Improving Climate Services for the Health Sector

Background report for the

Inter-Agency Consultation Meeting on Global Framework for Climate Services (GFCS) User Interface Platform (UIP) & Implementation Plan

November 2011

World Health Organization
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# ACRONYMS

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# DEFINITIONS

- GFCS (Global Fund for Climate Services)
- CI (Climate Information)
- UNFCCC (United Nations Framework Convention on Climate Change)
- IPCC (Intergovernmental Panel on Climate Change)
- CIP (Climate Information Partnership)

# EXECUTIVE SUMMARY

This report highlights the need for improved climate services to protect and enhance human health. It aims to inform the health sector with climate information, emphasizing the importance of decision-making processes, end-users, types of climate information and services, and current limitations for their application. The document also discusses climate services for the health sector, climate & health partnerships, capacity needs, and considerations for first phase actions of a UIP for health.

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**Acronyms**

ACMAD  
African Centre of Meteorological Applications for Development

ACPC  
Africa Climate Policy Center

AFRO  
WHO Africa Regional Office

AfDB  
African Development Bank

AUC  
The African Union Commission

CHWG  
Climate and Health Working Group

ClimDev-Africa  
Climate for Development Programme for Africa

CRM  
Climate Risk Management

CSF  
Climate Services Framework

CSIS  
Climate Services Information System

DNP  
Department of National Planning

EWS  
Early Warning Systems

FEWSNET  
Famine Early Warning System Network

GCOS  
Global Climate Observing System

GMP  
WHO Global Malaria Programme

HCF  
Health and Climate Foundation

IFRC  
International Federation of the Red Cross Red Crescent

IPCC  
Intergovernmental Panel on Climate Change

IRI  
International Research Institute for Climate and Society

LDC  
Least Developed Country

MALOF  
Malaria Outlook Forum

MDG  
Millennium Development Goals

MEWS  
Malaria Early Warning System

MOH  
Ministry of Health

MERIT  
Meningitis Environmental Risk Information Technologies

NMHS  
National Meteorological and Hydrological Service

NOAA  
National Oceanic and Atmospheric Administration

OBS  
Observation and Monitoring

PPP  
Public-Private Partnerships

PHE  
WHO Department of Public Health and Environment

RBM  
Roll Back Malaria Programme

RES  
Research, Modelling, and Prediction

SAMC  
East and Southern Africa Malaria Control

UIP  
User Interface Platform

UN  
United Nations

UNDP  
United Nations Development Programme

UNECA  
United Nations Economic Commission for Africa

UNEP  
United Nations Environmental Programme

UNICEF  
United Nations Children's Fund

UNFCCC  
United Nations Framework Convention on Climate Change

WCC-3  
World Climate Conference-3

VIGIRISC  
African Early Warning and Advisory Climate Services

WHA  
World Health Assembly

WHO  
World Health Organization

WMO  
World Meteorological Organization
Definitions

**Climate Information** is a broad term that includes summary statistics, historic time-series records, near-real-time monitoring, predictive information from daily weather to seasonal to inter-annual time scales, and climate change scenarios.

**Climate informed health decisions** are those that incorporate spatial and time-scale climate data with clinical and epidemiological data to prevent public health impact from climate-sensitive variables (flooding, pathogens, famine).

**Climate Products** cover a range of information from climate observations and information, such as temperature, precipitation, wind velocity, soil temperatures and other climate information that has been collected and organized.

**Climate services** are climate information prepared and delivered to meet users’ needs.

Climate Service Framework Pillars

**(UIP) User Interface Platform** provides a means for users, user representatives, climate researchers and climate service providers to interact, thereby maximizing the usefulness of climate services and helping develop new and improved applications of climate information.

**(CSIS) Climate Services Information System** is the system needed to protect and distribute climate data and information according to the needs of users and according to the procedures agreed by governments and other data providers.

**(OBS) Observations and Monitoring** component will ensure that the climate observations necessary to meet the needs of climate services are generated.

**(RES) Research, Modeling and Prediction** assess and promotes the needs of climate services within research agendas.

**(CB) Capacity Building** supports systematic development of the necessary institutions, infrastructure and human resources to provide effective climate service.
Executive Summary

The effects of climatic conditions on health are now well known, and protecting health from preventable negative impacts of climate variability and climate change has become a priority for the health community in recent years. However, there are a number of important deficiencies in how health community currently manages climate risks, including the limited use of information about the climate in regular programmatic and health policy decisions. This gap is not only a reflection of limited capacity and experience within the health sector to use climate information, but also indicative that today’s climate information, tools, technology, and services are not always produced to respond to sectoral needs.

Such shortcomings are likely to become more evident and important due to increasing climate variability and long-term change, and the need for vulnerable countries to manage the associated risks. If the health sector is going to be prepared to cope with the impacts of greater climate variability and longer term changes, then climate and meteorological information must be taken into greater consideration in health science, practice, and policymaking. On the other hand, for climate services to respond to such a significant sectoral need, wide-scale investments are needed to maintain and enhance the climate monitoring systems and capacity of meteorological services in order for them to inform and assist climate sensitive sectors, such as health, to manage climate risks. Genuine dialogue between the health and climate sectors is thus needed to identify how to ensure that targeted investments in existing and new climate services to can appropriately and effectively enhance benefits to society.

At the third World Climate Conference (WCC-3), the Member States of WMO endorsed the establishment of a Global Framework for Climate Services (GFCS), to support and enhance this process. A High Level Taskforce (HLT) was convened to review the status of climate services, and to guide the implementation of the GFCS, and identified health, disaster risk reduction, agriculture and food security and water resources as priority areas for support. They concluded that present capabilities to provide climate related services fall short of meeting present and future standards as set by the GFCS. These needs are more evident in least developed and developing countries. Existing climate services do not adequately address community level user needs, and the level of interaction between end users and climate service providers needs improvement, particularly in least developed countries to address their climate adaptation needs.

The HLT gives general recommendations on the future directions of the GFCS outlining five key ‘pillars’ for the GFCS (Figure 1), namely observations and monitoring; research, modelling and prediction; the Climate Services Information System (the operational heart of the GFCS); a User Interface Platform; and Capacity Building. It recommends high quality observations across the entire climate system, incorporating relevant socioeconomic variables to provide insight to vulnerabilities or certain populations or segments of that population to climate variability and change. Utilizing new research developments and strengthening current collaborations will help to maximize current climate services. National level capacity building is a critical and unifying component of the GFCS. The HLT placed the highest priorities on building the capacity of developing countries to enable all countries to manage climate risk effectively, as well as strengthen regional elements of the Framework (e.g. Regional Climate Centres) which are supportive of national actors.
The User Interface Platform (UIP) provides a means for users, user representatives, climate researchers and climate service providers to interact, thereby maximizing the usefulness of climate services and helping develop new and improved applications of climate information. The development of a UIP for the health sector is therefore a significant opportunity to come together with climate service providers, to establish a platform for the health sector to engage with, be able to provide feedback on current needs and issues for health actors (i.e., specific models and observations, assessment tools, technical guidance, research support, and capacity development), and jointly develop a strategy to collaborate, communicate, and monitor the implementation and effectiveness of the GFCS.

Scope and Purpose of Health Consultation:
The aim of a health sector specific consultation is to inform the GFCS implementation plan of health sector decision and information needs, and build upon the principles and general recommendations given by the HLT to develop sector appropriate climate services. The feedback of key stakeholders on how to guide the GFCS to best to address current gaps, to support the production, availability, delivery and application of climate services for health and disaster risk reduction, to generate a detailed set of recommendations to be considered in the development of the draft implementation plan for the GFCS.

Specific Objectives of Consultation include:
- Review the current status of, and critical needs for climate services in the health sector and DRR community at global, regional and national levels;
- Identify decision making processes (including segmentation of the associated user groups), and the climate information required to assist these, in the health sector and DRR community;
- Assess the current status of interactions of the climate service providers with the health sector and DRR community and identify the major areas for improvement;
- Identify capacity development needs to advance the access, interpretation and use of climate information in the health sector and DRR community, including the aspects of uncertainty;
- Identify criteria for selection of high priority projects to address major gaps at regional and national levels in the health sector and DRR community to be considered in the implementation plan of the GFCS.

Expected Consultation Outcome
Identification of key issues and needs to be addressed by a UIP to empower the health community to make climate informed decisions. The consultation will aid to orient the scope of activities a Health UIP will undertake in the coming 2, 6, and 10 years. The consultation will also propose concrete projects on health and DRR are to be included in the draft implementation plan, as part of the UIP of the GFCS.
advance the use of climate information in decision making in the health sector and DRR decision making across sectors.

