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Wengen-2005 Workshop on Global Change Research
10th Anniversary Meeting
Climate, Climatic Change and its Impacts on Human Health

Wengen, Switzerland, September 12-14, 2005

Jointly organized by:
The University of Fribourg, Switzerland
The Graduate School for International Studies, Geneva, Switzerland
NOAA-OAR, Climate Diagnostics Center, Boulder, Colorado, United States
The University of Acre, Brazil
The International Research Institute for Climate Prediction, Columbia University, New York, United States
The World Health Organization, Rome, Italy
The EU-ENSEMBLES Project coordinated by the Hadley Centre, Exeter, United Kingdom

SYNTHESIS REPORT

Rationale for the meeting

Over coming decades, humankind is likely to be subjected to the impacts of rapid environmental change that is attributable at least in part to human activities. While the balance between humans and their resource-base has always been delicate, the accelerated changes resulting from industrialization and significant global population increase over the last century has resulted in visible impacts on the global environment and the resource base that determine the basic conditions for human health, in particular food and water availability and quality. There are numerous side-effects of environmental change that can impact upon health and well-being, including hygrothermal stress and enhanced levels of air pollution, the modification of natural ecosystems that may have repercussions on agricultural production and hydrology. These changes may in turn affect the geographical distribution and celerity of propagation of vector-borne diseases, as well as the equilibrium between a number of other infectious and non-infectious diseases. In addition, if climatic change were to be accompanied by an increase in the intensity and frequency of heat waves, cyclones, floods, or drought, these would compound the effects on human health. Moreover, such catastrophes can generate large refugee and population movements, with a need for resettlement in what are often already densely populated areas, thereby exacerbating health-related problems in many parts of the world's larger cities.

The impacts of climatic change on human health are complex to ascertain, because populations have different vulnerabilities to climate and susceptibility to disease. However, there are likely to be two distinct types of impacts, those related to the physiological effects of heat and cold, and indirect effects such as the spread of vector-borne pathogens into areas where disease currently does not exist or was eradicated in the past, in and out-migration of allergenic pollen, and enhanced air pollution in large cities.

Human health impacts in coming decades will respond to numerous factors, in particular existing infrastructure, financial resources, technology, access to adequate health care facilities and equity across different countries and regions; in this context, climatic change will be one among many exacerbating factors. It is thus necessary to place the environment-related health hazards in a socio-economic context, such as age, hygiene practices, access to adequate medical facilities and agricultural traditions.

In view of the above issues, an interdisciplinary Workshop was held in Wengen, Switzerland, from September 12-14, 2005. The first day of the meeting was organized by the IRI and WHO in the context of the EU-ENSEMBLES Project and focused specifically on issues related to seasonal climate forecasts and how these could favorably influence advance planning for health-related impacts. The second and final days of the meeting dealt with a range of topics, from the climate impacts on plants and changes in allergy responses in humans, the impacts of extreme climates and in particular heat waves, shifts in water-borne and vector-borne diseases in a changing climate, and policy response to these issues.

The oral and poster program is appended to this report in order to remind the reader of the contributions made during the three-day Wengen-2005 Workshop.

Session-by-session report

1. Seasonal climate forecasting for health (ENSEMBLES/IRI/WHO Session)

Climate impacts on health directly through extreme events (e.g. heatwaves) and indirectly through its role in moderating the transmission dynamics of many infectious diseases, especially those transmitted via insect vectors or water(1). Using climate information in Health Early Warning Systems (HEWS) is widely accepted as an essential component of managing climate-related health risks. In recent years the technological capacities of early warning systems have steadily improved. This has resulted in part from greater scientific understanding of weather, climate and other geophysical processes; improved satellite based observation systems, greatly enhanced computer-based prediction and communications; and in part from a better understanding of disease–climate relationships. In particular our capacity to predict the climate of the season ahead based on phenomena such as El Nino/La Nina has improved dramatically in recent years and for some regions offers the promise of improved risk management through even earlier warnings of changes in epidemic risk based on seasonal climate forecasts.

