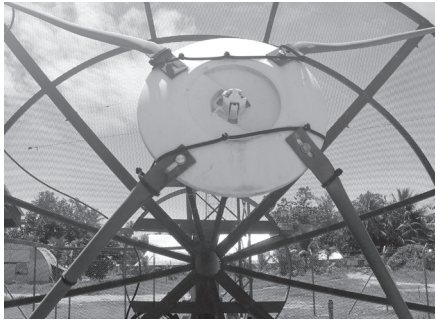
The simple answer is no. Important data rescue efforts focusing on developing countries around the world exist, but often just barely. These activities are generally lacking in ongoing funding support, personnel and overall infrastructure.

Just to highlight a few of these situations. Australian and New Zealand NMSs are leading a Pacific islands climate data rescue project to save and preserve meteorological observations from that region. However, this project needs ongoing funding to enable its

rescue, preservation, digitization and archiving efforts to cover the full historical extent of such material. Much of the earliest data is held in the colonial records of the United Kingdom, Germany and France.

The International Environmental Data Rescue Organization (IEDRO), a non-profit organization based in the United States, is an initiative to collect and put into digital form weather observations from countries around the globe that need help with such activities. This benefits both the countries involved and improves global climate databases for international understanding of climatic variability and change issues and impacts. IEDRO has undertaken this work on surface and upper-air data in conjunction with the NMS and other institutions in Kenya, Malawi, Mozambique, Niger, Senegal and Zambia in Africa and Nicaragua, Dominican Republic, Chile and Uruguay in the Americas. Ironically, IEDRO is currently under pressure with regard to its funding. We're not talking big monies, but there is a chance that IEDRO may simply cease to be.

Projects such as MEditerranean climate DAta REscue (MEDARE), and the Mediterranean CLImate VARiability and Predictability (MedCLIVAR) initiative are trying to establish and fund coherent data rescue missions across the wider Mediterranean region, in which important records from North Africa and the Middle East will be recovered and digitized. These actions have the backing of bodies such as the World Meteorological Organization, but no real monies are available to support them.



Kiribati Meteorological Service, Betio, Tawara, Kiribati Photo: © Penehuro Lefale

With minimal funding, the Atmospheric Circulation Reconstructions over the Earth - ACRE - initiative, which I manage, is working with various institutions, NMS and university groups to develop ongoing data rescue, imaging and digitization projects for the South China Sea-South East Asian region and for the greater European region. It also has a specific undertaking with MeteoFrance to recover and digitize old daily to sub-daily French colonial observations from around the globe.

It's not just a matter of collecting the data, is it? The improved data bank can be used to reconstruct the wind systems of the planet through a process known as reanalysis.

Climate reanalysis is an important new tool that creates dynamically-coherent climatic reconstructions of the global climate system, which can be used to study the processes which drive climatic variability and change. It is a technique in which global daily to sub-daily observations for a period in the past are assimilated into a modern-day numerical weather forecast model, which uses this information and the known physics of the climate system to create three dimensional (3D) gridded and spatially-complete weather variables over the planet. The products generated by reanalysis do not suffer from inhomogeneities caused by changes in the data assimilation system, but are, of course, only as good as the quality and quantity of data assimilated by the reanalysis process.

Until recently, reanalyses assimilated all available observational data, covering surface to upper atmosphere observations made by terrestrial and marine platforms, aircraft, meteorological balloons and satellites. The two most widely used of these reanalyses, are those generated by the National Centers for Environmental Prediction (NCEP) in the United States and the European Centre for Medium-Range Weather Forecasting (ECMWF) for the post World War 2 period (as in the figure).

However, new developments and research by our collaborators in the ACRE initiative, Gil Compo and Jeff Whitaker of the National Oceanic and Atmospheric Administration Earth System Research Laboratory and the Cooperative Institute for Research in Environmental Sciences, University of Colorado, with the 20th Century Reanalysis Project, have

shown that it is possible to perform a reanalysis which can generate 3D weather variables throughout the depth of the atmosphere by assimilating only surface observations over the globe. Given that surface observations are the longest measures of the state of the climate system, a reanalysis using such data will extend our ability to reconstruct the global climate: that is, up to three times the length of current NCEP or ECMWF reanalyses.

