

# Opening of the Workshop

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## **Climate Variability and Change and their Health Effects in the Caribbean: Information for Adaptation Planning in the Health Sector**

### **OPENING**

Dr. Joan L. Aron, PAHO consultant and technical coordinator of the conference and workshop, welcomed the participants to the workshop and invited Dr. Carlos Corvalán of WHO to give the opening address.

### **DR. CARLOS CORVALÁN**

Dr. Corvalán thanked the participants for their keen interest. He alerted the gathering that the Workshop on Climate Variability and Change and their Health Effects is an initiative that will hopefully build on the objectives of a previous workshop held in the Pacific (Samoa) in 2000. He emphasized the importance of sensitizing the public to the possibility of escalation of current problems by the impact of climate change. He expressed concern about the impression, held by many, that such environmental health problems are only the responsibility of the environment sector or of the health sector. Dr. Corvalán anticipated that the recognition of the need for inter-sectoral collaboration will be a major outcome of the workshop. He suggested that some of the key points for discussion should include

- required actions in the health sector for adaptation to climate change,
- key partnerships required,
- assessing capacity-building needs, and
- addressing future steps, including recommendations for action.

He urged workshop participants to engage in open dialogue with the objective of outlining the goals, achievements and leadership expected from the partnership with PAHO/WHO. He emphasized that the conclusions of the workshop will be used by PAHO/WHO in developing future regional initiatives on climate change.

### **DR. JOAN L. ARON**

Dr. Aron provided the orientation for the workshop. She offered direction by informing the group that work sessions will follow an integrated approach with information from facilitators serving to fuel discussions. The broad objectives of the workshop were then listed.

The workshop was expected to:

- generate awareness of the impact of climate change/variability on health in the Caribbean region with consideration given to regions with similar issues (e.g., the Pacific Islands);
- enhance the understanding of how climate data are and could/should be used in health planning;
- identify the elements of a framework for proactive health/climate actions to assess vulnerabilities and implement mitigation and adaptation strategies in relation to adverse health impacts of climate change/variability;
- discuss and define the roles of health and climate professionals in the implementation of the framework for proactive health/climate actions;
- identify key partners and assess institutional/organizational arrangements that must be strengthened and determine what new entities must be put in place at the national and regional levels to assess vulnerabilities and implement mitigation and adaptation strategies in relation to adverse health impacts of climate change/variability; and
- identify follow-on capacity-building activities to address climate change/variability and health nationally and regionally.



### ***Expectations of Workshop Participants***

Following is a sample of the expectations as expressed by the workshop participants.

- To be exposed to risk communication methods proven to be successful in enhancing public awareness (Antigua and Barbuda, Jamaica).
- To be sensitized to the issues of climate variability/change and the relationship to health by professionals.
- To gather information and share with relevant sectors on returning home (Belize).
- To obtain strategies for the integration of climate change and health in environmental policy.
- To learn about the Caribbean situation and offer assistance.
- To share satellite services and form partnerships in planning for adaptation to climate change (NASA).
- To share methods of data collection and archiving (NCDC).
- To gain a sense of regional needs and strategies for implementation and to establish a Caribbean-Pacific linkage for sharing of information (CEHI).
- To become aware of available resources and accessibility.
- To gain a comprehensive understanding of health factors relating to climate variability/change and strategies for coping.
- To gain knowledge of the impact of climate variability/change on dengue and possible interventions.
- To establish regional partnerships with climate change planners, such as CPACC, and to gain an assessment of regional vulnerability and available services in relation to the development of early warning systems.
- To become involved in technical cooperation programs with member countries and engage in discussions on mitigation as it relates to disaster preparedness (PAHO/Trinidad and Tobago).
- To enhance awareness of the use of remote sensing in data acquisition for analysis of climate change patterns and to determine the needs of researchers in the region so that products can be tailor-made for relevance to the region (NASA).
- To learn more about climate change, coastal zone management and health factors, as well as to form linkages (Suriname).
- To form regional links for public health surveillance and to determine how scientific results can be used to predict impacts and advise policymakers regarding environmental health (Cuba).
- To form linkages for sharing of information that can be used in the establishment of a National Environmental Health Unit (Haiti).
- To gain exposure to the key issues on climate change and environment to assist in the formulation of teaching objectives for a module on vector control (Barbados Community College's Division of Health Sciences).
- To discuss ways of coordinating research activity in the region (Antigua and Barbuda).
- To forge awareness of the role of meteorological offices in strategic planning and development of early warning systems.
- To discuss strategies for strengthening inter-sectoral collaboration and the establishment of regional and national surveillance systems in the context of a regional framework for action (Barbados).
- To forge regional linkages (Saint Vincent and the Grenadines).
- To harness the skill of meteorological services in the generation and dissemination of relevant and useful information linking the impact of weather on public health and to collaborate in the use of climate forecasting for the minimization of the impact of weather on public health (WMO).
- To use information gained as an integral part of planning in the environmental health sector (Ministry of Physical Development and Environment/Barbados).