At the Ministerial Conference on Epidemic Prevention and Control in the Great Lakes Region, Kampala, June 2003, at the Budapest Ministerial Conference for Environment and Health, in 2004; and at the World Conference on Disaster Reduction, in Kobe in 2005, the international community requested an early warning programme with specific priorities to assist countries in building early warning systems that would truly reach and serve those at risk. Collaborative efforts between the health community and the climate research community through for example, the European Union funded ENSEMBLES (http://www.ensembles-eu.org/) and AMMA projects (http://amma.mediasfrance.org/index) have provided a major impetus to developing the scientific basis for integrated seasonal climate based health early warning systems.

In September 2005 the European Office of the World Health Organization (http://www.euro.who.int/globalchange/20030929_1), the International Research Institute for Climate & Society (http://iri.columbia.edu) and the ENSEMBLES project organized an international workshop in Wengen, Switzerland, supported by the University of Fribourg, to review the "state of the art" of seasonal climate forecasting and health. The workshop focussed on the fledgling experimental and operational use of seasonal forecasts in health early warning systems (both for infectious disease and for extreme weather events) and discussed scientific, policy and practical opportunities and obstacles presented by this new technology. This report summarizes the workshop findings.

At the Wengen-2005 Workshop, The overall discussion centered on four main questions:

1. Can these types of early warning information be used in a tool for decision making?
2. What conditions have to be satisfied for them to be useful?
3. How sensitive specific should the information be? What are the consequences of delay, or getting it wrong, or of a non-event action?
4. What actions are needed to further promote early warning initiatives?

Early warning varies in its accuracy, predictability and usefulness. When an early warning system is developed three stages need to be made clear, and these are the Proof of Concept, information (product development) and value (utility). For example the time scale needs to make sense to be useful as early warning tool by decision makers; the forecasts need to contain relevant information for relevant *empirical* targets, like the health workers; risk management scenarios need to be played through beforehand and the costs of the system need to be contained but also the costs of acting too late or of inaccurate predictions need to be considered. Early warning is only effective if it triggers a response. However there are not always effective response mechanisms for all diseases, or situations. The value of soliciting an early response will be if the effect of this early response sufficiently out ways the potential problems of false alarms.

In terms of the oral presentations, it was seen that a number of actions are further needed assuming that in some areas in certain moments and for certain diseases, early warning can be very useful. This regards overall information of the tools and how and where they work targeted to the health and decision makers community; end-users training and inclusion of the end users health workers in the overall development of the warning, and last but not least a better understanding on some of the underlying processes.

Some seasons are unusually hot or cold or unusually wet or dry. Such seasonal anomalies in the climate may have significant implications for seasonal variations in climate sensitive diseases including the occurrence of epidemics(1) and in the occurrence of extreme climate events (e.g. hurricanes or heatwaves). We now know that these seasonal climate anomalies result from complex interactions between the atmosphere and the underlying surfaces: that is, the world oceans and land surfaces. The atmosphere is particularly sensitive to tropical sea surface temperature (SST) anomalies such as those that occur in association with the El Niño/Southern Oscillation (ENSO). From the early discovery that seasonal climate could be modeled from sea surface tembperature(2) our capacity to predict rainfall and temperature anomalies through seasonal climate forecasts has improved substantially, largely in response to increased understanding of the El Niño/Southern Oscillation (ENSO) phenomenon and improvements in the way we deal with model uncertainty. Routine, scientifically based, skillful, seasonal climate forecasts are now possible for some parts of the world, for some seasons (3).

