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**COMMISSION STAFF WORKING DOCUMENT**

*Accompanying document to the*

**WHITE PAPER**

**Adapting to climate change: Towards a European framework for action**

***Human, Animal and Plant Health Impacts of Climate Change***

{COM(2009) 147 final}

## COMMISSION STAFF WORKING DOCUMENT

### **Human, Animal and Plant Health Impacts of Climate Change**

The purpose of this Commission staff working document is to outline the main issues relating to human, animal and plant health in relation to climate change, to describe what is currently being done to address these challenges and, finally, to indicate key future steps for Community and Member State action to be considered.

This paper is based on the general framework set out in particular in the White Paper "Adapting to climate change: Towards a European framework for action" [COM(2009) 147] which proposes to increase the resilience of health and social systems and underlines the need to ensure adequate surveillance and control of the health impacts of climate change, such as epidemiological surveillance and the control of communicable diseases or the effects of extreme events.

In general, climate change is not creating many new or unknown health threats, but it will increase certain interactions between environment and human health with stronger and more pronounced effects than currently seen. Most public health measures and systems are already in place but they need to be tuned to the new situation and demands.

This paper outlines what the European Union can do in concrete terms to address these potential challenges.

#### **INTRODUCTION**

##### **The European Environment and Health Action Plan 2004-2010<sup>1</sup>**

The European Environment and Health Action Plan 2004-2010 specifically addresses climate change and health under Action 8, which announces that emerging issues on environment and health will be identified and addressed.

The Mid-Term Review of the Environment and Health Action Plan<sup>2</sup> reported progress on the implementation of the Action Plan: on climate change and health several EU projects<sup>3</sup> have been funded under the Sixth and Seventh Framework Programmes (see also chapter 9 on EU Framework Programmes for Research) and the EU Health Programme. The Mid-Term Review also stressed the importance of integrating sectors and stakeholders and health issues into a comprehensive policy approach, and issues such as the health effects of climate change, in particular. Lastly, it announced that the focus on climate change and health will be increased in the future implementation of the Environment and Health Action Plan.

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<sup>1</sup> COM(2004) 416.

<sup>2</sup> COM(2007) 314 - SEC(2007) 777.

<sup>3</sup> MICORDIS, CANICULE, EuroHEAT, EDEN,  
[http://ec.europa.eu/health/ph\\_information/dissemination/unexpected/unexpected\\_2\\_en.htm](http://ec.europa.eu/health/ph_information/dissemination/unexpected/unexpected_2_en.htm)

In its Conclusions on Environment and Health, the Council urged the Commission and the Member States to develop tools for anticipating, preventing and responding to potential threats from climate change<sup>4</sup>.

The European Parliament has called for enhanced multi-agency cooperation ‘in order to boost the early warning system and thus to curb the harmful effects which climate change has on health’<sup>5</sup>. The European Parliament also calls on Member States and the Commission to respond adequately to the new threats posed by climate change, such as the increased presence of emerging viruses and undetected pathogens, and therefore to implement new existing pathogen reduction technologies that reduce known and undetected viruses and other pathogens transmitted by blood<sup>6</sup>.

In addition to the implementation of the EU Action Plan, the Commission is supporting the World Health Organisation and EU Member States in implementing the "Children's Environment and Health Action Plan for Europe" (CEHAPE) and the Ministerial Declaration issued in Budapest in 2004. Health issues related to climate change will be one of the main pillars of the next Ministerial Conference on Health and Environment, which is due to be held in Italy in March 2010.

The JRC (Commission Joint Research Centre) supports the European Environment and Health Action Plan by providing the scientifically based information needed to help the EU and the Member States reduce adverse health impacts from environmental factors. In relation to climate change and health, the JRC was involved in the GAPCC (Global Air Pollution and Climate Change) Action contributing to scientific research on the linkages between air pollution and climate change, so that policy makers were made aware of the potential synergies and trade-offs in which the atmosphere and the climate system work. This action includes: the European Flood Alert System (EFAS), developed within the Weather Driven Natural Hazard (WDNH) project, which seeks to provide medium-range flood simulations across Europe with a lead-time of between 3 and 10 days, and which will provide information for the preparation and management of aid during a flood crisis; and the European Forest Fire Information System (EFFIS), which supports the services in charge of the protecting forests against fires in the EU and neighbouring countries, and which also provides information about forest fires in Europe.