That's very exciting. But just how can weather data from the Earth's surface give you information about winds high above the ground?

The dynamics and thermodynamics of the atmosphere link variations at the surface and aloft. The link is so strong that with a good numerical weather prediction model and an advanced method for using the surface information in our United States collaborators' reanalysis techniques, they can successfully infer the weather variations at the jet stream level, high in the atmosphere, from variations at the surface.

The results of initial testing of preliminary 3D weather variables by our 20th Century Reanalysis Project collaborators are extremely encouraging. Comparisons between gridpoint reanalyses and weather balloon-observed atmospheric temperature and geopotential height surfaces for the same location at the 700, 500 and 300 hPa levels reveal very high correlations of between +0.87 and +0.97, explaining between 76 and 94 per cent of the variance.

What improvements in understanding are likely when we have this long record of the atmospheric circulation?

The ACRE-facilitated reanalyses will produce the longest global database of reconstructed 3D atmospheric weather conditions to date. This database will provide a climate quality reanalysis product, downscaled so that researchers and a myriad of users can evaluate and revaluate climatic variability and climate change influences, impacts and modulations on the environment, society, resources and infrastructures on global through to regional and local scales.

The climate quality reanalyses will help researchers learn more about the evolving spatial and temporal structure of specific atmospheric circulation phenomena in the climate system, such as the El Niño Southern Oscillation phenomenon, the Madden-Julian Oscillation, the Antarctic Oscillation/Southern Annular Mode, the Arctic Oscillation/Northern Annular Mode, and the North Atlantic Oscillation. This will make it possible to address the nature, intensity and frequency of climatic impacts such as floods, storms and droughts in ways and over time spans not previously possible.

What's the specific role of the ACRE project?

The Atmospheric Circulation Reconstructions over the Earth initiative is an 'end-to-end' project which facilitates both the historical global weather observational data needs of pioneering surface-observations-only climate quality reanalyses, and the seamless feeding of 3D weather products produced by these reanalyses into climate applications and impacts models.

The long historical terrestrial and marine weather observations assembled and digitized by ACRE will be used to generate new surface-observations-only reanalyses, producing a 56 member ensemble every six hours of two degree latitude by two degree longitude resolution, global 3D tropospheric weather variables.

ACRE is facilitating the data requirements for three historical climate quality reanalyses:

- the ongoing 20th Century Reanalysis Project (1892 to present);
- an early to mid-19th Century Reanalysis (1830s/1850s to present); and,
- a North Atlantic-European Region mid-18th Century Reanalysis (1750s to present).

Can Tiempo readers make a contribution?

Yes, Tiempo readers could encourage researchers, research institutes and the NMS in their countries to work with ACRE to rescue, image and digitize daily to sub-daily surface weather variables.

ACRE would also be very keen to hear from those who might be interested in using any of the reanalysis products it is helping to develop. Such outputs can be tailored or downscaled to seamlessly flow into various climate applications, biophysical and production models.

In fact, ACRE is particularly keen that these reanalyses products and their climate appli-

cations are taken up and applied by agencies, institutions, governments and NMS in developing countries. To facilitate this process, ACRE is aiming to hold workshops, or link with other planned workshops, in or near developing regions around the globe.

What benefits are we likely to see out in the real world as a result of this work?

The ranges of uses that can be made of ACRE-facilitated historical climate quality reanalyses are enormous. They include a long historical database of 3D weather variables needed in various primary production, economic and hydrological models for both the developed world and in developing counties. It will be possible to undertake assessments and modelling of the intensity and frequency of extremes, such as floods, storminess, storm surges and droughts, and their costs to society and governments, in ways not previously possible.

A wide range of weather variables impacting on health issues, such as cold snaps or heat waves, epidemics and pandemics (for example, influenza, avian flu) can be generated. The data could be used to assess impacts on commercial activities and business applications, including climate-dependent industry sectors such as energy, for supply/demand assessment and wind power generation, agriculture and forestry, fisheries, water resource management, and insurance/reinsurance. Commercial ventures such as marine salvage, off-shore oil and gas exploration and wind and wave power generation will find the data useful.