- To gain knowledge of the best practices applied intra- and inter-regionally in quantitative research, risk management and public awareness.
- To strengthen the linkage among the ministries (e.g., Environment/Public Health).
- To be empowered to sensitize people at home and raise awareness.
- To receive sufficient data and information to make appropriate decisions regarding climate change- and health-related national activities.
- To urge the players in the country to participate more actively in climate change through health activities.
- How choice of research questions can be informed by public health needs.
- Increasing awareness of climate and health on all time scales.
- To construct the overall framework within which climate / health studies can be placed.
- To improve national and regional collaboration.
- Use of data / development of indicators within the context of sustainability.
- How to ensure coordination among countries after meeting.
- How do we make sure that others are not left out / back?
- To see the possibility of Pacific - Caribbean collaboration.
- Risk management and communication research.
- “Best practices” for climate/health studies.
- Identification of priorities.



# Workshop Proceedings

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## **Climate Variability and Change and their Health Effects in the Caribbean: Information for Adaptation Planning in the Health Sector**

### ***Workshop Activity***

The participants were divided into five workgroups. A primary consideration was to group people together who would work together in the future. Therefore people from different sectors in the same country were usually grouped together. However, every group had multiple countries represented. Each workgroup selected a chairperson, a rapporteur and a delegate. The groups were assigned the task of discussing selected issues according to guidelines suggested in the workshop program and with the aid of background information provided by facilitators. The delegates were given the responsibility of reporting, in plenary, the conclusions and recommendations of their individual workgroups in the final session of the workshop.

### ***Regional Issues and Topic Facilitators***

#### **Awareness of the Impact of Climate and Health in the Caribbean Region**

##### **Jonathan Patz**

Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, U.S.A.

#### **Public Health Programs and Planning: Using Health, Climate and Environment Data**

##### **Sari Kovats**

London School of Hygiene and Tropical Medicine, London, U.K.

*Short presentations added to the schedule to address particular needs*

#### ***Integrated System for Health and Environmental Applications***

##### **Gilberto Vicente**

George Mason University and NASA, U.S.A.

#### ***El Niño Southern Oscillation (ENSO) and its Impacts***

##### **Roger Pulwarty**

NOAA and University of Colorado at Boulder, U.S.A.

#### **Framework for Actions and the Roles of Health and Climate Professionals**

##### **Alistair Woodward**

Wellington School of Medicine, Wellington, New Zealand

#### **National /Regional Institutional Arrangements and Follow-on Capacity-Building Activities**

##### **Ulric O'D. Trotz**

CPACC/ACCC, UWICED, Cave Hill Campus, Barbados

### ***Issue #1***

## **AWARENESS OF THE IMPACT OF CLIMATE AND HEALTH IN THE CARIBBEAN REGION**

### **FACILITATOR**

#### **Jonathan Patz**

### **PRESENTATION**

Dr. Patz instructed the members of each workgroup to examine the health situation in their individual countries. He further sensitized the groups to points for consideration as issues of relevance to local communities. These were listed as:

- vectors and related factors, such as the effect of temperature on larval development;
- UHI;
- fish kills;
- availability of tools for data acquisition (e.g., remote sensing);
- transatlantic dust;
- precipitation levels;

- temperature change – IPCC predicts 1.4 to 5.8°C rise by 2100; and
- sea level rise – IPCC predicts 9 to 88 cm rise by 2100.

The groups were advised to link specific climate change impacts to related health issues. He also suggested that discussions should identify stakeholders, decision makers, the current state of systems, and channels available for dissemination of information.

### *Issue #2*

#### **PUBLIC HEALTH PROGRAMS AND PLANNING: USING HEALTH, CLIMATE AND ENVIRONMENT DATA**

##### **FACILITATOR**

**Sari Kovats**

##### **PRESENTATION**

Ms. Kovats gave an overview of data that could be used in public health planning for climate-related impacts on health. These data can be used for:

- development of a model on which to base an early warning system;
- validation/testing of a model;
- evaluation of interventions/responses;
- risk mapping -- in time and space;
- targeting resources (demographic/household surveys, census); and
- health surveys -- cross-sectional studies to detect risk factors.

These methods were illustrated with the example of data used as part of an early warning system for a climate-sensitive disease such as malaria:

- climate forecasts (rainfall and temperature anomalies 3 - 6 months ahead);

- satellite data -- proxies for weather or vegetation indices (e.g., Normalized Difference Vegetation Index);
- socio-economic data (e.g., census information on populations);
- weather data [climate stations]; and
- health surveillance (case detection to confirm the start of an epidemic).