## **Legal basis**

According to the objectives of the Community action in the field of public health as set out in Article 152 of the Treaty Community action, shall complement national policies, shall be directed towards improving public health, preventing human illness and diseases, and obviating sources of danger to human health. Such action shall cover the fight against the major health scourges by promoting research into their causes, their transmission and their prevention, as well as health information and education. The legal base for the adoption of measures relating to animal and plant health is laid down in Article 37 of the Treaty.

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<sup>4</sup> 20th December 2007

<sup>5</sup> Paragraph 24 of European Parliament Resolution of 4 September 2008 on the mid-term review of the European and Health Action Plan 2004-2010 (2007/2252(INI)).

<sup>6</sup> Paragraph 26 of European Parliament Resolution of 4 September 2008 on the mid-term review of the European and Health Action Plan 2004-2010 (2007/2252(INI)).

## 1. HUMAN HEALTH

Following the impact assessments conducted in a number of European countries and research funded by the EU and WHO-EURO, climate change is expected to have impacts on the epidemiology of many diseases and health conditions. This assessment is further supported by reports<sup>7</sup> from WHO and IPCC<sup>8</sup> describing the negative impact on human health.

The way in which such health effects are experienced between and within different countries will be uneven, also given the geographical make up of the EU. The nature and scale of the final impacts will depend on the adaptive capacity and actions of health systems and the baseline access of different populations to these services. Some of the measures might be efficient enough under current climates, but might need to be strengthened or revised in a situation of much stronger or accelerated climate change.

Health systems are vulnerable to extreme climatic events. Indeed, climate change might have an impact on health systems by increasing the demand for health services beyond the capacities of those systems. It may also interfere with their ability to cope with demand by undermining infrastructure, technology and the availability of workforce. This is linked to emergency preparedness and response.

### 1.1. The EU Health Strategy

The EU Health Strategy acknowledges the importance of addressing major threats to health. Climate change and its impact on public health is mentioned as an important challenge in terms of protecting citizens from health threats. Adopted in 2007, the strategy set out proposals for action on climate change. The Commission then undertook to draw up a document on "Health aspects of adaptation to climate change"<sup>9</sup>.

### 1.2. Direct and indirect impacts of climate change on human health

Climate change will affect human health, either directly - in relation to the physiological effects of heat and cold - or indirectly, for example, through altered human behaviours (e.g. forced migration, more time spent outdoors), the increased transmission of food or vector-borne diseases, or other effects of climate change, such as flooding. An increase in some of these impacts has already been observed in Europe over recent decades (for example, the summer heat waves in 2003 alone are believed to have resulted in more than 70 000 excess deaths (Robine et al, 2008)).

Not all climate related changes are negative for human health. In temperate areas, milder winters will lead to less cold-related fatalities. The indoor environment will be improved because of milder measures to keep comfortable indoor temperatures. Outdoor workers will

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<sup>7</sup> <http://www.euro.who.int/Document/E91865.pdf> page 9

<sup>8</sup> <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>

<sup>9</sup> The Commission Staff Working Document *accompanying the Communication Together for Health: A Strategic Approach for the EU 2008-2013*{COM(2007) 630 final}: p.33 "The Commission will produce a report on Climate Change covering a range of areas of concern including health. The most up-to-date scientific information on health effects from extreme weather and events relating to climate change will be gathered and analysed to support effective responses in preventing and responding to them. The implementation of surveillance systems for the main effects of climate change such as heat-waves and flooding will be examined. The capacity of EU health systems and infrastructure to cope with different levels of climate-related health threats will be estimated, with the aim of supporting contingency planning for hypothetically dangerous situations as necessary."

have less cold related stress during winter season, which will improve productivity. An increased growing season together with more precipitation will promote agriculture and food production but also private gardening and other outdoor activities.

**Morbidity and mortality.** The primary concern in Europe is linked to heat-related mortality and morbidity, due to increases in annual temperature and extremes of heat, although these issues are also influenced by socio-economic changes due to population growth, age distribution (the ageing European population) and other factors, such as migration. In EU countries, it is estimated that mortality increases by 1–4% for each one-degree rise in temperature, meaning that heat related mortality could rise by 30 000 deaths per year by the 2030s and by 50 000 to 110 000 deaths per year by the 2080s, (PESETA project<sup>10</sup>). The elderly, in which the ability to control and regulate body temperature is reduced, are most at risk of death from heat stroke and cardiovascular, renal, respiratory and metabolic disorders (Matthies et al, 2008). Whilst the numbers of total deaths are strongly related to population size, the change in death rates can be much greater in regions where conditions are conducive to greater warming.