**Background Report Overview**

This report provides a background for discussion and expansion on the development of climate services which cater to the needs of the health sector, particularly at the national level in vulnerable countries. It aims to draw upon and summarize the active and dialogue which has occurred in recent years between key partners in climate and health. Drawing notably upon the recommendations from the following meetings, and relevant publications and studies generated by this community of practice:

- Climate and Health In Africa, 1999 (IRI)
- Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks Espoo, Finland, 17 – 21 July 2006 (WMO)
- Secure and Sustainable living Social and Economic Benefits of Weather Climate and Water Services, Madrid Spain March 2007 (WMO)
- World Climate Conference – 3: Climate and Health Working Session (August 2009)(WMO)
- WCC-3 Side meeting on Climate Risk Management of Infectious Diseases (August 2009)(WMO)
- Climate and Health in Africa: 10 Years on (April 2011)(IRI)
- International Conference on Climate Services (Oct 2011)(IRI)

This report contains five sections which review the current practices and issues for Climate Informed Decision-making (Section 1); Climate Services for the Health Sector (Section 2); Partnerships for Climate and Health (Section 3); Capacity Building for the use of climate information in the health sector (Section 4); and finally an outline of priorities, for the development and design of Climate Service User-Interface Platform for Health, and suggested criteria for pilot projects which can test and refine models and practices of a CSUIP for Health.

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Section 1: Introduction

1.1 Need for improved Climate Services to protect and enhance human health

Human health is closely linked to meteorological and climatic conditions. Population health is affected directly through extreme weather events such as heatwaves, hurricanes, floods and drought. Weather and climate conditions also affect some of the largest infectious diseases burdens, particularly of poor countries, including diarrhoea, malaria and other vector-borne diseases (McMichael et al. 2003). More fundamentally, climate variability and change affect the natural and managed ecosystem services that underpin population health, including the availability of freshwater, and agricultural production, as determinants of food security. Health is therefore connected to climate both as a formal sector, but more importantly as an overall societal good, that would benefit from better management of climate risks across a wide range of other sectors.

The importance of the connections between climate conditions and health are increasingly recognized by both the climate and health sectors. The UN Framework Convention on Climate Change (UNFCCC) specifies damage to human health as one of the three sets of "adverse effects" that the UNFCCC aims to avoid (UNFCCC 1992) successive reports of the Intergovernmental Panel on Climate Change (IPCC) have documented the significant health risks of climate variability and change. Although, the World Meteorological Organization and World Health Organization have had a collaborative agreement since 1952, the rationale for applied collaborations has increased over the past decade. The World Health Assembly passed a resolution on climate change and health in 2008, and all six WHO regional committee meetings have developed and endorsed plans for the Health Sector to identify climate risks and appropriate protective policies in relation to climate risks. The importance of managing the full spectrum of climate hazards to health and wellbeing over short and longer time scales, highlights the vital role that climate information and services should play in health policy and practice in coming years.

Despite the widely acknowledged connections, and needs for climate information from the health sector (Rogers et al. 2010) there is an emerging consensus that climate information and services to inform health decisions is not used to its full potential. Over the past decade, WMO and partners in the meteorological sector have pro-actively sought the perspective of operational "end-users", including the health sector, to help guide the development of climate services. The current emphasis on climate services aims to further develop the traditional functions of meteorological agencies in collecting data from terrestrial, ocean, and atmospheric observing systems, and focus on their evolving capacities to analyse data and generate information products, such as climate services, weather forecasts, and long term climate projections, to make a stronger connection to informing practical decisions in climate sensitive sectors, such as health.

Effective climate services can be an important support for the management of climate-related risks to health. With climate services working alongside health and other health affecting sectors critical information can be provided which helps identify and understand the seasonality of disease and health risks, and how environmental and climate factors influence the timing and location, and human behaviour which influence disease transmission. Most importantly, climate services which not only provide information, but work alongside the health community can assist in developing tools and systems to forecast and provide warnings for health events. Early warnings improve health preparedness and critically extend the lead-time health actors have for decisions and preventive measures. Health oriented climate services can not only save lives but help increase the efficient use of limited resources by identifying and targeting the most at risk and vulnerable areas or populations.
SECTION 2: Informing The Health Sector with Climate Information

**What kinds of decisions are made in the health sector which can be informed by or improved with climate information?**

The GFCS-UIP for health should be driven by and respond to the needs of the health community to protect health in an ever changing climate, and facilitate the improvement of health sector performance and management with the use of climate information. The range of issues and contexts which the health care, public health, medical emergency management, health systems management, medical and health research personnel confront are extensive and have complex linkages with weather conditions, and thus long term trends in climate variability and change. This section outlines common decisions which can be climate-informed (2.1); the range of decision-makers who are potential clients for climate services (2.2); the types of information currently used to improve decisions (2.3); current limitations for the application of climate information (2.4); and currently identified priority information needs (2.5).

### 2.1 Decision making processes that can be improved with climate information

**Climate informed health decisions** are those that incorporate spatial and time-scale climate data with clinical and epidemiological data to protect public health from climate-sensitive hazards (flooding, pathogens, famine, extreme temperatures). It involves many decisions on varying scales, from location and planning of clinics to resource acquisition and distribution.

The protection of community and public health requires a complex health service delivery nexus and collaboration with water, agriculture, land planning, and other sectors that impact disease transmission, access to health determinants, and public health safety. Therefore information about how climatic conditions, both short and long term, will influence these conditions is essential for the appropriate investment and deployment of public health and health care policy and services. Some of the common decisions which can benefit from use information about the weather and climate include:

- Risk and Vulnerability identification
- Resource allocation
- Infrastructure placement
- Emergency preparedness
- Public health information dissemination, ie Public Service Announcements and Alerts
- Disease control strategies
- Regulation and laws
- Health policy
- Pharmaceutical, Health supply, Pesticide and Vaccine supply flow
- Health staffing decisions
- Targeted medicine for vulnerable populations
- Training of the health workforce for potential outbreaks or signs of illnesses, even side effects medicine in extreme temperatures

### 2.2 End-users of climate information in the health sector

**Who are the end-users (clients) of climate information in the health sector?**
The Health sector is comprised of broad nexus of partners that not only provide health services at a community or national level, but those agencies and institutions involved in, for example, communication, research, policy-making, teaching and education, etc. Therefore, the range of decision makers and important user groups, or consumers of climate information may include:

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<tr>
<th>Health-end user Segments</th>
<th>Example</th>
<th>Primary Decision areas</th>
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<tbody>
<tr>
<td>◦ Public health service providers</td>
<td>Regional or district level health managers, disease control program staff,</td>
<td>Operations. Policy.</td>
</tr>
<tr>
<td>◦ Health care providers</td>
<td>Clinicians, pharmacies, hospital personnel</td>
<td>Operations.</td>
</tr>
<tr>
<td>◦ Health emergency managers humanitarian actors, early warning providers, emergency planners, emergency response and recovery agencies, service providers</td>
<td>Emergency managers, hospitals emergency departments, international humanitarian agencies. Managers, logistic, community health workers, pharmaceutical and commodity managers. (NGOs, CBOs), local authorities (emergency medical services, fire and rescue)</td>
<td>Planning. Operations.</td>
</tr>
<tr>
<td>◦ Media and telecommunications, and communication services:</td>
<td>TV, newspaper, radio journalists, telecommunication companies</td>
<td>Inform communities of risks, PSAs, and advisories.</td>
</tr>
<tr>
<td>◦ Training &amp; Education</td>
<td>Universities, institutes</td>
<td>Training and Capacity Building</td>
</tr>
<tr>
<td>◦ Communities</td>
<td>CBOs, health care providers</td>
<td>Response. Risk identification.</td>
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Table 1 Categories of End Users of Climate Information in the Health Sector

The user interface platform (UIP) envisaged under the GFCS is concerned about linking climate services with the end-users (e.g., public and private sectors at local, national, regional and global levels). This requires understanding their requirements and how climate services impact (or contribute to) ongoing decision making. Understanding health user needs should underpin the provision of climate services to these sectors. It is important to recognize there is not only a great variety of end-users but their needs and requirements are highly diverse, given the scope and multi-sectoral aspects of health protection. Thus, the identification and segmentation of users and their needs should drive the development of user interfaces. It is also important to understand the 'commonalities' between sectors – and if and where common services and tools can be leveraged and used by multiple end-users. As well as, the needs and requirements to develop metrics and indicators to assess the performance of climate services for these user groups.

It should also be recognized that health is intimately connected to water, disaster, and agriculture sectors – and the development of “stovepiped” services for each sector may not be in the best interest of the health community. There is an articulated need to improve the communication, information
sharing, and awareness of information about how climate is affecting other sectors (ie food and agriculture) which are fundamental determinants of health, and disaster risk reduction (which can reduce population vulnerabilities and health preparedness). There may be strong benefits to interlinked climate services, particularly for the health sector – making use of climate services for water, food security, and DRR.

2.3 **Types of Climate information and services used to inform health - decisions**

*What kinds of climate information can be useful to these end-users to improve decision-making in the health sector at community, national, and global levels?*

**Climate Information**
Climate information includes summary statistics, historic time-series records, near-real-time monitoring, predictive information from daily weather to seasonal to inter-annual time scales, and climate change scenarios. It covers a range of spatial scales; and can include derived variables related to impacts, such as crop water satisfaction indices, epidemic disease hazard or stream flow. Climate information is packaged and presented as climate products.