The groups were then instructed to focus their discussions on restraints in data acquisition.

### *Added to Schedule*

#### *Issue*

#### **INTEGRATED SYSTEM FOR HEALTH AND ENVIRONMENTAL APPLICATIONS**

##### **FACILITATOR**

**Gilberto Vicente**

##### **PRESENTATION**

Dr. Vicente demonstrated the use of an interactive CD showing NASA's Integrated System for Health and Environmental Applications currently in development as part of NASA's Earth Science and Public Health Program. The purpose of this system is to provide guidance for quick access to user-friendly satellite data and products for health and environmental applications. The system aims to satisfy an increasing demand by the health community for data and information on many different environmental factors pertinent to the links between disease occurrence and transmission and the environment.

These data and information are important for monitoring, risk mapping and surveillance of epidemiological parameters on a large number of different spatial, temporal or spectral resolutions. Dr. Vicente stressed that, in order to improve the manipulation and integration of both health and remotely-sensed environmental data for addressing these issues, we need to develop systems

that allow the use of remote-sensing data beyond the research community into operational disease surveillance and control.

The current system under development at NASA's Earth Science and Public Health Program and presented during the workshop is designed to provide quick and easy data access to people unfamiliar with remote-sensing technology, but responsible for making decisions about the control of outbreaks of environment-related infectious diseases. The focus of the project is to create personalized tools to serve the needs of users with very little knowledge in the field of remotely sensed data acquisition and manipulation, but have an important role in the decision making processes at the local, state and federal levels. This is a NASA attempt to decrease the gap between the remote-sensing science/research community data producers/users and the operational/application users in the medical and epidemiological fields.

A demonstration CD was distributed during the workshop. Additional information is available by contacting Dr. Vicente at NASA: [gvicente@pop900.gsfc.nasa.gov](mailto:gvicente@pop900.gsfc.nasa.gov) (see also the entries for Dr. Maynard and Dr. Vicente on the registration list).

### ***Added to Schedule***

#### ***ISSUE***

### **EL NIÑO SOUTHERN OSCILLATION (ENSO) AND ITS IMPACTS**

#### **FACILITATOR**

**Roger Pulwarty**

#### **PRESENTATION**

Dr. Pulwarty provided background information on ENSO and its impacts. The ENSO cycle includes El Niño and La Niña events. He informed the groups that El Niño and La Niña occurrences have been estimated to have 30-40 % impact on climate change, and a

knowledge of the frequency of occurrence can help in preparedness planning for agricultural activity. He established the effects of the systems indicating that El Niño leads to warmer SSTs in the central and eastern equatorial Pacific Ocean during the months of May to July, while La Niña has the opposite effect.

He added that researchers have linked decreased precipitation and tropical storm activity in the Caribbean with an El Niño year and the reverse effect for a La Niña year. Some of the other effects of an El Niño year included decrease in river levels, sea water intrusion in aquifers and hence increased salinity of ground water. The impact of these conditions should therefore be considered in preparedness planning and mitigation of effects.

The groups were advised that factors other than the state of tropical Pacific Ocean SSTs may influence regional climate variability. Some of these factors include local atmospheric dynamics, SST in other ocean basins and land surface conditions. In linking ENSO to health, Dr. Pulwarty suggested that the impact of climate in triggering or exacerbating health-related occurrences should be the focal point. He concluded by admitting that the dynamics of ENSO are not fully understood and hence a degree of uncertainty is associated with the use of prediction models. He noted, however, that some success has been achieved



from modelling using local and regional data, and examples were drawn from applications in the agriculture sector in Trinidad, specifically the sugar cane industry. The current forecast for 2002 (at the time of the workshop) predicted a weak warm phase of ENSO and an average hurricane season.

### **Issue #3**

#### **FRAMEWORK FOR ACTIONS AND THE ROLES OF HEALTH AND CLIMATE PROFESSIONALS**

##### **FACILITATOR**

**Alistair Woodward**

##### **PRESENTATION**

Dr. Woodward presented questions for consideration during the discussion of the topic:

- How should assessment of climate change impacts on health be approached?
- What steps should be taken to improve adaptive capacity and to mitigate climate change?
- What part should climate and health professionals play in making these changes?

He advised that discussions should focus on how territories can strengthen adaptive capacity. He also suggested that current problems associated with climate variability should be connected to future impacts of climate change. Consideration should also be given to the difficulty of influencing public response to impacts



that may occur in 50 to 100 years. Woodward then offered a framework for action that included:

- use of local knowledge;
- empowerment of agencies and institutions;
- examination of policy and institutional changes that would impact both the short and long term; and
- enhancement of public awareness of the need to plan for long-term effects.