In contemporary state-of-the-art seasonal climate predictions, computer models of the atmosphere are generally run in groups, or ensembles, of 10 or more for a given sea surface temperature forecast. An ensemble climate forecast system predicts not only the most likely evolution of climate, but also the uncertainty in such a prediction. For each member of the ensemble, the model is run with slightly different "initial" conditions. The differences among the ensemble members give forecasters some measure of the likelihood that a particular seasonal climate state will be above, near, or below normal. Seasonal temperature and precipitation forecasts are couched in terms of shifts in these equal probabilities to favor one or two of the categories. It is apparent that these generalised forecasts of rainfall and temperature based on terciles are difficult and sometimes impossible to use within the context of specific health early warning systems and that forecasts tailored to specific disease control problems are required. Recent advances in tailored forecast for Rift Valley Fever (Normalized Difference Vegetation Index: NDVI), malaria (rainfall) and meningococcal meningitis (dust) where presented and the current status of early warning system developments in malaria, rift valley fever and cholera where discussed While the latter is clearly a climate sensitive disease(1) and epidemics have been associated with large scale climate and hydrological processes, as for many other climate-sensitive diseases there is an important interplay between the role of extrinsic and intrinsic factors in determining epidemic outbreaks. The fledgling operational use of seasonal forecasting in Africa for both the health (malaria in Botswana) and veterinary sector (rift valley fever in Senegal(4)) where presented and the importance of using seasonal climate forecasts in an integrated early warning system involving vulnerability assessment, environmental/climate monitoring (based on satellite and meteorological station data) and routine surveillance was stressed as was the critical aspect of developing early warning systems around response capability(5). Such forecast systems require statistical or biological models which capture the impact of climate variables on disease transmission.

The important contribution of the climate research community towards developing health related products was discussed with examples from the European Union funded ENSEMBLES (http://www.ensembles-eu.org/) and AMMA projects (http://amma.mediasfrance.org/index) which both have significant health user group communities. In particular the importance of engagement with the health community throughout the entire process of forecast development, tailoring and testing was emphasized. It was noted that very little research has been done so far on predicting extreme events on the seasonal timescale. For example, neither a precise definition of extreme events on the seasonal timescale has been established yet, nor a general consensus has been found on what type of extreme events our attention should be focused on. Another important obstacle for scientific work in this area is the limited availability of long enough data and forecast records for seasonal forecasts. Despite these limitations there is some evidence that skill could be identified in certain regions for certain events. For example in most years, South Indian Ocean tropical cyclones do not make landfall in Mozambique. The main reason is that the tropical cyclone tracks in the South Indian Ocean (SIO) usually have a southward re-curvature before reaching the African coast. However, in 2000, two tropical cyclones made landfall in Mozambique with hurricane intensity. In a recent paper(6) it was shown that the main reason for the landfalls in 2000 was the associated characteristics of SIO, ENSO and local sea surface temperatures indicating the potential predictability of cyclones in the region. Skill of climate predictability in the extra-tropics is known to be more limited than that found in the tropics. Results from a study on winter mortality in the UK indicted the importance seasonal climate descriptors such as such as minimum temperatures and duration of cold spells as determining factors. However the potential value of seasonal climate forecasts for the health sector is constrained by limitations in the predictability of the climate in the northern hemisphere.

One important area of the workshop discussion was the potential role that health early warning systems may play in adaptation strategies to climate change. This was highlighted in a presentation of a new project in Colombia (part funded through the World Bank by the Global Environmental Facility on Adaptation to Climate Change). The project aims to strengthen the national disease surveillance system by incorporating seasonal climate forecasting, climate monitoring, disease modeling and surveillance into a system which guides control services in more proactive interventions against these diseases.

Finally the potential economic benefits of seasonal climate forecasting to the health sector were discussed along with statistical issues surrounding the their probabilistic nature and the methods in which this information is captured, interpreted and conveyed to decision makers.