We will have improved historical datasets for the purposes of climate studies, their application to observational and model-based studies of climate variations, and up-to-date climate information for users as well as an improved capacity to assess ocean-atmosphere model integrations simulating anthropogenic effects on the climate for future Intergovernmental Panel on Climate Change assessment reports. We'll learn more about the typical climate variability of sparsely-observed regions in order to better understand some of the limitations of the climate models we are currently using.

Finally, we'll be able to provide improved, quantitative and reliable advice to governments and the public on climate and its variations. ■

"Tiempo readers could encourage researchers, research institutes and the NMS in their countries to work with ACRE"

ABOUT THE AUTHOR

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FURTHER INFORMATION

● **On the Web:** The ACRE project website is at http://brohan.org/hadobs/acre/acre.html. Further information about related projects can be found at the websites of the ACRE partner institutions: the Queensland Climate Change Centre of Excellence in Australia (www.climatechange.qld.gov.au/response/about_qccce.html), the Met Office Hadley Centre in the United Kingdom (www.metoffice.gov.uk/research/hadleycentre/), and the National Oceanic and Atmospheric Administration Earth System Research Laboratory (www.esrl.noaa.gov) and the Cooperative Institute for Research in Environmental Sciences (http://cires.colorado.edu), University of Colorado in Boulder, in the United States.

NEWS

UNITED NATIONS

Participants at a ministerial session of the United Nations General Assembly on the Bali Action Plan urged speedy action to meet the late 2009 deadline for a new global pact on climate change, with special attention paid to vulnerable nations.

John Nashe, on behalf of the Group of 77 and China alliance, called for an "effective and comprehensive global response to cover the four building blocks of the plan - mitigation (action to reduce the extent of global warming), adaptation (action to minimize the effects of global warming), technology transfer and financing."

Read more:
www.tiempocyberclimate.org/newswatch/archive/arweek080224.htm

BIOFUELS

Land clearance to grow biofuels may create a "carbon debt" that has the net effect of increasing greenhouse gas emissions for years to decades, according to researchers in the United States.

In the worst case studied, peatlands to palm oil plantations in Indonesia, the carbon debt could take over 400 years to repay as the annual biofuel savings in emissions offsets the carbon released as a result of the land conversion. Some sources of biofuel, such as perennial grasses, are more effective as they can be harvested without ploughing under existing carbon-carrying species.

Read more:
www.tiempocyberclimate.org/newswatch/archive/arweek080224.htm

CHINA

A new projection of China's carbon dioxide emissions finds that the "growth rate is surpassing our worst expectations."

This makes "the goal of stabilizing atmospheric carbon dioxide... much, much harder to achieve," says author Maximilian Auffhammer of the University of California, Berkeley, in the United States. The study predicts an annual growth rate of at least 11 per cent over the period 2004-2010, compared to previous forecasts of up to five per cent.

Read more:
www.tiempocyberclimate.org/newswatch/archive/arweek080323.htm

MINORITIES

Minorities and indigenous people often experience the worst effects of climate change but receive the least assistance, according to a new report from Minority Rights Group International (MRG).

"Climate change has finally made it to the top of the international agenda at every level but... recognition of the acute difficulties that minorities face is often missing," said MRG's Ishbel Matheson. "From the immediate aftermath of a disaster to the point of designing policy on climate change - the unique situation of minority and indigenous groups is rarely considered."

Read more:
www.tiempocyberclimate.org/newswatch/archive/arweek080323.htm

ARCTIC ICE

The thickest and oldest Arctic sea ice is melting, according to the National Snow and Ice Data Center (NSIDC) in the United States.

"Thickness is an indicator of long-term health of sea ice, and that's not looking good at the moment," said NSIDC's Walt Meier. The older ice is being replaced by fragile new ice, which is more susceptible to disruption by winds and higher temperatures.

Read more:
www.tiempocyberclimate.org/newswatch/archive/arweek080330.htm

A reason for optimism

Gary Yohe discusses a significant change in attitude towards climate risk on the part of the international community

The Intergovernmental Panel on Climate Change (IPCC) completed the work of the Fourth Assessment of climate science, impacts and policies at its 27th meeting in Valencia, Spain, on November 18th 2007 with what could be an historical change in direction.