### **Issue #4**

#### **NATIONAL/REGIONAL INSTITUTIONAL ARRANGEMENTS AND FOLLOW-ON CAPACITY-BUILDING ACTIVITIES**

##### **FACILITATOR**

**Ulric O'D. Trotz**

##### **PRESENTATION**

Dr. Trotz gave a comprehensive overview of the developments leading to the institutionalization of climate change activity in the Caribbean. He indicated that the BPOA, conceptualized at the SIDS conference in 1994, laid down the framework for the implementation of sustainable development strategies that included preparedness for climate change. The CPACC project was initiated with assistance from the OAS and the World Bank with funding through the Global Environment Facility. The Regional Project Implementation Unit, staffed with regional professionals, was responsible for the management of the regional project in twelve CARICOM countries.

Four years of sustained effort led to the establishment of National Climate Committees in each territory with responsibility for the implementation of activities. These committees were established through the efforts of National Focal Points appointed by Governments to coordinate national activities under the project, and they consisted of representatives from different governmental sectors, non-governmental organizations and the private sector. Through this process, linkages were

developed with the political directorate. At the regional level, such linkages are made through the mechanism of reporting on Climate Change activities to the CARICOM Council of Ministers responsible for Trade and Economic Development under the agenda item dealing with sustainable development.

The success of CPACC led to the endorsement by CARICOM ministers of a permanent regional institutional mechanism to address climate change issues. The CCCCC has been proposed and subsequently approved of as the appropriate institutional mechanism to continue the work completed by CPACC in December 2001. The CCCCC became a legal entity in February 2002, when it was finally approved at the Inter-sessional meeting of CARICOM Heads of Government held in Belize. A decision regarding the host territory will be made in July 2002. CCCCC is mandated to act as

- an executing agency for regional climate change programs and projects,
- an advisory mechanism on climate change policy to the CARICOM Secretariat and its member countries, and
- a source of scientific and technical information on climate change and its potential impacts in the region.

The CCCCC will be the focal point of all climate change activities in the region and will work toward the establishment of an effective regional network geared to addressing climate change issues in the region.

Dr. Trotz expressed anticipation that the conference activities would lead to enhancement of regional networking and welcomed the initiative in linking climate change to public health. He commended organizers for the inter-sectoral blend of the participants invited to the conference. He cautioned that it was essential for requirements from varying sectors to be clearly defined so that meaningful outputs result from collaborative and cross-linking activities. He added that careful analysis of the current status in terms of data, records and available tools must be made to provide a platform for future capacity building. He felt strongly that priority must be

given to building national capacity and developing modalities to address concerns at a national level.

Generally, he envisioned building of regional capacity such that this capacity could be made available to enable individual countries to address national issues of import. In conclusion, he intimated that he expected the pooling of regional expertise to provide the capacity to form international partnerships in making contributions in other environmental areas of concern, including biodiversity, desertification and regulations on ozone-depleting chemicals.

*The schedule was modified to combine the discussion of Topics 3 and 4 in plenary, leaving more time on the final day to develop a group consensus on recommendations.*

### ***Plenary Session on Institutional and Organizational Arrangements***

Participants met in plenary to discuss institutional frameworks. Shown below are the categories addressed and the responses captured.

#### **NEW STRATEGIES FOR INSTITUTIONAL AND ORGANIZATIONAL ARRANGEMENTS**

- Strengthening of surveillance systems and data collection as well as further use of CAREC.
- Support of AIACC research into links between climate change and diseases (e.g., dengue).
- National Forum for discussion of mediating factors and the generation of data.
- Periodic review of indicators in planning.



- PAHO / WHO and the Caribbean Disaster Emergency Response Agency should give a presentation at the next Health Ministers conference to inform policymakers.
- Survey to gauge state of preparedness, data acquisition, methodologies and surveillance systems.
- Cross-linking with international agencies for data acquisition.
- Development of a regional Environmental Statistics Unit.
- Increase in accessibility of regional data and use of modern information systems.
- Regional meeting on climate, environment and health for information exchange and climate forecasting.

#### **CAPACITY-BUILDING ACTIVITIES NEEDED TO ASSESS VULNERABILITY AND IMPLEMENT MITIGATION AND ADAPTATION STRATEGIES**

- Integration of the knowledge base regarding climate and health as well as targeting of youth via educational programs.
- Strengthening of laboratory infrastructure for analysis.
- Strengthening of information technology infrastructure.

- National cross-sectoral database.
- Improvement in communication systems.
- Introduction of climate change modelling into curriculum at the undergraduate level.
- Collaboration with community groups in planning and management for mitigation/adaptation.
- Development of reliable models to inform mitigation efforts.

#### **NEED TO MAXIMIZE INTERSECTORAL LINKS**

- Regional newsletter.
- Individual efforts at maintaining links established at conference.
- Ongoing development of regional plans of action, sharing and updating.