2. Pollen, allergies, and climate

This short session addressed issues of shifting plant distributions in a warming climate and the potential impacts of in- and out-migration of allergenic species on human health response, e.g., pollinosis and asthma. It was shown on the basis of French and Swiss studies that there has been a systematic shift towards earlier blooming of plant and tree species and changes in the timing of release of pollen into the atmosphere. In addition, invasive species such as the very aggressive *Ambrosia* (ragweed), whose spread into hitherto *Ambrosia*-free zones is related not only to climatic change but also to land-use changes, has substantially increased the number of pollen-related allergies.This is particularly the case in Switzerland, where *Ambrosia* has spread into the western part of the country from France and into the southern part from Italy, with signs of a rise in plant numbers at increasingly-higher altitudes.

As a means of understanding and ultimately forecasting the mechanisms by which pollen is transported and dispersed in the atmosphere, preliminary results from numerical simulations of the diurnal cycle of ragweed release, transport/dispersion, and deposition were presented. This innovative approach to pollen studies, using a regional climate model within which a pollen dispersion module is embedded, can help in developing early-warning systems for public health authorities, and for quantifying the potential changes in the seasonality and amount of pollen in the atmosphere under various scenarii of climatic change.

3. Extreme events and health

The session on extreme climatic events and health examined the relationship between human responses to the occurrence of extreme climatic episodes, such as the 2003 summer heat wave in Europe that resulted in 30,000 excess deaths in Europe, and both the human and institutional responses to such relatively uncommon events. For example, it appears that humans respond different absolute climatic thresholds depending on their geographical situation, but that appropriate responses by emergency management entities can significantly modify the impacts of such extremes.

A broader context for the meeting was to explore the connections between climate science and health early warning systems on the one hand, and emergency preparedness entities and the general public on the other. It was noted that crises arising from major disasters are much more effective at enabling effective mitigation actions, by providing “learnful moments” that focus the attention of public institutions. Two case studies related to the 2003 summer heat wave in Europe provided a useful context to illustrate the above statement about mitigation and response to climatic extremes. The 2003 heat wave was blamed for the occurrence of over 20,000 excess deaths in France alone. It was noted that the same mistake was not likely to be repeated, when the next major heat wave affects the region. On the other hand, in Spain, the response, which at first appeared to be one of denial of the fact that spikes in mortality were being record in various parts of the counrty, may only have changed to the extent of reporting the impacts of future climatic extremes as they unfold, but not necessarily to undertake mitigative actions proactively in order to reduce such impacts.

Health risks associated with increased surface ozone and their climatic associations through wind regimes and location of pollution sources were also discussed.

4. Water- and vector-borne diseases

Despite significant uncertainties related to climate change, projections suggest important consequences for the evolution of infectious diseases that already have considerable impacts on morbidity, mortality, and general health status. When potential changes in climate are combined with evolution of other human activities such as migration, changing production strategies, infrastructure developments, there is even higher probability that the geographic distribution of disease and the number of people at risk for infection could increase.

A presentation on the "Potential Impact of Climate Change and Water Resource Development on the Transmission of *Schistomsoma japonicum* in China" and the discussion of "Land Use/Cover Changes and Rising Malaria Cases: The Case of South-western Amazonia" were stark illustrations of such possibilities. In China, models show that temperatures are rising and that the critical threshold for development of host and parasites for schistosomiasis may also be increasing, thus exposing millions of new people to the disease. In addition, the second largest water infrastructure project (after the Three Gorges Dam), intended to deliver water to northern provinces of China, will provide new pathways for the spread of the disease. Similar mechanisms appear to be affecting the spread of malaria in the southwestern Amazon, where, in addition to climate change, road construction is leading to important ecological changes in land cover, favoring the development of malaria-transmitting mosquitoes, which can effect a human population that is growing as it moves into the region, following the path of the roads.

5. Policy and adaptation

Response to these kinds of processes requires both information and public policy response. One paper addressed the first issues with his discussion of "A French Initiative on Remote Sensing and Public Health". The endeavor will use satellites to provide real-time data on epidemiological, social, biophysical, hydrological, and climate data. These are intended to become the foundations for health early warning and information systems. Information-gathering and response strategies incur substantial costs, however.

