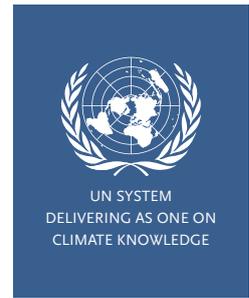# CLIMATE INFORMATION FOR HEALTH

Weather and climate are inextricably linked to some of the most fundamental determinants of health: air, water, food, shelter and disease. Heat and cold waves, tropical cyclones, floods and drought claim many lives each year. Many more people are killed or sickened - at a huge cost to society and the economy - by the indirect effect of extreme weather and climate events and their relationship with non-communicable, infectious, water-borne and vector-borne diseases.

As the global climate changes, people in many areas are at an increasing risk of vector-borne diseases such as malaria, West Nile virus and dengue fever. Scientists are also concerned about a heightened risk of water-borne diseases like cholera and leptospirosis due to warmer temperatures that may change the survival rate of pathogens, coupled with increased rain and flooding which mobilize contaminants.

Excessive heat, particularly through heat waves, contributes to dehydration, aggravates chronic pulmonary and cardiac conditions (especially when coupled with air pollution), and can lead to heat exhaustion, heat stroke and even death. The climate is the major determining factor for the timing and type of air pollen, which is a leading cause of airborne allergy and asthma. Sand and dust storms trigger respiratory and cardiovascular problems and are linked to meningitis in Africa.

Understanding the relationship between climate and health is fundamental to taking protective actions against climate related health risks. One challenge for the health community is the ability to recognize, understand, interpret and apply available climate information. Likewise, the climate services community often does not fully appreciate all public health concerns, and the related environmental issues.

The Global Framework for Climate Services aims to help bridge the gap and to foster the development of tools to effectively provide reliable predictions for time scales ranging from months to seasons, decades and longer time scales that will improve health preparedness and critically extend the lead-time for preventive measures. The public health sector's ability to respond will be based on the generation of accurate and reliable data and capacity building among research and disease control communities.

Climate and Health Working Groups (CHWG) in Africa – notably in Ethiopia and Madagascar _ illustrate the value of engagement between the two sectors. In Ethiopia, health professionals and decision makers are trained to analyze and integrate climate information into decision making. In Madagascar, the Meteorological Service seeks to meet the specific needs of the health sector in terms of climate data, information and services while the health sector gains knowledge on how to make efficient use of this information for epidemic prevention and response. Climate data from the health sentinel sites, seasonal climate predictions (monthly, 3 monthly, 6 monthly), and global trends such as El Niño/La Niña events are used to achieve these objectives.

Installation of manual climate stations at health sentinel sites, Madagascar

DIRECTION GÉNÉRALE DE LA MÉTÉOROLOGIE
DE MADAGASCAR

CLIMATE AND INFECTIOUS DISEASES

In recent years, there has been increasing collaboration between public health decision-makers and weather and climate specialists on epidemic-prone infectious diseases. Multiple sectors, partners and international organizations such as the WHO and WMO are involved. Initiatives on meningitis and leptospirosis are examples of innovative frameworks to support public health preparedness and control strategies for climate/environmentally sensitive diseases of international concern.

The Global Leptospirosis Environmental Action Network (GLEAN)

With an estimated annual incidence of 1,700,000 cases and 123,000 deaths, leptospirosis has emerged as a complex major public health problem. Within the last decade, there has been a worldwide increase in the number of reported outbreaks, specifically linked to severe weather events such as flooding from tropical cyclones. The sensitivity of the disease to certain environmental conditions suggests that climate change may influence the nature of the disease and the size and severity of outbreaks. In order to improve the control strategy of leptospirosis, there needs to be a better understanding of the impact of climate, as well as relationships between humans, animals, and the environment. The WHO and the Health and Climate Foundation therefore developed a new approach to integrate the knowledge about the public health challenges and risk factors through a multi-disciplinary, technical framework. Launched in 2010, GLEAN gets together representatives from international organizations, including WMO, foundations and research institutes. It offers an opportunity to strengthen current public health strategies and mitigate the risk and impact of leptospirosis outbreaks in high risk populations.

Meningitis Environmental Risk Information Technologies 'MERIT' Initiative

With a population of close to 300 million people, the Meningitis Belt region of Africa stretching from Senegal to Ethiopia is subject to severe and often devastating meningitis epidemics. The last major outbreak took place in 2009 when over 88,000 meningitis cases, mainly in Nigeria, occurred within a few weeks.

