level of uncertainty. Therefore incremental adaptation strategies need to be developed. The term 'incremental' in policy development refers to a process of connected building blocks of actions, eventually resulting in policy change. In addition, there is a need for increased attention to the vulnerability of disadvantaged population groups for health impacts of climate change and the cumulative effects of several climate-related exposure factors.

Protecting health in Europe from climate change: policy options for climate change and health

Bettina Menne, WHO Regional Office for Europe

The "Climate, Environment and Health Action Plan and Information System" (CEHAPIS) project is a jointly-funded project established and by the WHO Regional Office for Europe and the European Commission. The overall aim of the project is to provide an evaluation of policy options for a successful health adaptation to climate change and monitor trends over time. This includes preparing an assessment of the consequences of climate change on public health in Europe. Towards this objective, the WHO prepared a technical background document on the public health impacts of climate change, as well as a discussion document on policy options for adaptation and mitigation. The policy options are presented in four key categories: (i) ensuring that all current and future climate change mitigation and adaptation measures, policies and strategies include health issues at all levels; (ii) strengthening public health and health services to improve their capacity to prevent, prepare, and cope with climate change; (iii) raising awareness to encourage health mitigation and adaptation policies in all sectors; and (iv) sharing of best practices, tools, data and information, and enhancing research.

Roadmap to a climate-proof Netherlands – adaptation to health effects

Leendert van Bree, Netherlands Environmental Assessment Agency (PBL)

Trends in climate change are expected to continue, although there is uncertainty about the rate and the possible impact. Possible consequences such as the increasing temperature and the frequency and intensity of weather extremes, increasing river discharges, and sea level rise may have a substantial negative impact on a country like the Netherlands and require a targeted long-term adaptation strategy lowering the country's vulnerability. The adaptive ability of the Netherlands is, however, influenced by (choices in) spatial and non-spatial developments and the political and societal willingness to adapt. The Dutch Ministry of Housing, Spatial Planning and the Environment (Ministerie van VROM) has therefore requested the Netherlands Environmental Assessment Agency (PBL) to develop a roadmap for a climate-proof Netherlands. *(1)* The PBL roadmap study is conducted using a structured, stepwise framework to develop adaptation strategies. The framework consists of the following critical elements: (i) potential impacts, (ii) possible adaptation options, (iii) relevant criteria to judge adaptation options, (iv) selection of relevant adaptation options, (v) possible governance mechanisms, and (vi) targeted adaptation strategies. Besides strategic themes like 'agriculture and nature' and 'water safety', the PBL roadmap study also focuses on urban resilience and on health. The central aim of the PBL study is to develop targeted adaptation strategies and to search for co-benefits with existing and new urban and rural spatial policies.

Climate and health impact assessment

Franziska Matthies, WHO Regional Office for Europe

The preliminary assessment carried out by the WHO and several other agencies point out that impacts of climate change are already being observed in Europe; heat-waves, floods, and droughts are all increasing in their frequency and intensity. Health effects have already been observed, in particular from heat-waves and associated air pollution, as well as changes in the range of disease vectors *(2)* Very few future projections of health effects are available. Those available mainly point out to an increased heat-wave risk, flooding risk and the re-emergence of some vector borne diseases in Europe. It is also important to note that climate change will affect everybody, but not everybody in the same way: populations differ in their vulnerability. In particular, as developing and long-term exposed organisms, children are most at risk, and excessive heat primarily affects old people. During extreme weather events emergency services providers and labourers in outdoor environments are especially affected. A recent Lancet assessment pointed out the benefits for human health in reducing greenhouse gas emissions: (i) air pollution, namely particulate matter and ozone, is reduced, thus improving urban air quality; (ii) sustainable transport schemes can reduce traffic-related injuries and increase physical activity and thus contribute to reduce obesity and cardio vascular diseases; (iii) changes in agricultural sector, especially livestock farming, could be a response to consumers' climate-friendly diet; and (iv) reduction in carbon dioxide emissions in building and construction could lead to health benefits in indoor air quality. The details of the impact assessment are presented in the WHO technical background document.

