

cannot prepare for all possible El Niño-related hazards, so they must weigh the risks, making difficult choices about which hazard(s) is (are) the one(s) to which they are most likely to have to respond.

Diverting limited available resources to deal with potential El Niño-related problems that might arise in future months is a difficult action for many governments to take, especially if there are no visible signs (as yet) of its negative impacts. Regardless of the recognized value of pro-action to deal with its impacts, considerations of El Niño's impacts are often delayed in favor of other pressing issues . . . until the next event has been forecast or, in some cases, until the impacts of the next event begin to appear

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Integrated response is a must

Often, international donor agencies tend to treat the national recipients of aid as being in an inferior bargaining position. There are many examples of inappropriate donor actions that were either useless or counterproductive to the emergency. For effective and timely disaster reduction, therefore, international donors and recipients must interact as equal negotiating partners. Donors and recipients alike must rethink the validity of the budgetary distinctions and restrictions they make between emergency-disaster and long-term development assistance.

Individual governments should create supra-national regional organizations devoted strictly to the ENSO phenomenon, as has been done by the countries along the Pacific coast of South America. ENSO is a significant disrupter of national economies and national well-being. It does not respect international borders. Regional El Niño- and La Niña-related disaster plans can be developed less expensively than if each country in a region were to go its own way, as has often been the case. Even if neighboring countries are at odds over a variety of issues, the threat of

adverse ENSO-related disasters can spark a modicum of "*disaster diplomacy*." This appears to have been the case in Central America, following the devastation caused by Hurricane Mitch in late October 1998.

Economic development and impact studies

Government policy makers must realize that climate affects their policies in both good and bad ways. They must realize that El Niño information can be used not only for disaster early warning but also for enhancing the prospects of sustainable development over the long term. Hence, government authorities need to encourage the study of climate-society-environment interactions.

Researchers need to undertake an inventory of climate resources in their countries. Broadly defined, such an inventory includes more than just meteorological data. It includes an identification of climate-related costs as well as benefits. It must also include domestic and foreign sources of climate information as well as climate-related development assistance. Doing so would require a focus on climate impacts on regions, institutions, disaster management, and economic sectors. Impact studies encompass climate's impacts on both managed and unmanaged ecosystems and on society.

Defining a management paradigm to cope with El Niño

There are several management issues raised by El Niño-related impacts. First, there should be transparency in those agencies dealing with those impacts. Transparency means that there will be openness and honesty in information about the El Niño phenomenon, the forecast, and its potential impacts. At-risk regions, populations and sectors should be identified and notified in a timely way.

Second, disaster plans and policies need to be backed up by adequate expertise and funding. National expertise should be maintained, if not strengthened, over time so that government agencies can call on it for ENSO-related experience whenever the need arises. Funding from donor agencies is an important

aspect of national disaster response for a variety of reasons. It helps to build national expertise (capacity building), it shows commitment of donors to disaster preparedness, it enhances the prospects for long-term planning instead of fostering a reliance on ad hoc reactions, it enhances logistical efficiency; it enables a government to maintain its infrastructures (transportation, health, communications).

Third, it is important for the donors and the recipient governments to improve their trust, dialog and relationship with each other in order to enhance the timeliness of response and appropriateness of assistance. Recipient governments have a responsibility to get the funds to the at-risk regions in time for decision makers in those regions to prepare to cope with the potential impacts. Local people must be involved in the planning at the national level for responses to El Niño forecasts and impacts. If

expertise is lacking at that level, then a comprehensive education and training program needs to be put in place.

The ENSO cycle merits, where appropriate, its own autonomous government management structure. A well-defined El Niño emergency management structure encompassing national to local levels should be developed and maintained, even though El Niño (warm) events recur on an irregular time interval (at some time between 2 and 10 years). Administratively, a lead agency, among equals, should be identified. Agencies involved in this structure must take their responsibilities seriously. Part of its responsibility would be to periodically review national and local disaster management plans. This can be done at a relatively low cost by evaluating their country's responses to the 1997–98 event or an earlier event that had affected their country.

Understanding the Social, Economic, and Political Setting

In discussions about responses to El Niño's impacts on a country's socio-economic and political structure existing at the time of onset of either one of ENSO's extreme events, many comments appear to be no more than political rhetoric. Few could find good reasons to disagree with such platitudes as: "strengthen the economy," "reduce poverty," "saving lives is the highest priority," or "maintain the infrastructure." The reality is that when it comes to the potential impacts of natural hazards, including those sparked by El Niño, these statements are indeed highly relevant.