#### ***Final Conclusions and Recommendations***

Delegates from the five workgroups met with Jonathan Patz and Chris Sear as facilitators. They drafted a document of conclusions and recommendations from the workshop. The summary of discussion and conclusions appears in this section of the report. These represent various individual opinions, but they do not necessarily represent the consensus opinion.

In contrast, the recommendations were refined in plenary session and do reflect the consensus made by the workshop. They appear in the section entitled Recommendations by Workshop Consensus, which immediately follows the delegates' report.

#### ***Delegates' Report***

'Public Health Community' is here defined as all persons who share a common responsibility for health and welfare of community and nation, including government institutions, and public and private practitioners.



## Discussion Topics

### I. AWARENESS OF IMPACT

**Q. A. Does the public health community in your country believe the climate issue is important? If yes, why? If no, why not?**

All agreed that there was some awareness of climate issues in their countries. In some cases though, recognition of the issues' importance is restricted to policy-makers and public health officials. Often the public at large is not aware that climate variability and change are already adversely impacting on their lives. Indeed, lack of public awareness is a real barrier to effective political action in many communities. However, in Cuba, all communities are well informed through the media and educational programs.

The evidence for this answer includes the fact that all represented countries signed the UNFCCC. In some territories, climate change committees already exist. Also, health communities are already informed through their recognition of relevant links and their need to deal with non-communicable diseases, such as heart disease, hypertension and others that are aggravated by heat stress; as well as to address the issue of communicable diseases influenced by current climate, including dengue, gastroenteritis, etc. (These diseases are possible entry points for the recommended future activities on climate and health in the region.)

A current requirement is to provide timely early warning capabilities for hurricane preparedness and other severe weather events. (Early warning is a possible entry point for capacity building and other recommended future activities on climate and health in the region.)

Three reasons are identified to explain why understanding in the health community is sometimes limited:

- lack of access to information about climate and health relationships and a lack of interpretive expertise;
- no common terminology used by health and climate professionals; and

- lack of understanding concerning the difference between climate variability and climate change.

In some countries, the public has limited awareness because of the 'newness' of the issue and its 'remoteness' from their daily lives. But there were presented several specific examples (cases) which demonstrate some localized awareness because of recent events. These include, for example, fish kills, floods, drought, dengue outbreaks and heat-stressed chickens (adversely affecting their owners' livelihoods).

**Q. B. How would you use presentations from the conference on climate and health in the Caribbean to enhance awareness of the impact of climate change/variability on health?**

Participants and other health community actors should take and explain the workshop findings to policy and decision makers and other stakeholders, at local to national levels (including politicians, insurers, health agencies, etc.); and using information and contacts, they should establish and inform public awareness programs. Proposed activities include:

- hosting of inter- and cross-sectoral workshops, panel discussions and other events for all stakeholder groups;
- lobbying strongly for the inclusion of climate change issues in school and college curricula... "Save (our home) for future generations";
- involving the media and government information services, both as partners and as promoters;
- introducing the concept of risk assessment into the public consciousness;
- using already established regional and international institutions and agencies: ACCC-MACC, UWI, AIACC, PAHO/CPC, CEHI, CAREC, CIMH, CCA, PAHO/WHO, WMO, UNEP;
- generating promotional materials and dissemination strategies, including using music disc jockeys and similar entertainers to promote the message, providing bumper stickers and memorabilia and the like; and

- partnering community leaders and institutions (for example, community centers and local NGOs).

**Q. C. Are your responses to A and B different for seasonal to interannual climate variability such as El Niño, as compared with long-term global climate change? If so, why?**

The answer is sometimes no. One reason is that the public health community simply has not grasped the significance of the difference between climate change and variability. There was a strong feeling that issues of short-term variability (which have immediacy) are available as entry points with which to introduce longer-term issues to identify and inform stakeholders at all levels. It should be possible to generate win-win now strategies (immediacy and relating to ‘today’s concerns’) which will spin off longer-term benefit. It is recognized, however, that there is a possible downside of ‘sidelining’ climate change (as opposed to climate variability). The logic goes: “if we are going to do this anyway, why do we need to care about the longer-term future impact of (uncertain) climate changes?”

In order to address some of these issues, the following actions were recommended:

- establish early warning systems for seasonal, inter-annual and long-term effects;
- develop and implement legislation and regulations to reduce vulnerability to seasonal and interannual climate variability: building codes, coastal zone management, etc.; and
- make use of panels of global, regional, intraregional and especially national experts to speak to issues ‘endemic’ to islands and countries.

It is necessary to carefully define mitigation, since it has different meanings in different professional communities.