The general problem of cost and willingness to pay was analyzed in Canada for the specific problem of "Water Quality and Climate Change: What are Consumers Willing to Pay? The paper presented methodologies aimed at evaluating the additional costs individuals are willing to assume in order to reduce collective risks of microbial infections or cancer from their water supplies. An Internet survey was conducted in Canada to provide some concrete figures on the values people attached to improvements in the safety of their drinking water. This single example raised the important question of cost and benefits that must be posed about the development of warning systems and health infrastructure developments but that cannot be divorced from other social factors such as changing livelihoods, economic status, population movements and concentrations. The session highlighted the tight connections between health, climate, and society and underscored the need for interdisciplinary and integrative approaches.

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APPENDIX 1: ORAL PROGRAM

	Monday, September 12, 2005, Morning	
	07:30-09:00	**Registration**
	09:00-09:30	**Opening Remarks, Objectives of the Workshop** Martin Beniston and Henry F. Diaz WENGEN-2005 Bettina Menne and Madeleine Thomson for PART A: WHO/ENSEMBLES/IRI
		PART A, SESSION 1: Seasonal Climate Forecasting and Infectious Disease
		Chairperson: ***Madeleine Thomson, IRI, New York, United States***
A1.1	**09:30-10:00**	**The global climate system and seasonal forecasting: focus on health** Simon Mason *IRI, Columbia University, New York, United States*
A1.2	**10:00-10:30**	**Seasonal and interannual dynamics in the generation of cholera epidemics in India and Bangladesh: prospects for future predictability** Xavier Rodo *ICREA, University of Barcelona, Spain*
A1.3	**11:00-11:30**	**Seasonal climate forecasting for transboundary zoonotic diseases –focus on RVF** Vincent Martin *EMPRESS Project, FAO, Rome, Italy*
A1.4	**11:30-12:00**	**Integration of seasonal climate forecasts into a malaria early warning system framework** Stephen Connor *IRI, Columbia University, New York, United States*

	Monday, September 12, 2005, Afternoon	
		PART A, SESSION 2: Seasonal Climate Forecasting and Extreme events, Floods, Droughts, Heat-waves and Cyclones
		Chairperson: ***Andy Morse, University of Liverpool, United Kingdom***
	13:45-14:00	**Introductory remarks to the session and a brief overview of the EU-ENSEMBLES project** Andy Morse *University of Liverpool, United Kingdom*
A2.1	**14:00-14:30**	**Seasonal climate/weather forecasting and extreme events** Renate Hagedorn *ECMWF, Reading, United Kingdom*
A2.2	**14:30-15:00**	**The potential utility of seasonal climate forecasting for predicting health events in Europe** Glenn McGregor *University of Birmingham, United Kingdom*
A2.3	**15:00-15:30**	**Seasonal climate forecasts for disaster risk reduction** Maxx Dilley *UNDP, Geneva, Switzerland*
A2.4	**15:30-16:00**	**The potential economic benefit of seasonal climate forecasting to the health sector** Lennie Smith *London School of Economics, London, United Kingdom*
	16:30-17:45	**Panel Session** Chair: Bettina Menne, WHO, Rome, Italy.

Tuesday, September 13, 2005: Morning

		PART B, SESSION 1: Pollen, Allergies and Climate
		Chairperson: ***Martin Beniston, University of Fribourg, Switzerland***
1.1	**09:00-09:30**	**Effects of climate change on tree pollen in France and Switzerland from 1982/1987 to 2004** Michel Thibaudon et al. *RNSA (French Pollen Monitoring Network), Lyon, France*
1.2	**09:30-10:00**	**Effects of climate change on grass and herbaceous pollen in France and Switzerland from 1982/1987 to 2004** Regula Gehrig et al. ***MeteoSwiss, Zurich, Switzerland***
1.3	**10:00-10:30**	**High resolution numerical simulation of a ragweed pollen cloud** Joelle Goyette-Pernot *University of Fribourg, Switzerland*
1.4	**11:00-11:30**	**Impacts of climate change on aeroallergens and asthma: an early health effect?** Paul J. Beggs *Macquarie University, Sydney, Australia*