**Food-borne diseases<sup>11</sup>.** In addition, temperature-sensitive infectious diseases, such as food-borne infections (*Salmonella* sp., and others.) are likely to grow. Recent work (PESETA, based on Kovats 2003) shows that the disease burden in Europe could be significant with potentially an extra 20 000 cases per year by the 2030s and 25,000 to 40,000 extra cases per year by the 2080s.

**Vector-borne diseases<sup>12</sup>.** A great deal of attention has been devoted to changes in vector-borne disease patterns in relation to climate change. The IPCC foresees climate change leading to changes in infectious disease transmission by vectors such as mosquitoes and ticks, as a result of changes in their geographic range, seasons of activity and population size (Confalonieri et al, 2007); land use changes and socio-economic factors (e.g. human behaviour, the movement of people and goods) will continue to be important too. A number of models have investigated the potential increase of malaria risk in parts of Europe. Although accurate predictions are difficult at the present time, there is agreement nevertheless that the overall risk of transmission of malaria related to localized climate change is very small, especially where there are adequate health services and good management of mosquito control (EEA/JRC/WHO, 2008).

Nonetheless, new challenges may emerge, as changes in vector distribution and capacity - particularly in combination with increased human mobility - could facilitate the introduction and local transmission of new emerging pathogens. As regards other mosquito-borne diseases, this phenomenon was seen in the 2007 **Chikungunya virus outbreak in Europe**; the sustained presence of a suitable vector might create the conditions for future local outbreaks of Chikungunya and even Dengue fever, although the latter is less likely.

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<sup>10</sup> PESETA report, <http://peseta.jrc.ec.europa.eu/docs/Agriculture.html>

<sup>11</sup> Food-borne diseases: an infection acquired by consuming contaminated food or drink. Myriad microbes and toxic substances can contaminate foods. Most of the 250 known food-borne diseases are infectious and are caused by bacteria, viruses, and parasites. Other food-borne diseases are essentially poisonings caused by toxins, chemicals contaminating the food. Nausea, vomiting, abdominal cramps and diarrhoea are frequent in food-borne infections.

<sup>12</sup> Vector-borne diseases are bacterial, viral, or parasitic diseases transmitted to humans and animals by the bite or sting of infected vectors as insects, e.g. mosquitoes or ticks

Changes in tick distribution have also been observed. The limit of tick distribution in the EU is shifting northwards and also to higher altitudes; plus, the shift towards milder winters may lead to an expansion of the tick population and, consequently, to the human exposure to Lyme borreliosis and Tick-borne encephalitis. There are also reports of changes in the geographical distribution of sand flies, which are a vector of *Leishmania* sp. Further work needs to be done to determine the role of climate change in the future epidemiology of other diseases and it may take many years before accurate estimates are available.

**Water-related issues.** Aside from flooding, a number of other water-related issues are also important. Heavy precipitation has been linked to a number of outbreaks of water-borne diseases, due to the mobilising of pathogens or extensive water contamination from overflowing sewage pipes. Reductions in summer water flows may increase the potential for bacterial and chemical contamination. Higher water temperatures may also result in increased occurrence of harmful algal blooms. Increased faecal bacteria contamination is also likely to affect drinking water intakes and areas of water used for recreation. Furthermore the scarcity of suitable water for routine hygiene practices of high significance for health such as proper hand washing might contribute to more infectious diseases outbreaks.

**Air quality.** There are a number of other health issues emerging from climate change in Europe, where quantification and valuation have not been explored sufficiently on a Europe-wide basis. Whilst air pollution levels have fallen dramatically in recent decades in Europe, the health risks of air pollution are still significant, primarily from particulate matter and ozone (Thematic Strategy on Air Pollution, TSAP<sup>13</sup>). However, future policy on air quality and on climate (mitigation) is very likely to determine any future increase in respiratory diseases and mortality.