**Refer to Recommendations by Workshop Consensus 1 – 5 under Awareness of Impact.**

## II. PUBLIC HEALTH PROGRAMS AND PLANNING: USING DATA

**Q. A. What kinds of data are used in public health programs and planning?**

The workshop participants generally agreed that most surveillance and monitoring aspects of most public health programs use the following data:

- weather/climate data, such as temperature and especially rainfall;
- derived information (i.e., not strictly raw or primary data), such as forecasts (hurricane, severe weather events, etc.);
- indices, such as the Global Solar UV Index and Mosquito Breteau Index;
- rates, such as mortality and morbidity, and disease-specific incidence and prevalence data;
- economic data, such as the gross domestic product, budget, etc.;
- demographic and other social data; and
- other: water availability and quality, waste water system data, etc.

There are large variations between islands, however, in the amount, the temporal and spatial specificity and the quality of the data used in health community planning.

**Q. B. What data could/should be used in public health programs and planning?**

The workshop participants prepared the following list of data:

- climatic indices or variables, including drought indices and hydrological variables;
- environmental data, including such as earth observation (remotely sensed) imagery and data, mapping, coastal zone profiling, water quality, hydrological data, air quality and UV data, etc.;

- expanded health data, including, for example, pupae per person (pupa is a stage of mosquito development); and
- data integrated, stored and analyzed using GIS technologies, such as delineated zones of health hazard, flood risk, routings for disaster response, control planning and evaluation.

**Q. C. What are existing or foreseen constraints regarding application of climate and environment data to health issues? and What are the strengths and weaknesses of health, climate and environment data? Include other sources of data as appropriate.**

#### **Strengths**

- tradition of data collection in all represented countries;
- legislation for collection and reporting;
- accessibility to data on the internet (could be a weakness unless confident of weeding out poor data/information);
- some history of regional collaboration.

#### **Constraints / Weaknesses**

- limited sharing of data amongst agencies and lack of feedback to data providers;
- inappropriateness of data and limited systematization;
- limited data quality and availability, inadequate storage;
- lack of financial and human and other resources to analyze data rigorously;
- infrastructural and information technology weaknesses;
- lack of regional co-ordination and data exchange;
- weak reporting mechanisms;
- lack of cross-sectoral dialogue (especially with respect to water supply and waste management, tourism, agriculture and fisheries);
- some data networks are inadequate to represent spatial variability (e.g., rainfall gauge networks);
- lack of an 'information culture' on some islands;

- information that is not user-friendly;
- political insensitivity to scientific data and their limitations.

*Refer to Recommendations by Workshop Consensus 6 - 10 under Public Health Programs and Planning: Using Data.*

#### **El Niño Southern Oscillation (ENSO)**

**Q. A. What is the current forecast for El Niño? What are the possible implications for the Caribbean region? What are the major health concerns? What are the possible responses?**

At the time of the workshop, the current forecast was for a weak warm phase of ENSO later in the year 2002, but that this could strengthen the following year 2003. At the time of the workshop, an above-average hurricane season had been forecast for 2002.

**Response:** *maintain guard*

It is important to note that the Caribbean Region is exposed most years to flooding due to storms and hurricanes and drought, irrespective of El Niño and La Niña. Therefore, preparedness should not focus just on the El Niño and La Niña forecast.

#### **Sea Level Rise**

**Q. B. How are coastal zones vulnerable to sea level rise? What are the possible implications for the Caribbean region? What are the major health concerns? What are the possible responses?**

- Caribbean coasts are vulnerable to sea level rise.
- Many coasts are vulnerable to erosion.
- Many coasts are vulnerable to salt water intrusion.
- There is a risk of increasing the number of habitats for some mosquito vectors.

- There is a significant risk of increased coastal flooding and loss of natural resources (reefs, mangroves, sea grasses, beaches and other coastal habitat, with indirect but important impacts on fisheries, algae and biodiversity); and adverse impacts on tourism, coastal structures, roads, water supply systems and other built infrastructure.
- There would be an increased gastroenteritis risk from water contamination.
- There may be a risk of population displacement.
- Human interventions (such as dredging) may ameliorate or worsen impacts.
- There are other economic implications and possible mental and physical stress on local populations.

Responses and solutions include long-term adaptation strategies, evacuation plans and building sea defenses. Water supply policies need refinement to account for likely sea level rise. Zonal planning (Integrated Coastal Zone Management) will be required. The development of sea level rise response policies will have to combine elements of

- Protection,
- Adaptation, and
- Retreat,

depending on local situations, resources and policy. Other responses will include improving

- emergency preparedness programs,
- health education, and
- early warning systems.

*Refer to Recommendations by Workshop Consensus 11 – 13 under Public Health Programs and Planning: Using Data/ Special Situations: El Niño-Southern Oscillation (ENSO); Sea Level Rise.*

### III. INSTITUTIONAL AND ORGANIZATIONAL ARRANGEMENTS

This section contains lists of recommendations from the plenary, with no prioritization or workshop consensus.