**Climate Services**
Climate services are mission-oriented and driven by societal needs to enhance economic vitality, maintain and improve environmental quality, limit and decrease threats to life and property, and strengthen fundamental understanding of the earth. Climate Services produce and deliver authoritative, timely and usable information about climate change, climate variability, trends, and impacts on local, state, regional, tribal, national, and global scales.

**Examples**
- Daily Weather: temperature, precipitation, humidity, etc
- Weather statistics: real-time monitoring, historic time-series, summary statistics
- Early warning systems
- Monitoring systems
- Provision of data
- Statistical Analyses of data

*Table 2 Description of Climate information and climate services.*

The health and humanitarian community currently utilize the following types of meteorological, hydrological and climate information-products and services, organized by time scale. Table 3 shows four categories of climate information and services are useful to the health sector according to time frame; long range climate data, annual and inter-annual climate forecasts, seasonal and interseasonal forecasts, and short term weather information. The following sections describe in more detail examples of how these are used in the health sector.

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3 Climate products cover a range of information from climate observations and information, such as temperature, precipitation, wind velocity, soil temperatures and other climate information that has been collected and organized.
### Time Scale

<table>
<thead>
<tr>
<th>Time Scale</th>
<th>Example Climate Information Products</th>
<th>Example application areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Range Climate information</td>
<td>Climate change scenarios&lt;br&gt;Dynamic climate models, Global Circulation Models</td>
<td>Long term health infrastructure investments, research, demographic/population models, health systems planning. Increase understanding of disease trends, epidemic behaviour on a regional scale</td>
</tr>
<tr>
<td>(decades)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-term Climate information</td>
<td>Status of El Nino&lt;br&gt;Inter-annual forecasts&lt;br&gt;Dynamic climate models</td>
<td>Mid-term policy decisions for disease control, research</td>
</tr>
<tr>
<td>(annual to multi-year)</td>
<td></td>
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</tr>
<tr>
<td>Short-Term Climate Information</td>
<td>Risk indexes of Cyclones, Floods, Dust Storm, Wind Storms, Extreme Temperature, Fire&lt;br&gt;Temperature/precipitation Outlooks of (6, 3, 1 month) average, maximum and minimum&lt;br&gt;Seasonal trends&lt;br&gt;Tercile forecasts&lt;br&gt;Dynamic and Statistical climate models</td>
<td>Short term operational investment in preparedness, outbreak prevention, resource needs</td>
</tr>
<tr>
<td>(Decadal, Monthly, Seasonal, Annual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather Information</td>
<td>Daily Weather: temperature, precipitation, humidity, etc&lt;br&gt;Weather statistics: real-time monitoring, historic time-series, summary statistics</td>
<td>Short term operational decisions&lt;br&gt;Risk announcements, trigger response plans, staff placement, delivery of supplies</td>
</tr>
<tr>
<td>(Hourly, Daily, Weekly)</td>
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Table 3 Types of climate information relevant for health decision-making

Further description of how these different climate products and services are used by health sector end-users.

1. **Long range climate data (decades in the future)**

   Long range climate data such as global climate models and climate scenarios anticipate how the conditions of the climate will be decades into the future and is critical for climate adaptation in the health sector. These climate products can provide key information for: research, long range policy and planning decisions and investments.

2. **Mid-term climate information (Multi-year and Annual forecasts)**

   Climate information which reflects climate conditions on an annual or multi-year timescale can be useful, such as the status of El Nino as well as inter-annual forecasts can be useful in the following ways:
   - Support for national capacity development is based on risk assessment (and emergency risk profiles) incorporating meteorological, hydrological and climate information.
   - Climate information related to food security (good and poor rains for agriculture, drought)
• Development of WHO response plans as part of UN country teams.
• Development of national/community/health facility response plans for climate-related hazards, including wildfire, flood, storms, landslides, infectious diseases, water shortages, cold weather, heat stress, chemical and radiological hazards and other potential sources of risk, including food security, mass gatherings, population displacement and infrastructure failure.
• Climate information informs policy on climate change adaptation (such as siting and standards of health infrastructure.)
• Climate data informs spatial distribution of health risks and burdens (e.g. climate suitability maps for infectious disease transmission, including epidemics).
• Climate information informs WHO advocacy on disaster risk management and climate change (through country and regional risk assessments, eg E-Atlas)
• Water resource planning, providing regional and local communities the information to protect and allocate water accordingly.
• Nationally and locally, agricultural agencies and farmers can adjust crop timing and even make choices for animal or seed investment based upon climate information and market demands.

3. **Short-term climate information (seasonal and intra-seasonal forecasts/outlooks):**

Climate information for seasonal and intra-seasonal forecasts provides information on climatic conditions in the range of 3-12 months, such as maximum and minimum conditions (rain, wind velocity, etc.), seasonal trends, and intra-seasonal forecasts. *(inter-seasonal outlooks and temperatures, seasonal trends, inter-seasonal rainfall forecasts, monthly and seasonal rainfall forecasts, and risk indices of cyclones, floods, dust storms, wind storms, extreme temperatures, and the fire, status of El Nino conditions.)*

Short-term climate information has a broad range of applications, examples include:

- Adaptation of WHO/national response plans based on seasonal information (such as El Nino/La Nina)
- WHO contributes to health information to the UN Early Warning Early Action Reports which are distributed to Regional and Country Offices.
- Forecasts also required to emergency response and post-disaster recovery concerning the weather conditions to be expected and impact on public health (eg. cold weather relates to clothing and shelter, surface water for vectors carrying disease)
- Seasonal information is required for risk assessment and early warning of diseases with epidemic potential (eg. water-borne diarrhoeal diseases, meningitis, malaria, dengue)
- Pesticide acquisition and timing of application are crucial in reducing vector-borne diseases such as malaria and dengue fever.
- Adequately prepare local health services with human, financial, and material resources according to hazard level which may occur seasonally.

4. **Weather information (days to weeks in the future)**

Weather information on a daily to decadal basis, temperature, precipitation, humidity, can be useful for preparedness and response to climate variability. Weather statistics, real-time monitoring, historic time series, and summary statistics provide information that impacts daily decisions or alerts. Examples of weather information in the health sector include:

- Warning systems for weather events, including storms, floods, heatwaves, extreme cold, and associated health risks, such as infectious disease epidemics
• Operational information on weather conditions for ongoing risk to populations and responders (eg. temperature, rainfall, wind for plume modelling related to smoke, water and air pollutants from chemical spills, radiological emergencies, fires, volcanoes)
• Operational information on the effect of hydrometeorological factors on humanitarian response operations such as logistics, access to affected populations, siting of health facilities, potable water and latrines
• Weather information required for the safety of people attending mass gatherings (eg heat, cold, rain)
• Impact water management by providing resource managers with information prevent water depletion through rationing or change of use policies.
• Short term information alleviates the toll on populations from flooding, hurricanes, tsunamis, and other natural events that may require communication of early warning, evacuation and other forms of disaster preparedness at individual, community, sub-national and national levels.
• Climate services provide law enforcement and public services time to relocate personnel and equipment in strategic areas.
• Firefighters and equipment may be put on standby during certain weather conditions keeping the toll on the population to a minimum.
• The placement of emergency personnel and health responders are dependent upon these short-term warnings and watches.

Useful climate information products currently produced for health decision making include:

Long-term (greater than 6 months):
1a. Maps which describe hydro-meteorological or climate related hazards, in relation to population vulnerabilities, health service capacities and other risks)
2a. Country profiles, which describe climate surfaces for spatial risk mapping, and decadal climate projection maps for climate change vulnerability assessment and adaptation planning.

2.4 Current limitations for the application of climate information

Experience has shown that even when climate information is available, limitations often exist to adequately use this information appropriately and to its full potential. It is important that climate service providers recognize these limitations within the end-user community, and design services and capacity building efforts accordingly.

Current health limitations that are widely recognized include those particularly related to:
• Limited availability, reliability, resolution, and completeness of epidemiological surveillance data
• The dynamic and fast changing context of public health can make climate information obsolete as prevention tool
• Limitations in knowledge about sensitivity of diseases to climatic conditions
• Limited capacity in environmental health and epidemiology
• Local nature and determinants of disease can often not be generalizable and need to be context specific

An important recent example to learn from is the Meningitis Environmental Risk Information Technologies (MERIT) Project, a collaborative effort of the World Health Organization (WHO) and members of the environmental, public health and epidemiological communities to bridge operational needs and researchers. The MERIT experience has shown the public health context (health services, technology, policies) can change over time, at times over short periods of time and marking significant change in the dynamics of a disease. It is therefore important that researchers and providers of climate
services are not only tracking environmental risk conditions, but also kept abreast of strategic developments in social risk conditions, and be prepared to identify and respond to these accordingly.

In the case of MERIT, the initial objectives of the multi-disciplinary initiative were developed in response to an expressed need of the public health community to help improve the existing reactive vaccination strategy. The activities developed under the MERIT framework have focused in large part on the development of statistical and spatio-temporal models designed to increase the understanding of the influence of environmental factors on the seasonal, epidemic nature of the disease. By increasing this knowledge, MERIT aimed to identify and integrate relevant information into the public health decision-support systems to help improve outbreak response strategies and more effectively plan vaccination activities during an epidemic season.