For more than 50 years, the influence of climatic factors such as relative humidity, dust and aerosol concentrations and population movement on the dynamics of meningitis outbreaks has been well recognized, but the precise factors are still unknown. A better understanding of the climate and environmental determinants of meningitis will help to refine the identification of areas at risk, measure and forecast a modification of the Meningitis Belt and adapt control and preventive measures accordingly.

The MERIT Initiative was established in 2007 to engage experts in the health-climate field, researchers and public health practitioners to help answer these questions. MERIT partners intend to increase the use of climate information in order to reduce the burden of meningitis epidemics in Africa. A large part of the work to date has focused on short-term forecasting of meningitis risk to improve outbreak response. The recent large-scale introduction of the meningitis conjugate A vaccine is expected to dramatically change the epidemiology of meningitis in Africa, and hence, the surveillance and control strategies for the disease. MERIT is therefore considering how best to support the vaccination strategies, set research priorities and translate new knowledge into public health actions.

Mapping the incidence rate of Leptospirosis (left) against frequently flooded areas (right) can help identify hot spots (the darker the color, the higher the incidence rate/flood frequency).

## Vector-borne Diseases – Malaria Early Warning Systems

Malaria is transmitted by mosquitoes which thrive under certain climatic conditions. Warm temperatures and increased rainfall create additional breeding sites for mosquitoes, thus increasing their numbers. In 2010 there were an estimated 216 million cases of malaria and 655,000 deaths, the vast majority in Africa.

Malaria mitigation strategies require a combination of preventive and curative treatment and close collaboration between the health and climate sectors. Countries increasingly incorporate early detection into their malaria control efforts. This entails careful monitoring of climate conditions favouring a pending outbreak. Timely provision of climate information with several months lead-time can be combined with a well-targeted response strategy that provides advance distribution of medication, insecticides and bed nets to vulnerable communities.

The Malaria Early Warning System (MEWS) combines seasonal rainfall forecast with vulnerability assessments and population and health surveillance information. Examination of climatic variables which influence the proliferation of mosquitoes facilitates the prediction of potential outbreaks. The technique gives health programme officers up to four months of advance notice.

Malaria Outlook Forums have taken place in conjunction with Regional Climate Outlook Forums, which provide consensus based climate predictions and information to user communities.

Estimated precipitation [mm]

MALARIA MAP | IRI/MEWS
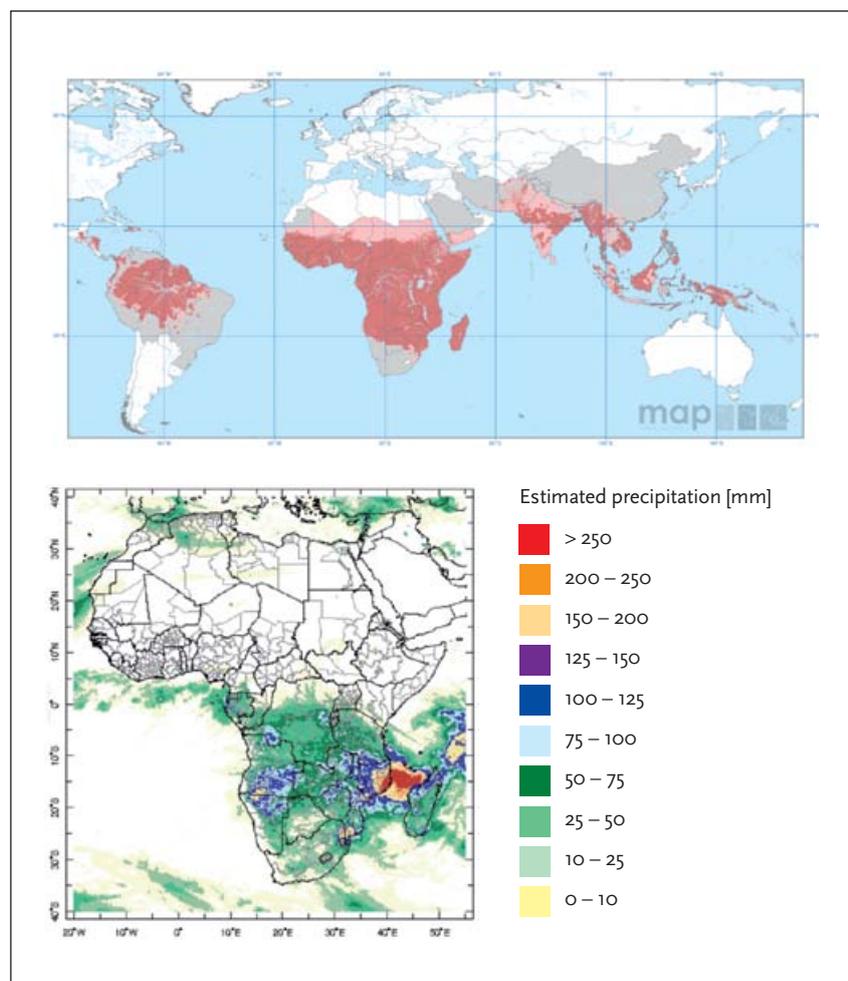
Combinations of knowledge on Malaria causing mosquito occurrence (top – the darker the color, the higher the mosquito occurence) and climatic condition (bottom) is needed to determine Malaria outbreaks.