***Q. A. What institutional and organizational arrangements must be strengthened and what new entities must be put in place at the national and regional levels?***

#### **National:**

- Strengthen health surveillance and monitoring systems, with assistance from CAREC.
- Build national forums.
- Undertake a survey and inventory of current data and surveillance systems.
- For effective outcomes, link and work at departmental level – forming personal networks and links at this level of government.
- Establish national environmental information units to ‘handle’ environmental data relevant to health and other sectors (i.e., to bring together, integrate, analyze, generate products and distribute data and information).

#### **Regional:**

- Evaluate currently commonly used indicators and generate regional standards if appropriate.
- Charge one agency to lead on climate change – health issues and give it a responsibility for delivery.
- Establish protocols for disease data (examples already exist).

#### **National and Regional:**

- Integrate across sectors.
- Fund demonstration projects of climate-health relationships, both nationally and regionally.
- Use appropriate data resolutions to represent geographic diversity.

- Develop institutional arrangements for data integration and dissemination.
- Generate political will by placing climate variability and change and health linkage issues on the agenda of the regional health ministers' conference.
- Convene regular meetings of climate, health and environment professionals, nationally and regionally, to exchange information and ideas.

**Q. B. What capacity-building activities will you develop in your country to assess vulnerabilities and implement mitigation and adaptation strategies in relation to adverse health impacts of climate change / variability?**

**National:**

- Develop laboratory infrastructure and information technology systems.
- Make centralized national databases accessible for all sectors and cross-sectorally.
- Develop education and public awareness campaigns.

**Regional:**

- Build on the current and planned initiatives.

**National and Regional:**

- Develop human capacity training (especially of young scientists) in assessing vulnerability.
- Develop skills transfer, long-term training programs, and short-term training (individual consultations).
- Evaluate current surveillance methods and archives.

In order to make these efforts sustainable, the groups affected must develop ownership of the issue.

**Q. C. How can you maximize the activities and linkages in the health, climate and environment sectors to exploit information from existing and new entities?**

**National:**

- Develop community-based interventions and collaboration.
- Develop knowledge of the science and the social and political process of mitigation.

**Regional:**

- Make best use of CPACC outputs (and follow-on projects ACCC and MACC).
- Maximize use of existing links.

**National and Regional:**

- Establish credible communications strategies.
- Develop predictive models through research in order to guide mitigation at multiple levels.
- Use workshops to incorporate new information over time.
- Use regional (and national, where possible) newsletters (including existing ones) and the internet to disseminate widely information on activities and climate-health links.

Three key entry points were confirmed to be these stakeholder groups:

- water resource managers;
- disaster managers; and
- vector control officers.

Other stakeholder groups need to be found (e.g., tourism officials).

Finally, it was noted that a gradual and staged approach would be beneficial, as would an interdisciplinary collaboration using further, focused regional workshops.

*Refer to Recommendations by Workshop Consensus 14 – 22 under Institutional and Organizational Arrangements.*

# Recommendations by Workshop Consensus

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## **Climate Variability and Change and their Health Effects in the Caribbean: Information for Adaptation Planning in the Health Sector**

### *Awareness of Impact*

1. Build awareness throughout the region.
2. Expand the knowledge base of relationships between climate variability and change and health, through nationally- and regionally-based research and engagement of existing interpretive expertise.
3. Identify entry points to build this awareness and develop adaptation and prevention strategies.
4. Promote cross-sectoral communication and consultation in developing these strategies (entry points can be both event- and stakeholder-based).
5. Establish early warning systems that incorporate monitoring of seasonal, interannual and long-term climate events.

### *Public Health Programs and Planning: Using Data*

6. Conduct inventories of existing data, identify current data gaps, and develop strategies to fill these gaps.
7. Establish better data management systems, programs and practices, including the establishment of data quality standards and the distribution of examples of best practices regionally.
8. Identify, engage and enhance appropriate national and regional institutions for data handling, analysis, and tertiary, multi-sectoral product development; and facilitate and enable networking.
9. Encourage fuller use of available data through regional and national capacity building (human resources, information technology, etc.)
10. Develop and maintain firmer inter-sectoral linkages.



***Public Health Programs and Planning: Using Data  
Special Situations: El Niño - Southern Oscillation  
(ENSO); Sea Level Rise***

11. Establish verifiable links between ENSO, extreme weather events, and climate variability and health consequences in the Caribbean.
12. Identify and map locations, hazards and communities especially at risk and vulnerable to sea level rise and associated health risks, taking a holistic, cross-sectoral view.
13. Develop long-term adaptive strategies for sea level rise, based on an understanding of current coping strategies and of national development priorities.