In 2010, with the launch of a new, more effective meningitis conjugate vaccine in Africa however, the epidemiological situation is set to change quite dramatically as it is introduced in countries across the Meningitis Belt over the coming 3-5 years. As a result of the development and introduction of this new vaccine, the meningitis control strategy in Africa is moving towards a longer-term, preventive approach and the nature of the disease and dynamics of epidemics will be significantly altered. While these developments are incredibly promising for susceptible populations in Africa, the MERIT community is looking at how its activities can be adapted in response to the changing epidemiological situation. A strategic review of the MERIT Initiative scheduled held in November 2011 addressed these challenges and explore opportunities for the public health strategy to benefit from existing and future research projects.

### 2.5 Next steps for the application of climate information

In conclusion, a range of decisions made in the health sector regarding short, medium, and long term time scales can be informed by or improved with the application of climate information. The range of end users who make these decisions in the health community are vast, and each have specific requirements that should be identified. In addition, the health sector is an end-user of climate services for OTHER sectors, and many commonalities can and should be identified to link climate services across sectors. Climate-informed health decisions however, are not only limited by the availability of climate information and capacity of climate services. Limitations for the uptake, utility, and use of climate information often originate within the complex health environment and the development of climate services can both assist the health community to overcome these challenges and must recognize the internal constraints and context of public health. The consultation will serve to identify next steps to support the health community make climate informed decisions.
Key existing recommendations for the use of Climate Information
The WCC Working Session on Climate and Health (2009) made in its key recommendations that: "The sharing of data, information and capacity (at local, regional and global scales) is necessary for improving health monitoring and surveillance systems to achieve "the most elementary public health adaptation" as stated in the IPCC Fourth Assessment Report. This is especially critical for the least developed countries, which have the weakest surveillance systems. It is imperative that resources are provided for collecting, managing and applying data to the creation of evidence-based policy and practice related to the development of climate-informed health early warning and adaptation strategies.

The recent meeting of experts in Africa, also made the following relevant suggestions for the improvement of Services and Data (IRI, 2011)

- **Develop tailored services** in partnerships with weather/climate and health organizations. These should recognize that health forecasts, which are different from weather forecasts, should be well designed and understood by all. They should act as early warnings to users of differing types, that assist in the prediction of future health outcomes.

- **Improve existing data**, for example through: the digitization of historical health and climatic data; the increased use of metadata analyses and validation tools; the inclusion of aggregated health data at appropriate spatial and temporal scales; and the enhanced awareness of, and use of, observational and processed data, appropriate satellite, and climate model data sources.

- **Access and use data in a systematic manner** in order to identify vulnerable groups and areas. This needs to involve: employing data strategically within and across sectors; considering trend and seasonality issues; using data to evaluate the success of interventions; and, importantly, understanding how communities cope.

- **Incorporating other data into these health forecast services**, for example population, rural vs. urban residence, migration, nutritional status, environmental and poverty data.

- **Collaboration + new, multi-disciplinary initiatives** that involve communities beyond health and climate/weather; build upon existing initiatives and progress; aim to meet emerging challenges; and communicate with end-users in appropriate ways.

- **Commitment at all levels** that brings climate and health communities together, clarifies responsibilities, builds capacity in the climate and health sectors to achieve these services, facilitates joint initiatives and ensures resources such as data are shared in a suitable way.

**NEXT STEPS:**
The consultation will aim to identify and further discuss:

- useful climate information based upon varying spatial (global, national, community) and temporal scales (long range to short term)
- additional decision makers and potential end-users
- Current levels of satisfaction of different end-users
- current application limitations in climate information:
- limitations and opportunities for improvements
Section 3: Climate Services for Protection of Human Health

What climate services are currently available for the health sector?

Based on current experiences of health sector applications and partnerships with climate service providers - what does the UIP need to accommodate, address, and deliver to meet user-needs?

Climate services are mission-oriented and driven by societal needs to enhance economic vitality, maintain and improve environmental quality, limit and decrease threats to life and property, and strengthen fundamental understanding of the earth. Climate Services produce and deliver authoritative, timely and usable information about climate change, climate variability, trends, and impacts on local, state, regional, tribal, national, and global scales. This section outlines the kind of climate services which are currently available and used by the health sector (3.1); highlights the current gaps in availability and services (3.2); and outlines the current priority needs for the health sector (3.3)

3.1 Climate Services used by the health sector (at global, regional, local levels)

It is important to recognize the health sector is a common consumer of climate services for food security (ie famine early warning and nutritional forecasts) and disaster communities (ie extreme weather alerts).

Currently, there are limited examples of health sector benefits from seasonal forecasts from global producing centres (GPC) and regional Climate Centres (RCC). At national level, capacities for the provision of climate services are varied and it is noted that decadal and longer time predictions are still under process. Today climate services used by the health sector often focus on early warning systems..(For the services being currently provided it has been stressed there is a need to evaluate their effectiveness). Examples include:

- Flood warning and early monitoring systems: have shown great success in countries like China, where the number of deaths from flooding has fallen from an estimated 2 million in the July flooding events of 1959 to 577 over the entire decade from 2000-2009.
- Food security and Famine Early Warning: the prediction of food insecurity or changes in availability of crops, can assist health actors to identify vulnerable populations, and mobilize humanitarian, nutritional and health support to, prevent avoidable death and disease.
- Malaria Early Warning System (MEWS): use a combination of epidemiological, climate, and environmental information to identify epidemic malaria risk zones. MEWS not only help prevent epidemics, but can lower the cost and public health impact of malaria through resource allocation and prevention (Worrell et al, 2008).
- Climate for Development in Africa: provides local climate information informs local health clinics and health ministries of how to best serve the community (vaccines, literature, out-reach to more rural areas).

At a global level, climate services can provide international organizations an idea of where to focus long-term efforts and resources.

3.2 Current Gaps in Availability of Climate Information & Services

Recent advances in science and technology offer the prospect of further improvements in quality of climate information and prediction services. It has been recognized in previous consultations that there
is room for improvement on how seasonal to multi-decadal predictions and long-term climate projections are effectively integrated into decision-making, not only for health, but all socio-economic sectors. There is space to improve two-way dialogues between providers and at-risk sectors on the range, timing, quality and content of climate products and services, to ensure that decisions relating to managing climate risks are well informed, more effective and better targeted. Furthermore, there is need for systematic strengthening of institutional and operational capacities of climate information providers at the national, regional and international levels, to ensure sustainable development and availability of information for risk management and planning.

A public service platform is needed to help end-users focus on relevant time frames for decision-making with an emphasis on days to decades, including seasonal and interannual variability, but also including long-term adaptation to climate change. Connor et al, (2010) point out that given the effects of variations on different timescales, it is clear that information is needed on all levels. They also indicate that climate variability and trends over multiple timescales pose a major challenge to the use of climate change scenarios for near-term climate change (for example, over 10–30 year time horizons). They note longer-term trends may be countered by shorter-term experience both on year-to-year and decadal timescales, and that today, climate change models are only able to capture the overall variability within the trend; and are incapable of indicating when in the future decadal or year-to-year changes and extremes may occur.

Connor et al, (2010) also point out the need for down-scaled regional models, as climate change scenarios and seasonal climate forecasts are modeled at the global–regional scale at best. A variety of tools and approaches exist for the downscaling of global climate products for use at regional and local scales, although limitations should be recognized. They cite several regional climate models (and forecast systems) which have successfully been developed and applied in developing country settings. However, they point to the gap that few developing country institutions have both human and infrastructure capacity to utilize these models routinely in seasonal forecasting or in longer-term climate assessments.

### 3.3 Needs for Climate Information and Services in the Health Sector

The Health community relies on relevant spatial and time-scale data to make informed decisions. A range of needs have been identified in prior works highlighting what should happen, or what is needed to better enable health actors to be able to access and use appropriate, timely, and relevant climate information for the purposes of anticipating health risks, and meeting service demands on a short time scale triggered by climate variability (such as an outbreak, or thermal extremes) and on longer time scales associated with climate change (i.e. sea-level rise and health infrastructure protection).