Climate and Non-communicable Diseases

An increasing number of forecasts related to health are being provided for decision makers and the public. These include air quality, heat health, Ultraviolet (UV) Index and pollen forecasts.
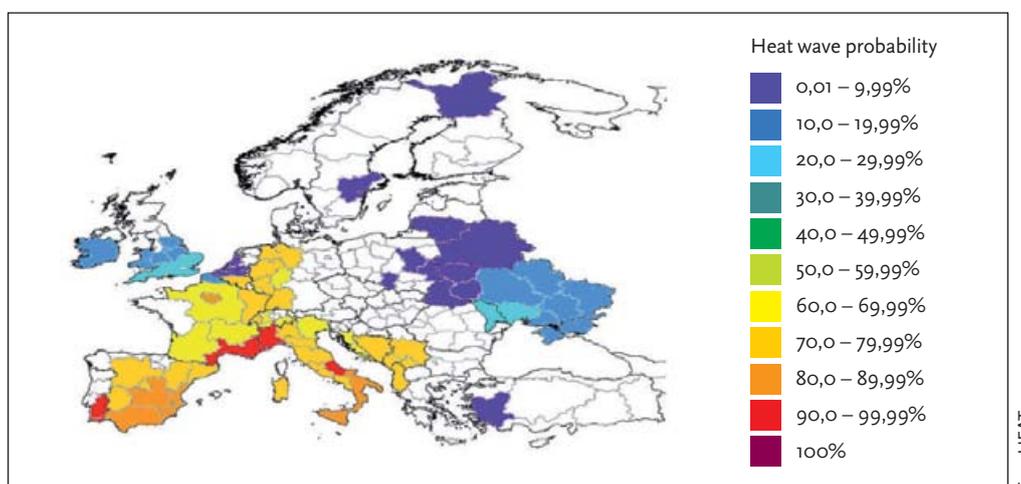
The sun's rays are important for our psyche and for the formation of vitamin D but, in excess, cause skin cancer and cataracts. WMO, WHO and other partners developed the harmonized UV Index, provided routinely by many National Meteorological and Hydrological Services to help people avoid the sun at peak times.

Climate is the major determining factor for the time and type of air pollen. During the last 30 years, the prevalence of airborne allergy and asthma in Europe has increased four-fold reaching an estimated 15%-40% of population. According to WHO, some 235 million people worldwide currently suffer from asthma, the total cost of which runs into billions of dollars. Pollen forecasts are increasingly in demand to help people plan their daily routine and prepare their medication. Provision of centralized pollen information at international level would reap considerable socio-economic and health benefits.

Excessive heat can exacerbate chronic pulmonary and cardiac conditions, particularly among the elderly, the ailing and the very young. The heat wave in Europe in summer 2003 caused 70 000 extra deaths, of these about 20– 38 % were due to air pollution. The high mortality rate led to the EuroHEAT project which quantified the health effects of heat in European cities, identified options for improving health systems' preparedness for and response to the effects of heat-waves, and prompted the introduction of Heat Health early warning systems throughout much of Europe. Based on medium range forecasting of 3-15 days and coupled with the comparison of the baseline climate of 1960-1990, warnings are issued on a national or regional basis.

The Intergovernmental Panel on Climate Change says it is virtually certain that there will be an increase in the frequency of warm daily temperature extremes and that those heat waves will increase in length, frequency, and/or intensity in the 21st century.

Climate services will therefore be necessary to help decision makers and public health authorities prepare for the changing pattern of extremes.

Heat wave probability

- 0,01 – 9,99%
- 10,0 – 19,99%
- 20,0 – 29,99%
- 30,0 – 39,99%
- 40,0 – 49,99%
- 50,0 – 59,99%
- 60,0 – 69,99%
- 70,0 – 79,99%
- 80,0 – 89,99%
- 90,0 – 99,99%
- 100%

EuroHEAT

Example of risk maps for heat waves based on medium range forecasting.