Tuesday, September 13, 2005: Afternoon

		PART B, SESSION 2: Extreme Events and Health
		Chairperson: ***Henry F. Diaz, NOAA, Boulder, Colorado, United States***
2.1	**14:00:14:30**	**Extreme weather and climate events: What are they and where do they come from?** David B. Stephenson et al. *University of Reading, United Kingdom*
2.2	**14:30-15:00**	**Independent and joint impacts of heat and ozone on mortality risk under a changing climate** Kim Knowlton and Patrick L. Kineey *Columbia University, New York, United States*
2.3	**15:00-15:30**	**The early August 2003 heatwave in Southwestern Europe** Ricardo Garcia-Herrera *Universidad Complutense, Madrid, Spain*
2.4	**16:00-16:30**	**Thermal comfort of humans and climate change** Andreas Matzarakis *University of Freiburg, Germany*
2.5	**16:30-17:00**	**Climate-pollution impacts on Sudden Infant Death (SIDS): using Singular Spectrum Analysis (SSA)**

		Irene Lena Hudson *University of Canterbury, Christchurch, New Zealand*

Wednesday, September 14, 2005, Morning

		PART B, SESSION 3: Water and Vector Borne Diseases
		Chairperson: ***Ellen Wiegandt, University of Geneva, Switzerland***
3.1	**09:00-09:30**	**Global Changes Impacts on Human Health: The Bolivian case** Eduardo R. Palenque *University of San Andres, La Paz, Bolivia*
3.2	**09:30-10:00**	**Potential impact of climate change and water resource development on the transmission of *Schistosoma japonicum* in China** Guojing Yang *Swiss Tropical Institute, Basel, Switzerland*
3.3	**10:00-10:30**	**Land use/cover changes and rising malaria cases: the case of South-western Amazonia** Manuel Cesario and Raquel R. Cesario *University of Acre, Brazil*
3.4	**11:00-11:30**	**Climatic Influences on West Nile Epidemics in South Africa: A 50-Year Retrospective Study** Andrew Comrie *University of Arizona, Tucson, Arizona, United States*

Wednesday, September 14, 2005: Afternoon

		PART B, SESSION 4 Policy and Adaptation
		Chairperson: ***Manuel Cesario, University of Acre, Brazil***
4.1	**14:00-14:30**	**Some Lessons Learned on Adaptation to Climate Change** Kristie L. Ebi *Alexandria, Virginia, United States*
4.2	**14:30-15:00**	**Water Quality and Climate Change: What Are Consumers Willing to Pay to Reduce Health Risks?** Diane P. Dupont et al. *Brock University, St. Catharines, Ontario, Canada*
4.3	**15:00-15:30**	**The Socio-Economic Benefits of Climatological Services to the Health Sector** Ana Rosa Moreno *The United States-Mexico Foundation for Science, Mexico City, Mexico*
4.4	**16:00-16:30**	**A French Initiative on Remote Sensing and Public Health** Yves Tourre *Centre National d'Etudes Spatiales (CNES), Toulouse, France*
4.5	**16:30-17:00**	**Climatic extremes and health: implications for policy in low-income settings** Roger Few *University of East Anglia, Norwich, United Kingdom*
4.6	**17:0 0-17: 30**	**Outreach from the IAI Collaborative Research Network on Climate**

		Variability and Human Health Impacts in the Tropical Americas Joan L. Aron *Science Communication Studies, Columbia, Maryland, United States*
	17:30-17:45	**Closing remarks and end of the Wengen-2005 Workshop** Manuel Cesario and Ellen Wiegandt