Reassessing the status quo

Many adjustments are likely to be required in the ways that societies operate to make El Niño earliest warnings more effective. Such societal changes might include, for example, a change of bank credit policies, a strengthening of infrastructure for transportation, communication and health, or identifying the currently at-risk populations, regions and socio-economic sectors. Also, environmental degradation must be

taken into account in such assessments because existing degradation can magnify the adverse impacts of El Niño in different locations.

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Not unlike other sectors of society, in the case of public health, many factors interplay to make an existing bad situation much worse in the event of an El Niño, e.g., existing poverty, an economic "meltdown" (as was the case in Asia in the late 1990s), inadequate public health facilities, and even the International Monetary Fund's restructuring policies (as was the case during the 1991–92 El Niño in Zimbabwe). Thus, a corps of national researchers, financed by their governments and international donors, is needed in order to distinguish between the physical impacts that can clearly be linked to El Niño from those that result from human activities.

Inter- and intra-national "brain drain"

Developing countries face a seemingly intractable "brain drain" problem as trained personnel leave their countries to join UN and other international organizations and non-governmental organizations. The brain drain also occurs within countries, because trained personnel are forced to take additional jobs in order to support their families. They are forced to do so, because the pay for their work in science is insufficient to meet the needs of their families. The "brain drain" issue must be addressed in an international forum to identify how to minimize in an equitable way the outflow of expertise from the developing to the industrialized world.

Political change and challenges

A change in government is yet another obvious, but often overlooked, factor affecting a country's ability to respond to recurrent disasters such as those spawned by El Niño and La Niña. When a government is changed, whether by violent or non-violent means, the incoming government often discards many of the policies established by its predecessor. That's politics. However, when it comes to disaster preparedness, including El Niño responses, it is imperative that the incoming government administration not discard or neglect existing policy and plans only for political reasons.

Use of Forecasting by Analogy as a Predictive Tool



Forecasting by analogy (FBA) refers to the process of assessing the impacts on society of recent climate-related anomalies and assuming that, in the absence of any societal changes, similar anomalies in the near future are likely to have similar impacts. Such analogies can help to identify strengths and weaknesses in societal responses to recent droughts, floods, fires, frosts or cyclones. This would enable societies and their governments to reinforce those strengths and overcome the weaknesses in the face of future similar extreme climate and weather events spawned by the extremes of the ENSO cycle.

Forecasting by analogy can provide a government (and society in general) with quantitative and qualitative information on the impacts of previous El Niño events. While there is no certainty about the similarity of future impacts to those of the past, an historical retrospective does provide a glimpse of possibilities for which a society might prepare.

All governments must look back to the 1997–98 El Niño event, labeled by scientists as the "El Niño of the Century," and to the lengthy 1998–2000 La Niña event as well. A retrospective assessment would help them to gain insights into how such changes in sea surface temperatures in the tropical Pacific Ocean might affect

their local climate regimes for good and for ill. FBA can provide disaster agencies with an opportunity to review how well their contingency plans worked in 1997–98 and, if necessary, make adjustments to them. This can be done agency by agency as well as at the inter-ministerial task force level.

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Such retrospectives can provide ideas in a preliminary way about the strengths and weaknesses of their institutions, when confronted by an ENSO extreme. For example, given the known linkages between an El Niño and the increase in forest fires in Indonesia (and the resultant haze throughout Southeast Asia), that government must maintain fire prevention programs and enforce compliance with them. By similar analogy, the United States must apply vigilance across the forests of the northwest and southern tier of the country during prolonged La Niña events. National researchers should be encouraged and supported financially, both domestically and

Local capacity building geared toward the interpretation of global forecasts and analyzing them for local use is an important aspect of disaster reduction. While the earliest of warnings can be made available to the public, people require education and training to interpret and use such warnings. For effective disaster mitigation, this expertise needs to be in place before the onset of a potentially disruptive El Niño event.

Capacity building at the national level can create and foster multidisciplinary expertise, while at the same time broaden existing disciplinary expertise. Both are needed for effective pro-active participation in national as well as international activities related to climate issues (e.g., research programs, education and training activities, workshops, conferences and scientific visits).