Much attention has been focused since then on the economic costs of mitigation, species extinctions, extreme weather events and other impacts highlighted in the Fourth Assessment Synthesis Report. Soon, however, it should become clear that the real news from the 27th meeting of the IPCC resonates from a different source: a few paragraphs that appear toward the end of the Summary for Policymakers, where governments accepted climate *risks* as the unifying theme of this and future assessments.

Because they unanimously approved the Summary for Policymakers of the Synthesis Report word by word, governments agreed that risks (and not just impacts or vulnerabilities) matter most to them. After intense scrutiny and debate that began on day one in Valencia, they embraced the fundamental insight of the Fourth Assessment that "responding to climate change involves a series of risk management decisions about adaptation and mitigation that account for climate damages, ancillary benefits and costs, sustainability, and equity."

There have been many reports in the media based on the Synthesis Report's listing of key vulnerabilities that "may be associated with many climate sensitive systems including food supply, infrastructure, health, water resources, coastal systems, ecosystems, global biogeochemical cycles, ice sheets, and modes of oceanic and atmospheric circulation." These are the critical connections between the science, the social science, and what might be deemed "dangerous anthropogenic interference with the climate system" - a fundamental concept from Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC). These are, therefore, important results for the world to see and to understand, but the Fourth Assessment did more than make a list.

The Fourth Assessment went on to provide detailed coverage of risks to threatened systems, risks from extreme weather events, and risks from singularities (nonlinear, complex and discontinuous responses, such as major ice-sheet collapse), in addition to aggregate

MAIN POINTS

- **The author discusses** the international community's groundbreaking acceptance of the notion of climate risk.
- **Governments are beginning to understand** that the risk associated with any possible event depends both on its likelihood and its potential consequences.
- **There is reason for optimism** in this historic change in the rules.

and distributional issues wherein metrics of economic risk are paramount. Indeed, the Summary for Policymakers highlights five aggregate "reasons for concern", only two of which are calibrated (and only then in part) in terms of the economic metrics that governments have, until now, tended to favour.

Careful, deliberate and extensive negotiations in Valencia made it clear that governments are beginning to understand that the risk associated with any possible event depends both on its likelihood and its potential consequences. This is the definition of risk that their finance ministers have been using for decades, so it was no surprise that many governments understood the concept well.

"governments agreed that risks (and not just impacts or vulnerabilities) matter most to them"

The only surprise is, perhaps, that governments now recognized that they should view climate change through the very same lens.

In any case, governments have, in this simple but profound change in attitude, finally asked the authors of IPCC assessments to provide information about "climate risks". These are the governments that have signed on to the climate treaty, the UNFCCC. These are the governments that negotiate global climate policy. These are the governments who hold the future of the planet in their hands. These are the governments that now understand that they have, heretofore, been asking the wrong questions.

To an optimist, the real news from Valencia is, therefore, that governments want the IPCC authors to inform their negotiations about risks that are "high", about vulnerabilities that are "key" and about "reasons for concern" that are serious based on assessments of risk. IPCC authors are required, therefore, to convey information about impacts whose consequences are potentially large, even if scientific confidence in their occurrence is medium or even low.

Unanimous government approval in the IPCC process had previously allowed only high confidence conclusions to find their way into the policymaker summaries. Only high confidence conclusions, therefore, made their way onto the table of international policymakers. The simple act of asking authors to report on "key vulnerabilities" based on high likelihood and/or high consequence has changed all that. It is, from the author's perspective, groundbreaking.

It seems that the governments that have signed onto the climate treaty process have made an historic change in the rules. They have, perhaps, given the planet a chance to save itself. ■

ABOUT THE AUTHOR

● **Gary Yohe** is Woodhouse/Sysco Professor of Economics at Wesleyan University, Middletown, Connecticut, in the United States. He was a convening lead author with Working Group II to the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC) and a member of the Core Writing Team for the IPCC Fourth Assessment Synthesis Report.

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FURTHER INFORMATION

● **On the Web:** The Summary for Policymakers (SPM) and the full text of the Synthesis Report are available at www.ipcc.ch/ipccreports/ar4-syr.htm. The three working group reports from the Fourth Assessment can also be found at the IPCC website at www.ipcc.ch.

From Bali to Copenhagen

CLIMATE CHANGE TALKS

The Bangkok Climate Change Talks, intended to move forward the Bali Action Plan, took place from March 31st to April 4th 2008. Mick Kelly reports.