**Generally identified needs of the health sector include:**

- Training and capacity building of end-users including the health sector and communities to understand and use climate data appropriately
- Improved health surveillance data
- Capacity to better assess, manage and monitor health risks of climate variability and change
- Monitoring and evaluation of the appropriate and effective, and cost-effective use of climate information for health decisions
- Research and forecasting of health impacts associated with CV & CC.
- Development and deployment of Early Warning Systems

**Specifically identified gaps in key areas (Information, Services, Capacity):**
Inventory and Assessment of the climate information, products and services that are currently available to the health sector,

Identification of the gaps between this and what is optimally required for risk management and adaptation;

Use of available information to inform risk management decisions for the siting and construction of health infrastructure and health facility emergency preparedness (e.g. safe hospitals programmes)

Developing and implementing Early Warning Systems (EWS) and Multi-hazard EWS (MHEWS) where needed (along with the required interdisciplinary training);

**Evidence based risk assessment** is the foundation for effective planning and risk management. This requires integrated approach that would link observations, research and modeling climate information with sectoral vulnerability and exposure information to develop relevant risk information to support decision processes. Thus, there is need for not only understanding gaps and needs in the availability of hazard data, metadata, tools and methodologies in hazard mapping and human expertise of the technical agencies (on the provider side), but also systematic assessment of availability of sectoral impact, vulnerability and exposure information, tools and methodologies for risk analysis and capacities of the stakeholders to incorporate this information in the decision making process related to this the health sector.

understanding the spread of vector borne diseases such as malaria as a result of climate variability and change (e.g. change of temperature with altitude);

segmenting the users (recognizing that the health sector is highly diverse and complex, with multiple thematic areas of interest and multiple partners) to understand capacities and needs in various sub-sectors;

**Training** for raising awareness on climate and health and in how to access and most effectively use the available information and products;

**Continued research** to fill current gaps in understanding the role of climate in health outcomes, and in development of operational methods and tools (such as climate-health models) including climate enabled decision support systems;

capacity development for both the providers of climate services and health community users taking into account the different requirements for the various climate risk management strategies. In addition, specific capacity development in the interpretation of the language used in forecasts is critical;

understanding and articulating the economic value of disaster preparedness in the health sector;

involving the health community in the governance aspects of the GFCS;

developing/strengthening partnerships between the climate community and the health sector at all levels (global, regional, national, local).

Priority needs of the DRR Community are modernized NMHSs and observing networks

Inform and strengthened national operational multi-hazard EWS

Strengthen hazard analysis and hydro-meteorological risk assessment capacities to support risk reduction and risk transfer

Strengthened NMHSs cooperation and partnerships with civil protection and other disaster risk management stakeholders

Train management and staff of NMHS on how to collaborate and support health DRR

Enhanced ministerial and public awareness.

It has been previously identified that easy-to-use, understandable guidelines for their field workers (generally very busy people), would be highly useful and beneficial (e.g. for EWS), and the importance of having the relevant climate information and products easily available, and ready to use following these recommended processes. Other gaps and issues identified include:

Better decision support systems

More effective use of indigenous knowledge

Improved reliability and credibility of climate information and products to build trust
- Expanded and enhanced RCOFs and NCOFs
- Awareness programmes on climate variability and climate change (for users) and on users and their requirements (for providers)
- Extension and intermediary services maintained and enhanced through training
- Interpretation of climate information to be understandable to users
- Data analysis and model calibration; interpolation methods
- Use of additional data sources (e.g. remote sensing)
- Packaging of information to suit users
- More active engagement of climate providers in contingency planning that influence development of seed and forage banks, e.g.
- Ensuring the most vulnerable receive all services, including warnings
- Training of the media in climate reporting
- Education of farmers (e.g. farmers schools, etc)
- Obtaining and acting on feedback from users
3.4 Next steps for the formulation of Health oriented Climate Services

In conclusion, there is significant opportunity to improve and expand the climate services available and used by the health sector. Previous dialogues and experts have already helped establish current gaps and priorities that indicate entry points for the GFCS to assist the health community to become climate resilient.

**KEY EXISTING RECOMMENDATIONS ON CLIMATE SERVICES**

The WCC3 recommended that investment be made in a public service platform within WMO member and partner institutions to encourage cross-sectoral interaction including cooperation on the establishment of observing and monitoring networks, the development of decision support tools and systems and the development of ‘one stop’ advisory services for the health sector that will strengthen health surveillance and response systems. This should include:

(a) Reinforcing, revising and changing existing policies and practices in order to ensure that quality assured, appropriate climate, weather and environmental knowledge, information and services are freely available to the operational and research health community and their partners (from local to global). These should be established with a focus on relevant timeframes for decision-making with an emphasis on days to decades, including seasonal and inter-annual variability, but also considering long term adaptation to climate change.

(b) Strengthening, where deficiencies are greatest (e.g. densely populated areas of Africa, Asia and South America and disease prone areas of the Pacific) ground-based climate and health observing systems in support of improving the anticipation and management of a range of health outcomes.

(c) Using knowledge management systems to facilitate the capture and dissemination of climate risk management information to communities of concern.

**NEXT STEPS:**

- The consultation will aim to further identify and specify user needs for UIP to accommodate, address, and deliver the appropriate range of climate services at global, national, and local levels.
Section 4: Climate & Health Partnerships and Services

What kinds of partnerships between the health sector and climate service providers exist? What do these partnerships tell about current and future needs to improve climate services, through the expansion of the GCSF-UIP?

Partnerships are the backbone of climate risk management and climate adaptation for the health sector. Effective climate risk management and adaptation will require discourse, partnership, experience sharing and feedback between the climate and health communities at multiple levels.

These efforts to build effective partnerships between the public health sector and the climate community are in many instances in their infancy, but significant initiatives at the global, regional and national levels already provide reflections and learning upon which to build more active collaborative arrangements. These ongoing partnerships range from national level climate and health working groups, health early warning system (HEWS) programmes and multi-hazard EWS, to training programmes and collaborative research. The development of a climate service UIP for health can learn from current partnerships between climate service and health actors.

This section identifies and describes some examples of current health and climate service partnerships at global, regional, and national levels (4.1). The synergies among existing initiatives (ie global/regional support to National) are highlighted in 4.2. Section 4.3 highlights best practices for climate and health partnerships, providing recommendations for future collaborations.

4.1 **Current Health and Climate Service Partnerships**

Many partnerships have developed over the last decade at global, regional, and national levels. This section is not an inclusive stakeholder mapping, but refers to key examples which exist at different levels.

**Global Level Partnerships**

Global level partnerships, such as that of the WHO and WMO, support member states in protecting them against climate related risks. However, more interagency collaborations, such as between UN agencies and others (e.g. United States Group on Earth Observations), are needed to strengthen and support partnerships on the ground. These agencies bring together a wealth of data and regional collaborations that serve as an interface for climate and health communities. The considerable advances in climate science, the globalization of health surveillance and the challenge of climate change have led leadership at World Meteorological Organization (WMO) and World Health Organization (WHO) to adopt agendas and action plans in recent years to support member states to protect health from climate risks.

The longstanding formal relationship between the WMO and the WHO is based upon a collaborative agreement signed in 1952. However, the operational partnerships between the two UN agencies has never been more critical to guide the communities of practice. Key steps have been recommended from the WCC to review and enhance the interagency collaboration. Effective climate risk management of infectious diseases is a fundamental aspect of climate adaptation, and collaborative mechanisms, investments, and support will be essential to enabling effective partnerships on the ground.

The United States Group on Earth Observations⁴ (US - GEO) is also a global level partnership which proposes that through an integrated, comprehensive, and sustained observation system of the Earth,

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these data can provide remotely sensed information for the health communities. This technical or information based approach to bringing communities of practice together so that the health community and public can easily access timely, comprehensive information to make real-time health decisions.

Regional Level Partnerships and approaches
Regional level partnerships provide much needed support for national and thus community level actors, especially in developing countries, where national capacities are limited to perform a full range of functions, analyses, and climate services. Regional level organizations which serve as an interface for climate and health communities are varied. Regional meteorological services are particularly important and active in Africa, where National Meteorological Services (NMS) often lack capacity to individually serve the full range of functions, analyses, and services required at a national level. Some key examples of these boundary institutions, relevant for the experience in Africa are CLIM-DEV, ACMAD, ICPAC, DMC, and programs such as MALOF, VIGIRISC and AMMA. These Pan-African or regional level institutions and initiatives aim to support the health community in their climate risk management of infectious diseases. Case studies of the Malaria Outlook Forum (MALOF), a regional partnership which informs the Malaria Early Warning Systems (MEWS) in Southern Africa and the Greater Horn of Africa. The Meningitis Environmental Risk Information Technologies (MERIT) initiative convenes global, regional, and local partners to focus on understanding and managing meningitis across the "Meningitis belt" of the Sahel and West Africa.

National level partnerships and approaches
National and local level partnerships in climate and health are essential for climate risk management of natural hazards (such as extreme weather) and infectious diseases. It is at the national and local level where disease control and emergency preparedness decisions are taken, making locally relevant information and capacity the essential key to useful climate services. Many examples and models exist from National Climate and Health Working Groups, such as those supported by WMO in Ethiopia, Kenya, Madagascar, Mali, Mauritania etc). As well as inter-ministerial, inter-departmental government coordination mechanisms, community oriented climate information services (Red Cross Red Crescent).