***Institutional and Organizational Arrangements***

14. Evaluate current indicators and generate regional standards.
15. Work effectively with policymakers to enhance awareness of climate variability and change, and to catalyze discussion at national and regional levels.
16. Develop institutional arrangements for data integration and dissemination.
17. Improve exchange of knowledge by developing effective mechanisms for information sharing.
18. Improve national and regional facilities and funding for interdisciplinary research.
19. Improve education and training through further workshops, follow-on networking (beginning with the participants of this workshop), and structured training at local, national and regional levels.
20. Find and use entry points for climate/health issues.
21. Engage existing regional and national institutional mechanisms and processes for climate change adaptation, including national climate committees and the CCCCC.
22. Obtain institutional support from international organizations (especially PAHO) in activities related to capacity building, research and regional/national assessments.

# Closing of the Workshop

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## **Climate Variability and Change and their Health Effects in the Caribbean: Information for Adaptation Planning in the Health Sector**

Participants were asked to offer suggestions that could lead to improvement of the outcomes in future workshops on the same theme. Several individuals responded with an assortment of ideas.

- Inclusion of national climate change coordinators.
- Inclusion of case studies, technical reports.
- Simpler framing of workshop questions.
- Inclusion of personnel in disaster preparedness and water resource management.
- Inclusion of environmental NGOs.
- Provision of more perspectives on climate change.
- Earlier distribution of invitations.
- Invitation of media personnel.
- Extension of workshop period.

### **WORKSHOP CLOSING CEREMONY**

Dr. Joan L. Aron expressed thanks to all those contributing to the success of the workshop. Special mention was made of Premier Event Services, Merville Lynch Services, Technician Ricardo King, Rapporteur Sonia Peter and Vicky Greenidge of the conference secretariat. Ms. Greenidge was presented with a token of appreciation on behalf of all participants.

Dr. Luiz A. Galvão, Coordinator of the Environmental Quality Program in the Division of Health and Environment for PAHO/WHO, and Mr. Harry Philippeaux, Environmental Health Advisor for the Caribbean for PAHO/WHO, were then invited to address the gathering.

### **DR. LUIZ A. GALVÃO**

Dr. Galvão thanked all of the co-organizers: UNEP, WMO, EPA, NOAA, NASA, Health Canada, Environment Canada, CPACC, CEHI, UWI, CAREC, CIMH, CCA and especially the Government of Barbados.

Dr. Galvão expressed regret at not being in attendance from the inception of the workshop, but welcomed sharing the accomplishments with the co-organizers UNEP and WMO. He thanked Joan Aron for catalyzing the participants and Harry Philippeaux for his expertise as technical advisor. He reaffirmed the commitment of PAHO/WHO in supporting regional capacity building for adaptation to climate change. Dr. Galvão reassured the gathering that PAHO will continue its role as coordinator for the sharing of information and networking of regional organizations.

### **MR. HARRY PHILIPPEAUX**

Mr. Philippeaux expressed delight over the development of the general proceedings which, in his estimation, exceeded all expectations. He lauded the workgroups for persisting during the technical difficulties and thereby contributing to the success of the conference and workshop. Participants were commended for exemplary performance throughout the proceedings and especially for the enthusiasm displayed in the discourse on climate variability and change.

Mr. Philippeaux extended gratitude to the Barbados Government, especially the Ministries of Physical Development and Environment and Health, for their investment that made the conference not only possible, but a success. He also acknowledged the expertise of Joan Aron, whom he considered to be the pulse of the activity. Recognition was also given to the facilitators for their presentations, which sustained the interest in the activities, and special mention was given to Dana Focks for the impromptu training session he provided for the Barbados professionals. Appreciation was extended to Clare Forrester, PAHO communications advisor,

for her sterling job working with the press and in informing the press; Brenda Lashley, PAHO System Administrator, for her assistance with the information technology needs; and Sonia Peter as Rapporteur of the conference and workshop. Mrs. Brown, Caribbean Program Coordinator of PAHO, was singled out for her leadership role in cooperating with international, regional and local interests in the development of a product relevant to all stakeholders.

Mr. Philippeaux expressed gratitude to all co-organizers for the collaborative effort, including UNEP, WMO, EPA, NOAA, NASA, Health Canada, Environment Canada, CPACC, CEHI, UWI, CAREC, CIMH and CCA. He considered the major achievements of the conference and workshop to be the map of the mandate for the CCCCC, the sensitization of inter-sectoral groups regarding climate change, and the linkage of the health, environment and meteorological services units. He recommended that each participant be an ambassador and seek to integrate activities in planning and development in their countries. In addition, he suggested that each participating country replicate the activities of the conference and workshop to secure a national consensus and pledged support from PAHO.

The workshop was then declared closed.