APPENDIX 2: POSTER PROGRAM

	1: Pollen, Allergies and Climate
P1.1	**Regional Climate Simulation of Ragweed Pollen : Coupling continental to urban scale sources** Yan Coulombe et al. *Univeristy of Quebec at Montreal, Canada*
P1.2	**Local and remote airborne pollen sources: ragweed in Geneva** Bernard Clot MeteoSwiss, Payerne, Switzerland
P1.3	**The impact of recent climate change on allergic rhinitis in Montréal, Quebec, Canada. A case study from 1994 to 2004** Michelle Garneau *University of Quebec at Montreal, Canada*
P1.4	**Impacts of outdoor aeroallergens on asthma in Montreal, Canada** Michelle Garneau, Léa Héguy et al. *Ouranos Consortium, Montreal, Canada*
	2: Extreme Events and Human Health
P2.1	**Seasonal variation in hospital admissions for acute myocardial infarction (ami) in Melbourne, 1993 – 2003** Margaret Loughnan *Monash University, Clayton, Victoria, Australia*
P2.2	**The influence of meteorological variables and air pollution on bronchial asthma in Athens, Greece** P. T. Nastos *University of Athens, Greece*
P2.3	**Heat Wave 2003, Ozone Smog and Impacts on Health** Marut Doctor *Institut Universitaire Kurt Boesch, Sion, Switzerland*
P2.4	**Weather, Air Pollution and Human Mortality in Adelaide, a temperate city of Australia** Peng Bi *University of Adelaide, Australia*
P2.5	**Evolution of extremes in the Météo-France GCM scenarios** Fabrice Chauvin *MétéoFrance, Toulouse, France*
P2.6	**Impact of the 2003 Heatwave on mortality in Switzerland** Leticia Grize *University of Basel, Switzerland*

P2.7	**Human contribution to the European heatwave of 2003** Daithi Stone University of Oxford, United Kingdom
P2.8	**Forest and Peat Fires in Indonesia: Influence of Climatic Factors on Fire Emissions, Smoke Dispersion, Air Quality, and Human Health** Angelika Heil *Max-Planck-Institute for Meteorology, Hamburg, Germany*
P2.9	**Climate and human health - experiences from Sweden and natural hazards in future** Gunn Persson *Swedish Meteorological and Hydrological Institute, Norrköping, Sweden*
P2.10	**Trends of thermal sensation in different climatic regions in Croatia** Ksenija Zaninovic *Meteorological and Hydrological Service of Croatia, Zagreb, Croatia*
	3: Water and Vector Borne Diseases
P3.1	**The Importance of Climate for Dengue/DHF in Indonesia** Paula Arcari *Monash University, Melbourne, Australia*
P3.2	**Associations of Climate with Dengue in the Caribbean** Dhamaratne Amarakoon *University of the West Indies, Kingston, Jamaica*
P3.3	**Impact of climate variability on the incidence of Dengue in Mexico** Magali Hurtado-Díaz, Horacio Riojas-Rodríguez, Stephen Rothenberg, Héctor Gómez-Dantés, and Enrique Cifuentes-García *National Institute of Public Health of Mexico*
	4: Policy and Adaptation
P4.1	**Climate change. Adaptation and adaptive capacity in the public health sector** Antonio E. Pérez Rodriguez *Institute for Tropical Medicine "Pedro Kouri", Havana, Cuba*
P4.2	**The population health approach and climate change : A Labrador Case** Sandra Owens *Public Health Research Unit, CHUL-CHUQ, Sainte-Foy, Quebec, Canada*
P4.3	**Recent developments in global environmental change and population health** Shilu Tong *Queensland University of Technology, Kelvin Grove, Queensland, Australia*
P4.4	**Epidemiologist behavior of the diseases before and after the atmospheric disaster of Jimani** David Joa and Ramona Nunez *National Center for Tropical Diseases, Santo Domingo, Dominican Republic*
P4.5	**35 years of medical bioclimatology in Italy** Umberto Solimene et al. *State University of Milan, Italy*
P4.6	**Global Climate Change, Health, and Women** Kirsty Duncan *Rotman School of Management, Univeristy of Toronto, Ontario, Canada*