Public-Private Partnerships (PPP)
Involvement of the private sector should be considered a positive collaborative interface for the health and climate communities of practice. PPPs can be a solution to service delivery and sustainability challenges often faced by public services institutions. A good understanding of the role of private actors, as potential coordinating partners, data and information providers, logistic and research operators should be further explored, as a potentially successful mechanism for climate and health risk management. However, caution was expressed based on experience, and appropriate mechanisms and roles for private sector actors greatly depends on the diseases of concern, and the role of the private sector in the country of implementation.
### Box 1 Public Private Partnerships for Climate and Health

#### Thoughts on Public Private Partnerships for Climate and Health  
**(Technical meeting dialogue 2009)**

**Advantages include:**
- Faster operational implementation capacity with fewer bottlenecks especially over organizational hierarchies.
- Private sector capital may be available and more flexible to explore new technologies and innovations. However, private sector actors require certain financial returns to guarantee sustainability, but allowing different roles to be developed between private and public actors.
- Successful private sector projects/pilots are often trendsetters and provide models that can be further explored or taken to scale by public or non-governmental partners.
- Inclusion of private sector actors can emphasize economic incentives for public health measures which contribute to worker productivity/livelihoods and national economic development.
- Private-public partnerships can contribute the strengths from each entity and collaboratively leverage resources or audiences otherwise not available to each, and fill gaps and strengthen weaknesses each partner may individually have.

**Constraints and disadvantages:**
- Private sector engagement requires government policy oversight, to ensure that public good remains the objective, and no accounts of exploitation or inequity is introduced by private sector or fee-based services.
- Transparency and accountability standards may be different and need to be explicitly agreed upon to meet each partners needs.

**Good practice for PPP**
- Capacity building should be made imperative and explicit goals of such partnerships. A successful example of private-public partnership for malaria and dengue in Colombia includes private institutions being required by law to train communities and produce health bulletins (of their activities).

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Table 4 Examples of Current Health and Climate Service partnerships
4.2 Strengthening Synergies among existing initiatives

Increasingly development is taking place at regional levels (manifested through the development of regional strategies and service providers). This trend should be considered in the development of concrete action plans. These mechanisms would provide a linkage with what happens at national level, where often there are no institutional mechanisms to act on the available climate information. The current drought in the greater horn of Africa could provide important lessons for the improvement of use of climate information. National level linkages between the climate and health communities are weak, requiring strengthened partnerships.

Additional synergies, are those between sectors required for all-hazard management systems, and the utility of climate services for water, agriculture, and disasters for the protection of health, and by health end users.

4.3 Good Practices and Lessons Learned on Partnerships in Climate and Health

In conjunction with WCC-3 in 2009, a technical meeting reviewed current partnerships for climate and health to manage climate risks and infectious disease. Presentation of case studies of different climate and health partnerships stimulated discussion among participants identified good practices of direct relevance to the UIP development. These included firstly, factors which enable building and maintaining partnerships between the public health and meteorological communities of practice. Secondly, good practice to improve the performance and use of climate information in health decision-making.

5 Both of these findings are indicative and useful for the development of a UIP for Health.

4.3.1 Good practices for effective collaboration for climate risk management of infectious diseases

Enabling the factors which build and maintain strong partnerships between the public health and meteorological communities of practice is essential. Dialogue identified the following primary factors and key lessons learned to facilitate collaborations in climate risk management of disease. It is apparent, that no single element is preeminent in making collaborations successful. However, adequate attention to these issues can collectively build stronger relationships and achievement of expected goals. Experience shows that particularly important factors for success include:

- **Critical to the success and smooth functioning of all collaborations were five main factors.**

  1. **Champion individuals** who can innovate and motivate are essential
  2. **Strong institutional frameworks** to guide and define clear aims and roles
  3. **Intention to build trust** and dialogue, plan to find and work out differences
  4. **Catalyzing enabling factors** and incentives needed to make the partnership work
  5. **Strong focus on the public health problem** and outcome maintained

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5 Session dialogue responded to the following questions:

1. **How do current arrangements provide effective support to early warning and disease control, and respond to changing disease control policies and interventions?**
2. **What attributes and kinds of collaborative arrangements have been identified to foster effective and efficient deployment of tools and information for control efforts and delivering effective early warning and response?**
3. **How do these diverse mechanisms manage evaluation, or the translation of science to policy and practice?**
Current collaborative experiences for climate risk management of infectious diseases, highlighted key social and institutional factors which have enabled collaborative relationships and projects to be implemented between the Meteorological and Health Communities. Such collaborative efforts have been noted to be most effective when:

1. **Partnerships are build on Common Principles**: these include health equity, definition of concrete outcomes, and clear vision of actor roles in achieving those outcomes.

2. **Benefits of a cross-sectoral collaboration are identified and articulated**, the sustainability and strength of relationships and joint activities can be particularly enhanced when collaborative work is the identified pathway to each partner achieving actions/solutions to their own objectives.

3. **Engagement is achieved at all levels** – from individual interest and willingness to be at this interface & learn about another sector’s needs and capacities, to an institutional framework which allows the working relationships and exchange of information between those individuals.

4. **Solidarity in knowledge and technology transfer**. This would include North/South and South/South partnerships.

5. **Good communication** processes

6. **Political commitment and mandates** are behind the partnerships *raison d’être*, or are designated within political mandates, such as those for climate adaptation.

7. **Strong incentives for collaboration are in place**, such as legal, economic, technical, professional incentives which catalyse and encourage individuals and partnerships to embark on collaborative work and share information.

8. **Addressing user-needs are designed into collaboration objectives**, effectiveness of joint outcomes is often best when goals to meet explicit timing, quality, and precision of information needs are outlined.

9. **Scale considerations are explicitly addressed** allowing the right scales of data to match intervention decision needs: local, national, regional, global.

10. **Stakeholder equality and partnership roles are effectively managed**. Partnerships that work try to understand what each partner has to gain and lose from the partnership, and recognizes differential needs and incentives to stay engaged and participate.

### 4.3.2 Good Practices to enhance performance and use of climate informed health decision-support tools and systems

Review of experience also highlighted factors and considerations which can increase responsiveness of systems and partnerships to better meet user-needs, supplier capacities; and increase system effectiveness, cost-effectiveness and sustainability of natural hazard and disease early warning systems. The following four categories of factors can improve the use of climate services and tools by the healthcare community.

1. **Focus on Local**: sharpening the scale and focus of data, collaborations and interventions to become obvious solution pathways to local public health problems. Efforts should be broadened from being solely global and regional to include the national and local levels. The execution and development of climate service programmes to date largely remain at global and regional scales. Activities and capacities need to be brought down to the national level to increase scale of data collected and increase capacity of local end-users. Efforts to incorporate the perceived benefits and experience of local actors and provide better avenues for communication and feedback.

2. **Conduct Evaluations** to identify evidence-based guidelines for the use of climate services in healthcare. Operational research is needed on the temporal, spatial and spectral aspects of meteorological data for healthcare purposes, as well as for the quality, level, and detail of healthcare data required for disease modelling. Monitoring of system performance and user-appropriateness is essential for feedback and system adjustment.
3. **Strengthen linkages for Early Warning to Early Action**: Broadening the scope of EWS to include other relevant operational factors and actors will increase system performance and perceived relevance from actors. Increasing engagement of actors which drive public health communications and information dissemination; storage, transport, personnel and other supply chain logistics concerns; planning and execution of interventions can mainstream information use and best identify user-needs.

4. **Identify and address system weaknesses**: Elements of system redundancy and factors which can build or undermine the performance of EWS, especially at national and local levels should be incorporated early to build in robustness to cope with unforeseen events and ensure sustainability.

Specific actions and recommendations for improving performance, through the above issues are detailed below:

1. **Local Level Inputs and Usage**:

   The execution and development of climate service programmes to date largely remain at global and regional scales. Activities and capacities need to be brought down to the national level to increase scale of data collected and increase capacity of local end-users. Activities proposed to accomplish this include:

   1. **Increase spatial resolution**: Most remote readily available remote sensing data is on a global scale, the use of national data sets in augmenting these to improve their spatial resolution is important for better uptake and correlation with local health decision needs.

   2. **Downscale regional level activities** such as Malaria Outlook Forums (MALOFs) which are regional scale activities, that bring together regional climate and health partners. National MALOFs would serve to build a more local community of practice and deal with the challenges being faced at a national and subnational levels.

   3. **Risk awareness leads to Risk Management** By improving dissemination of risk information national level using local media (radio/TV) can strengthen strong partnerships and collaborations between the health and climate communities and local institutions.

   4. **Improve inter-agency communication**. Channels of communication have to be opened formally and informally at national levels to increase support for climate risk management, and encourage local partnership and engagement.

2. **Monitoring and Evaluation**

   - **Overall stocktaking** In order to build on existing collaborations and experience with early warning such as the MEWS, the functioning and effectiveness of these initiatives to deliver expected benefits is needed to guide advancement in the right direction, and orient improved use of meteorological data.

   - **Use external evaluations and steering committees** could serve to play this role by providing objective assessments.

   - **Monitor Effectiveness**: cost-benefit analyses, end-user feedback, and other measures of effectiveness, and seek to have better information on anticipated value for decision makers.
Questions that should be answered include:

- How do these programs provide effective support to early warning and disease control, and respond to changing disease control policies and interventions?
- What attributes and kinds of collaborative arrangements have been identified to foster effective and efficient deployment of tools and information for control efforts and delivering effective early warning and response?
- How do these diverse mechanisms manage evaluation, or the translation of science to policy and practice?