Expert survey on climate change, health and uncertainties

Arjan Wardekker, Utrecht University

Impact assessments of climate change entail numerous uncertainties. Health risk estimates can be made with various levels of precision. Regarding some of the impacts we may be effectively ignorant, while for others, we

may be able to give rough indications or quantitative estimates of the risk. Experts in a Dutch survey indicated that, for most health effects, we can indicate the direction of change; whether there will be a positive or negative impact. For several suggested impacts, changes are plausible, but the trend may be ambiguous. Examples include allergic disorders, flood-related contaminants, and epidemics of non-endemic vector-borne diseases. For several other effects, it may be possible to give rough quantitative estimates; mainly in terms of the expected 'order of magnitude' of the health risk. Examples include temperature-related mortality and contamination of bathing water. Heat-related mortality and non-endemic vector-borne diseases are particularly relevant for Dutch climate adaptation. Differences in the level of precision and relevance for adaptation can lead to different policy strategies. For health risks with high precision and high relevance, tailored prediction-based strategies, with costly and extensive/encroaching options may be feasible. If precision and relevance are low, it may be more appropriate to focus on enhancing the capability of current measures, dealing with changes and surprises, using options with low costs or high co-benefits.

CLIMATE CHANGE, HEALTH AND ADAPTATION POLICY

Policy options for strengthening public health measures and novel policy approaches with respect to climate change impacts in Europe

James Creswick, WHO Regional Office for Europe

Within the scope of the CEHAPIS project, the WHO is developing policy proposals and associated policy assessment for the European Commission on climate change and health. These policies will work towards implementing the European Commission White Paper on adapting to climate change, *(3)* as well as the European Regional Framework for Action *(4)* adopted at the 5th Ministerial Conference on Environment and Health in Parma on 10-12 March, 2010. The methodology on how to carry out the impact assessment is being developed within the Impact Assessment Guidelines of the European Commission. *(5)* There is a substantial legal basis for action, taking into account Articles 168 & 191 of the Treaty on the Functioning of the European Union, *(6)* Article 1 of the United Nations Framework Convention on Climate Change, *(7)* resolutions of the 61st World Health Assembly, and decisions of 124th session of WHO Executive Board. The document under development by the WHO aims at: (i) assessing policy options for effective health adaptation; (ii) identifying direct and indirect environmental, economic and social (including health) impacts and how they occur; (iii) identifying who is affected by these impacts (including those outside the EU) and in what way; (iv) identifying whether there are specific impacts that should be examined; (v) assessing the impacts in qualitative, quantitative and monetary terms or explain why quantification is not possible or proportionate; and (vi) considering the risks and uncertainties in the policy choices.

Introduction to the group exercise on "uncertainty-robust" adaptation strategies

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Bettina Menne, WHO Regional Office for Europe
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The policies to be assessed were identified by the European Climate Change and Health Task Force[1] and divided into four overall strategies, and the participants were split into four groups according to these four strategies:

Group 1: Promote health in all policies
Group 2: Strengthen health systems
Group 3: Raising awareness
Group 4: Strengthen research, information systems, methods and tools

Each set of policy options was divided in addition into one of three categories:

A: Capacity-building options, addressing enabling mechanisms for adaptation, functioning as preconditions for other types of policy action on adaptation for health impacts of climate change;
B: Instrumental options, representing mechanisms for adaptation such as regulation, guidance, incentives etc., addressing health directly or indirectly e.g. through enhancing adaptation capacity;
C: Health-specific options, addressing the exposure or potential health effects of climate change.

[1] The European Climate Change and Health Task Force was chaired by the United Kingdom and Serbia, with the participation of Belgium, the Czech Republic, Denmark, Finland, Germany, Hungary, Italy, the Netherlands, the European Commission, the European Environment Agency, the European Centre for Disease Prevention and Control, the Health and Environment Alliance, the Regional Environment Centre and the World Health Organization (WHO) Regional Office for Europe. The Task Force was open for participation to all Member States and agencies in the WHO European Region. The WHO Regional Office for Europe acted as the secretariat for the Task Force.