The Bangkok Climate Change Talks resulted in a commitment to a further seven rounds of negotiations over the coming 18 months to resolve what will happen when the Kyoto Protocol lapses in the year 2012.

"Not only do we have the certainty that critical issues will be addressed next year, we now have bit-sized chunks which will allow us to negotiate in an effective manner," commented Yvo de Boer, executive secretary of the United Nations Framework Convention on Climate Change (UNFCCC).

The next meeting will be held in Germany in June and will focus on funding and on technology to mitigate climate change. The Bangkok meeting backed developing country calls to make climate-friendly technology and financial assistance a priority. The third meeting this year, in August, will take place in Ghana and will address issues related to enhanced action on mitigation, including reducing emissions from deforestation in developing countries.

The fourth session will be held at the United Nations Climate Change Conference in Poznan, Poland, in December. There, the focus will be on risk management and risk reduction strategies, technology and the key elements of a shared long-term vision for joint action in combating climate change, including a long-term emissions reduction target. Japan's proposal for sectoral, rather than national, targets was the subject of fierce debate in Bangkok, with further discussion pended till later in the year.

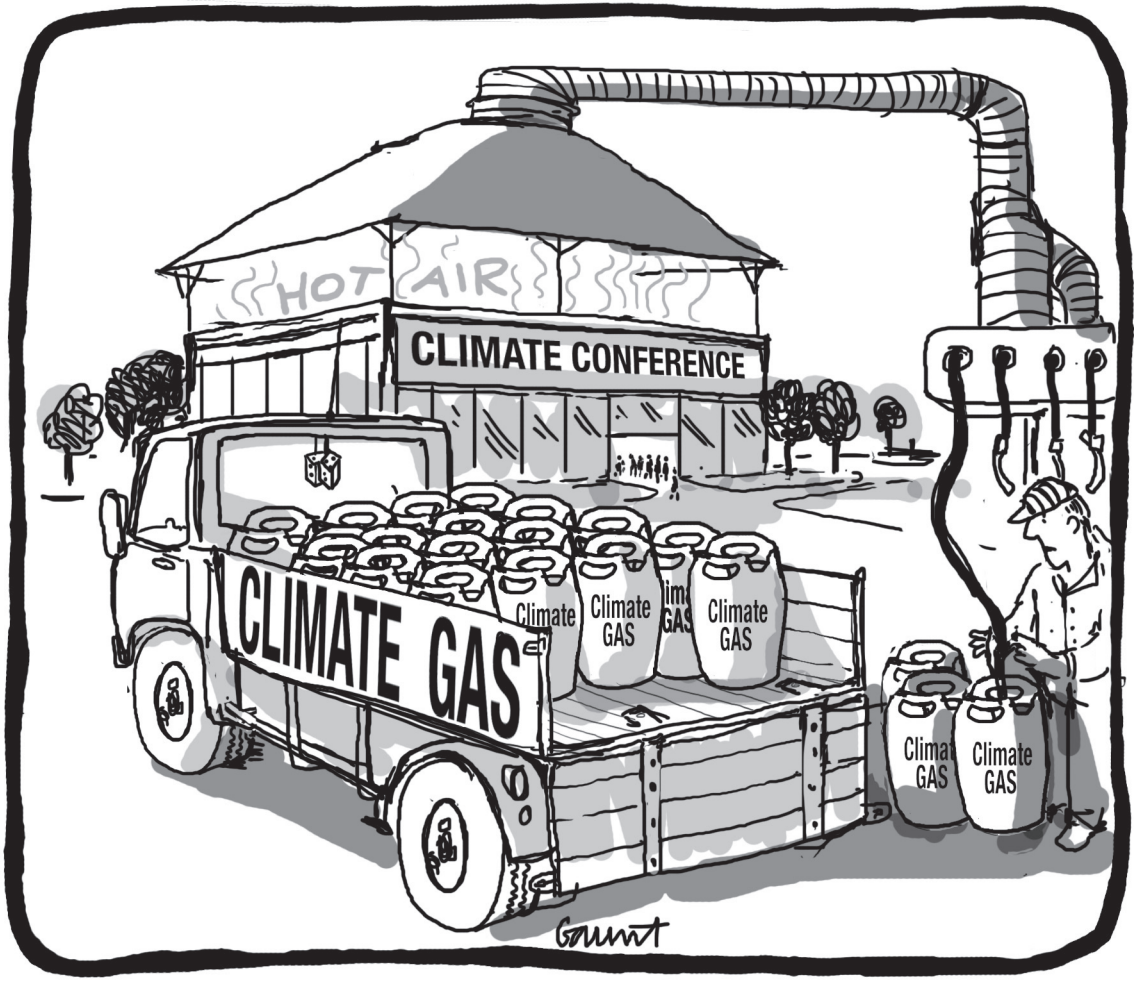
The overall aim of the process is to reach agreement on a post-Kyoto framework by the time of the Copenhagen climate talks in December 2009.