- **Monitor harmonization**: standardization of meta-data, agreement of data sources, processes, and variables can help to improve system effectiveness, transparency, and system functioning.

3. **Strengthen linkages for Early Warning to Early Action**

Actions which strengthen the operational interface of early warning systems and programmatic actors, can increase performance, engagement and commitment to making them work. Two considerations include:

- **Better understand needs of supply chain logistics** needed for early action. Early warning is an important step in providing capacity for action, but only if the right information is provided at the right time. Those needs should be understood, and including supply chain forecasting needs as part of the early warning system to directly inform the planning of interventions.

- **Engage operational partners**, involved in delivering early action and emergency response, including private sector (who may be supplying drugs) and organizations like the IFRC who may need to mobilize local partners and resources.

4. **Sustainability of Services and Systems**

A key factor to improving partnerships between the meteorological and health community is sustainability of interest, commitment, and resources for core activities. Ways to ensure or encourage sustainability include:

- **Secure resources**: The sustainability of resources and programmes is vital to keeping all components of EWS functioning. Continual support for training, communication, monitoring, evaluation activities, and physical investments are critical to system performance and levels partnership engagement.

- **Identify why partners drop out**: critical to dealing with sustainable partnerships is continual commitment to participate in communications or system investments required to make the entire EWS work. Recognizing the different reasons why partners drop out, and finding solutions may help solve continuity issues that can keep the EWS functioning.

- **Manage partner dropout risks**: considerations should be given for how programs should respond to a critical partner dropping out, and can a strategy be put in place for managing that risk.

- **Strengthen the perception that meteorological data is relevant and user-friendly**: The perception of climate information products may be that this type of data is not directly relevant to priority decision needs, nor in the right format or scale for easy utilization. Making the use of data easier and more routine can balance in the relationship between service providers and end-users, that can streamline usage to more routine processes, and thus structure sustainable partnerships.
• *Make the added value of using meteorological data clear.* Demonstrate why proposed actions are important, work, and are beneficial is really important to ensuring continuity and maintenance of systems. From the health sector perspective, competing priorities often hinder engagement and commitment to maintaining background systems, such as EWS.
4.4 Next Steps & Considerations for building Partnerships

The partnerships which will be formed between health and climate service providers are the key to building climate-resilient health community, and building capacity of all actors to make climate informed decisions. Current climate and health partnerships have served as pathfinders to identify best practices and make recommendations for future collaborations at global, regional, and national levels. There are synergies among existing initiatives that can be strengthened and built upon, particularly across other climate-sensitive sectors, such as DRR and agriculture.

**KEY EXISTING RECOMMENDATIONS ON C&H PARTNERSHIPS:**

The WCC3 highlighted that there should be full engagement of the public health community, through the WHO, in the establishment of a Global Framework for Climate Services in order to enable the inclusion of climate information in public health decision making. This should include:

a. Establishing new mechanisms to further strengthen the role of the climate community as a member of the public health community, serving to protect, promote and restore the health status of societies.

b. Establishing strong south-south, south-north networks across health and environment, oceans and climate communities for research and implementation of climate risk management for public health.

c. Support for national and local level efforts to improve partnerships across a broad range of sectoral stakeholders. This should include consolidating the synergy between oceanographic and meteorological/hydrological and other relevant institutions given that the climate challenge is a complex problem arising from the interaction of human activities with atmosphere, ocean and land surface processes.

The recent meeting of experts in Africa, also made the following relevant suggestions for practice in climate and health (IRI, 2011):

- Multilateral partners to consider the significant co-benefits of environment integrity, population health and consequent economic development that can result from mitigation and adaptation policies in the climate and health sectors and to support African countries in gaining access to resources under the various climate-related funds.

- Create a human resource center/virtual hub where expertise is shared in order to develop the capacity of African health and climate communities, institutions, practitioners and negotiators to understand/integrate climate change challenges into policy, socio-economics, planning and programming by identifying institutions and organizations in Africa that can deliver training courses and conduct research on "Climate, Health and Prevention".

- Strengthen community-based organizations by liaising, in a gender-sensitive fashion, with their leaders to develop locally owned sustainable strategies for adaptation to climate change and/or variability in their communities taking account of local knowledge rooted in social history and disseminated by appropriate channels, including the mass media.

- Define the different levels and needs (including learning outcomes) of health practitioners and stakeholders across different geographic scales, specifically researchers and teachers, graduate and undergraduate students, practitioners in the public health system, community opinion leaders, traditional healers, impacted communities and other special interest groups and develop appropriate curricula for adaptation to climate change and/or variability in the health sector.
Section 5: Capacity Needs for the Use Of Climate Services to Protect Health

What kind of skills and institutional capacities are needed for the identification, uptake, and appropriate use climate information in the health sector?

The evolution of climate science, ITCs, attention to climate impacts, and investment in weather and climate services over the last decade has resulted in an increasing volume of climate information potentially useful to the health sector. The overwhelming challenge for Health targeted CS is the ability of health-sector users to understand and appropriately interpret and apply this information. Educating and reaching out to the health sector to address this lacuna should be a paramount priority for the GCSF, and drive the implementation of the UIP. This section highlights currently identified technical and professional capacity needs of health sector user segments (5.1); it also refers to institutional capacity (for access to, feedback, interpretation of CI) (5.2); as well as the associated capacity area of communication and leadership (5.3) recommended capacity development issues for the UIP to address (5.4)

5.1 Improving Technical/Professional Skills

Climate services with specific applications for the health sector are relatively new, and capacity within the range of end-users (Section 1.2) worldwide is limited. Capacity exists predominantly in an academic, and research setting outside least developed and vulnerable countries where capacity is needed most. Thus, even with the availability of appropriate, reliable and timely climate information in a usable format, operational and applied end users in the health sector must have adequate capacity to understand and apply this information.

A range of professional skills are needed by health user segments to access, interpret and use climate information, including the aspects of uncertainty. These include:

- Appreciate and understand the probabilistic nature of climate service information products
- Appreciate the multiple ways in which climate change could adversely affect public health
- Understand the value of applied climate information in public health surveillance
- Understand and broaden the concept of climate risk management to development
- Understand the relevance of ENSO to human activities and welfare
- Understand the basic concepts of the dynamics of transmission of vector-borne diseases and their relationship with climatic factors climatic factors
- Understand the variability in space and time of climate-sensitive disease risk
- Understand how climate impacts public health through increased hazards and vulnerability, resulting in increased risk

The IRI have developed a training curricula based upon experience of health sector end-user capacity needs, which provides an important foundation for expanding and address capacity gaps. This identified desirable competencies set forth a starting point for minimum standards and capacity targets of health professionals using climate information for professional decision-making.

(http://iri.columbia.edu/publications/id=1044)
It is recognized that complementary skills are needed on the climate service provider side to be able to understand the needs and applications of health end-users. Cross-training has proved useful and relevant skill sets should be considered.

### 5.2 Improving Institutional Capacity for access to, feedback, interpretation of CI

There are a number of important capacity issues which could be addressed through the UIP for health. These could include activities which can:

- Facilitate the translation of climate information and to provide analysis that would support decision making.
- Facilitate the uptake and integration of currently available information (such as El Niño outlooks which provide good basis for planning) into decision making processes.
- Focus on developing global capacities to support needs at regional and national levels.
- Use Current ongoing partnerships and programs should be used as a model for capacity development.
- Focus on supporting developing countries to develop their own capacities to effectively use climate information, as well Facilitate the exchange and transmission of capacity development from developed to developing countries.
- Identify and address capacity needs of the climate service-providers to understand the specific information needs of the health sector and be able to meet those needs. Further identify and specify the range of competencies and skills needed by health actors to use climate information.

**Table 5  Competencies needed**

Source: IRI, 2010
5.3 Addressing Uncertainty, Risk Communication, and Leadership Capacity

The issues of uncertainty, risk communication, and leadership are recognized as issues of underlying paramount importance to the execution of climate-informed sectoral decisions. This area should be fully developed and addressed.

5.4 Next Steps for Defining Capacity Priorities for a UIP to Protect Health

**KEY EXISTING RECOMMENDATIONS ON CLIMATE AND HEALTH PARTNERSHIPS.**

The WCC-3 meeting highlighted the need for research and training opportunities, designed to build capacity and provide evidence for policy and practice, which should be developed through effective collaboration across relevant disciplines.

This should include:

a. Building capacity in institutions that support the operational needs of the health community and its partners for the creation and use of climate information in health decision-making. This includes the sharing of quality assured climate and health knowledge, information and data, as well as the development of monitoring and prediction products and services on all timescales. These are needed to inform disease risk mapping (space and time), epidemic and trend prediction, as well as intervention impact assessment and other health related outcomes.

b. Establishing relevant curricula for professional development, training and continuing education and other opportunities (e.g. through distance learning), as well as research capacity building. Such opportunities need to be made available in centers of learning throughout the world (e.g. schools of public health, geography departments, etc).

c. Establishing an independent expert process for setting standards for policy-relevant evidence of health-climate linkages and the socio-economic value of climate information and services.