The World Bank was heavily criticized in Bangkok over a perceived attempt, in promoting its own funding proposals, to seize control of climate aid. "The World Bank's foray into climate change has gone down like a lead balloon," commented Tom Picken of Friends of the Earth. "Many countries and civil society have expressed outrage at the World Bank's attempted hijacking of real efforts to fund climate change efforts," he continued.

"Generally we have been unpleasantly surprised by the funds [proposed by the World Bank]," said Ana Maria Kleymeyer, Argentina's lead negotiator. "This is a way for the World Bank and its donor members to get credit back home for putting money into climate change in a way that's not transparent, that doesn't involve developing countries and that ignores the UNFCCC process," she added.

● **Further information:** Earth Negotiations Bulletin at www.iisd.ca/climate/ccwg1/ has produced daily reports from the Bangkok Climate Change Talks and an overall summary of the meeting's outcome. News of the climate negotiating process and related issue is updated hourly in the Tiempo Climate Cyberlibrary at www.tiempocyberclimate.org/newswatch/newsfeed.htm.

A GAUNT VIEW



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Key climate agreement components

THE FINAL WORD

Maumoon Abdul Gayoom stresses the human aspects of climate change and describes the key components of a good post-2012 climate agreement

For over a decade, the Intergovernmental Panel on Climate Change has delivered definitive and unequivocal scientific proof on the many facets of global climate change. The Stern Review proved that climate change could be tackled effectively without submitting our economies to bankruptcy. The United Nations Development Programme's most recent Human Development Report identifies the human impacts of climate change, unlike many previous studies that projected the issue as a scientific and environmental one.

Climate change has now become a daily reality in the Maldives and other small island states. With meagre financial resources and limited capacity to mitigate or adapt, climate change has become the defining issue of the 21st century. Our severe lack of adaptive capacity, including financial, technical and institutional resources, means we are ill-prepared to deal with these multiple threats. All the while, the impending long-term effects of sea-level rise are drawing ever closer.

The impacts of climate change will be felt sooner, rather than later, in every nation, every community and every neighbourhood. But, of course, the Least Developed Countries and Small Island Developing States would be faced with a much greater challenge than the rest of the world. We believe that climate change must be viewed not only as a danger to natural systems, but also as a direct threat to human survival and well-being. We are convinced that the United Nations Framework Convention on Climate Change (UNFCCC) negotiation process must not be viewed as a traditional series of governmental trade-offs, but as an urgent international effort to safeguard human lives, homes, rights and livelihoods.

The Bali Process must have a clear long-term target to stabilize the climate system and ensure that temperature rises are reined in to reasonable levels. Even a two degrees Celsius temperature increase compared to pre-industrial levels would have devastating consequences on small island states. Adaptation must be at the heart of a post-2012 climate agreement. International activity on adaptation must include vulnerability assessments, enhanced resilience to climate impacts, building human and institutional capacity, and making public and private investments in making countries less vulnerable to climate change. The Adaptation Fund must be adequately resourced. It must also be easily accessible to the Small Island Developing States.

Negotiations within the framework of the UNFCCC towards a global and comprehensive agreement to stabilize the climate system must be completed by 2009. There can be no more delay, nor more distractions. After all, there is no more time.

Extracted from an address by His Excellency **Mr Maumoon Abdul Gayoom**, President of the Republic of Maldives, at the UNFCCC negotiations in Bali in December 2007.