The recent meeting of experts in Africa, also made the following relevant suggestions for expanded research and education in climate and health (IRI, 2011)

- Understand the relationships between climate and climate-sensitive diseases and health issues under different environmental conditions through interdisciplinary, multi-sectoral and multi-centre research.
- Ensure that climate change mitigation and adaptation strategies are informed by multidisciplinary research.
- Develop capacity within Africa for the generation, interpretation and use of climate, health and other interdisciplinary data enabling informed, evidence-based decision making.
- Standardize and quality control data collection and storage, ensuring data are available on relevant temporal and spatial scales.
- Enhance knowledge transfer and communication of information across disciplines and communities through existing networks, encouraging the introduction of climate and health into the curriculum at all levels of education.
- Strengthen existing partnerships and collaborations while developing new groups and building links across disciplines.
Section 6: Considerations for First Phase Actions of a UIP for Health

Based on current experience, and previous stocktaking exercises, what are the priorities for the health sector to advance in order to make better use of climate services?

This section aims to highlight the next steps for informing the GCSF-UIP for health by describing the GFCS Principles for Implementation (6.1); and highlight priority issues for early focus (6.2); as well as suggest for discussion the factors and criteria which can be used as starting points to shape the proposal of interventions (6.3).

6.1 GFCS Principles of Implementation

To ensure that the Global Framework for Climate Services provides the greatest benefit to those who are most in need of climate services, the HLT recommends that the following eight principles be adhered to in its implementation:

Principle 1: All countries will benefit, but priority shall go to building the capacity of climate-vulnerable developing countries

Principle 2: The primary goal of the Framework will be to ensure greater availability of, access to, and use of climate services for all countries

Principle 3: Framework activities will address three geographic domains; global, regional and national

Principle 4: Operational climate services will be the core element of the Framework

Principle 5: Climate information is primarily an international public good provided by governments, which will have a central role in its management through the Framework

Principle 6: The Framework will promote the free and open exchange of climate-relevant observational data while respecting national and international data policies

Principle 7: The role of the Framework will be to facilitate and strengthen, not to duplicate.

Principle 8: The Framework will be built through user-provider partnerships that include all stakeholder

6.2 Priority Issues for early focus

A public service platform, such as the UIP can serve to encourage cross-sectoral interaction including the cooperation on the establishment of observing networks, the development of decision-support tools and systems, and the development of advisory services for the health sector. Recommendations made in relation to the WCC-3 (Connor et al, 2010) WHO (2011) identified a range of needs of the health community which should be considered a starting point for prioritization. There is an overarching need

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to compile and learn from what has been done, disseminate and institutionalize recognized good practices, and bring forth innovations to flexibly respond to needs.

A UIP for the health sector may be able to facilitate this by:

1. Focus on the needs of vulnerable populations (and actors mandated for support);
2. Protect climate-sensitive investments in research and operations that improve the health outcomes of the most vulnerable;
3. Focus on relevant time frames for decision-making with an emphasis on days to decades, including seasonal and inter-annual variability, but also including long-term adaptation to climate change;
4. Strengthen the ground-based observing systems in support of improving health outcomes – especially for climate services where deficiencies are greatest, such as in Africa;
5. Strengthen health surveillance and response systems in accordance with needs identified in the IPCC Fourth Assessment Report
7. Easy-to-use, understandable guidelines for their field workers (generally very busy people), (e.g. for EWS).

To ensure immediate progress and results, the user interface platform would benefit from building on work being currently done between the meteorological and health community in priority areas such as:

- Heat-health early warning systems;
- Health-sector participation in RCOFs/NCOFs;
- Health-sector-driven outlook forums such as MALOFs;
- Early warning systems for malaria, water borne diseases and meningitis;

Areas of capacity which should be targeted include advances in assessment, research and training opportunities which specifically:

1. Improve assessments of the impact of climate-sensitive interventions;
2. Develop research and professional training in the use of climate information for public health decision-making to be launched in centres of learning (for example, schools of public health training for graduate and non-graduate health professionals) throughout the world;
3. Establish the equivalent of an independent expert process for assessing the evidence of health–climate linkages for policy development and decision-making using the example of the Cochrane and Campbell reviews processes;
4. Integrate weather and climate research to continue to create a seamless prediction system, and creating tools relevant to health decisions;
5. Develop verification and quality assurance of climate products relevant to health outcomes.
6.3 Criteria for pilot projects:

The first phase of the CGSF UIP proposes the implementation of mechanisms, processes, and pilot projects to test models for partnerships, and identify technical criteria, standards, parameters and principles that future work should refine. The consultation will discuss and identify the scope and selection of pilot projects to be part of the implementation plan.

First, it is proposed that these processes, build upon the GFCS principles (aforementioned)
Second, should aim to reflect the following kind of criteria (to be expanded and agreed upon):

- Protect vulnerable populations
- Addresses major gap identified at regional and/or national levels
- Addresses climate sensitive health condition of public health priority
- Engages a range of health, DRR, and meteorological stakeholders in partnership with the aim of protecting health and wellbeing
- Reporting/Monitoring/accountability
- Has a risk communication function
- Has articulated capacity building targets
- Cost-effective

Third, given the extensive range of current collaboration underway, should build upon or consider the inclusion of ongoing work between the meteorological and health community in priority areas such as:

- heat-health early warning systems;
- health-sector participation in RCOFs/NCOFs;
- health-sector-driven outlook forums such as MALOFs;
- Early warning systems for malaria, water borne diseases and meningitis;
- development and use of climate indices relevant to health outcomes;
- air quality, pollens and allergens, ultra-violet radiation and their impacts on human health, especially in cities;
- interdisciplinary training, knowledge building and awareness raising;
- gathering and managing evidence on the impacts of climate variability and change on the various aspects of the health sector, including vector and water borne diseases, for improved surveillance, evaluation, preparation and response activities (impacts assessment, impacts modelling, etc.);
- multi-hazard early warning systems (e.g. Shanghai MHEWS).
- Integrated Climate, Health, and Environment Surveillance Systems

In conclusion, the next steps to be taken in the consultation will aim to further identify priority areas of implementation, pillar issues, processes or mechanisms needed to be developed within the UIP, and define criteria for projects within the next 2 years, and propose 3-4 pilot projects proposed for inclusion in the IP.

Ideally pilot projects can test and explore the necessary structure, mechanisms, and processes for a UIP for the health sector, which can empower the health sector to mainstream climate informed decision making, as a matter of practice in years to come. Pilots should aim to identify and establish a series usable and transferrable UIP "model climate-services" which can establish, data standards, monitoring and evaluation standard, capture and identify precise capacity and user-needs which will inform later phases of the GCSF.
Bibliography:


IRI (2006) A gap analysis for the implementation of the global climate observing system programme in Africa. The International Research Institute for Climate and Society (IRI), in collaboration with Global Climate Observing System (GCOS), United Kingdom’s Department for International Development (DFID), and UN Economic Commission for Africa (ECA).


ANNEX 1

Outline of the Draft Implementation Plan of the Global Framework for Climate Services (GFCS)

Version 25 August 2011

(Version: 19 September 2011)

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Context
The High-Level Taskforce on GFCS estimated that about 70 countries around the world, mostly developing countries, do not currently possess the basic capabilities to provide sustainable access to climate services for users and decision makers. This highlights the critical need for strengthening capacity development efforts to support the operative components of the GFCS (user interface platform; climate services information system; observations and modeling; and research, modeling and prediction), in four areas: human resources, infrastructural, operational and institutional capacity.

Purpose of the sector consultations
Consultations within each of the components of the GFCS are needed to facilitate discussion of key issues related to the production, availability, delivery and application of climate services, in the key sectors, with a view to developing a detailed set of recommendations to be considered in the development of the draft implementation plan for the GFCS. The consultations are targeted at key stakeholders at international, regional and national levels in each of the five components of the GFCS.

Scope and Purpose of Health and DRR Consultation:
- Review the current status of, and critical needs for climate services in the health sector and DRR community at global, regional and national levels;
- Identify decision making processes (including segmentation of the associated user groups), and the climate information required to assist these, in the health sector and DRR community;
- Assess the current status of interactions of the climate service providers with the health sector and DRR community and identify the major areas for improvement;
- Identify capacity development needs to advance the access, interpretation and use of climate information in the health sector and DRR community, including the aspects of uncertainty;
- Identify criteria for selection of high priority projects to address major gaps at regional and national levels in the health sector and DRR community to be considered in the implementation plan of the GFCS.

Expected Consultation Outcome
Identification of concrete projects on health and DRR are to be included in the draft implementation plan, as part of the UIP of the GFCS to advance the use of climate information in decision making in the health sector and DRR decision making across sectors.

Consultation Workshop Organization
The workshop be co-hosted by the leading organizations dealing with health, DRR and climate services, namely IFRC, UN-ISDR, WHO and WMO. Tentative dates of 14 to 16 November 2011

More information:
WMO Concept Note GCSF Consultations http://bit.ly/puWOVN