The most significant effects of climate change are likely to be in relation to ozone – which is a major pollutant in many parts of Europe. The EEA/JRC/WHO study reports that climate variability and climate change have contributed to an increase in ozone concentration in central and south-western Europe, and the climate-induced increase in ozone levels might be hampering current ozone abatement efforts. There are no detailed projections for the future effects of climate change on air pollution in Europe - and even recent studies on air pollution (e.g. TSAP) have not factored in how climate change might influence air quality levels<sup>14</sup>.

**Air allergens.** There is also the potential for an increase in the seasonality and duration of allergic disorders ('hay fever', asthma<sup>15</sup>), with implications for direct costs in terms of care and medicines, as well as lost working hours. Finally, there may be other indirect health effects due to climate change acting on other health determinants, such as on indoor and outdoor air quality, the level of air pollution and the nature, severity and timing of air allergens, such as pollen or mould. Populations at potential risk include children and the elderly. However, people already suffering from chronic respiratory conditions such as asthma, serious allergies or chronic obstructive pulmonary disease (COPD) will be particularly at risk.

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<sup>13</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0446:FIN:EN:PDF>

<sup>14</sup> There are an estimated 21000 premature deaths from ozone each year in the EU, as well as over an estimated 100 millions respiratory symptoms days, see the TSAP.

<sup>15</sup> ISAAC study (International Study of Asthma and Allergies in Childhood), asthma prevalence in children across the ISAAC European study centres ranged from 5% to 20% in the period from 1999 to 2004. Allergic and asthmatic symptoms are associated, among other causes,

**Ultraviolet radiation.** Another indirect impact of climate change on health comes from potentially changing ultraviolet radiation. It has already been shown that higher ambient temperatures will influence clothing choices and time spent outdoors, potentially increasing ultraviolet exposure in some regions (Confalonieri et al., 2007). Aspects of potential UV threat are explored by the EUROSUN project on the quantification of sun exposure in Europe and its effects on health. The aim of this project, which is funded by the Community Health Programme, is to monitor ultraviolet exposure and its correlation with the incidence of skin cancers, including malignant melanoma and cataracts<sup>16</sup>.

**Mental diseases.** We know already that psychological effects following acute disasters can be considerable, especially in high risk groups like children. The multiplication of disasters due to adverse climate change conditions could therefore lead to the increase of incidence of people affected in this respect.

**Vulnerable groups.** As already estimated in relation to the impact of heat waves, the overall health effects of climate change should be unevenly distributed across the regions of Europe. Since health and well being are also strongly related to socio-economic drivers such as income, housing, employment, education, gender and lifestyle, the impacts of climate change should alter health inequalities within and between countries, and lead to uneven distribution and additional burdens for lower income groups and certain vulnerable groups, such as children, those working outdoors, the elderly, women and people with a pre-existing illness.

As an example, current heat related mortality has been shown to reveal a strong socio-economic dependence. For some effects, e.g. mortality related heat and to air pollution, the elderly are far more vulnerable, and there may be additional factors affecting this group which are linked to socio-economic status.

**Increased migration due to climate change.** The impact of climate change on national economies, availability of food and water, as well as the rise in sea levels, has as possible to increase the migration of the population worldwide. However, the exacerbated environmental conditions will predominantly impact internal and intra-regional mobility. The growing needs for humanitarian assistance and health protection of vulnerable groups migrating both to and even within the EU territory could require an enhanced capacity of Member States' health systems.

We could also anticipate an increase in displaced populations arriving from non-Member States to the EU territory – which is a frequent migratory destination - to exacerbate the challenge to Member States' health systems. Providing EU support to the source countries of migration to deal with a potential impact of climate change and with displaced people on the spot will mitigate a potential impact of climate change on the internal and intra-regional displacement of people. These measures may mitigate or limit the potential problems that Member States could face. Similarly national health systems in the EU could benefit from preparedness planning to improve their capacity to deal with such challenges.

### **1.3. Levers to improve EU capacity to react to Climate Change in relation to human health**

#### **Improve Health Security**

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<sup>16</sup> Moreover, since early 1980's, the European Code against Cancer recommends “to avoid excessive sun exposure,” supporting European Commission policies of cancer prevention. ([http://www.cancercode.org/code\\_06.htm](http://www.cancercode.org/code_06.htm))

The Health Security Committee (HSC) was set up by the Council as an informal committee to address preparedness for and responses to major health threats, such as CBRN events or pandemic influenza. It focuses on three areas, each assisted by a section consisting of representatives of the Member States. These areas are: (1) generic preparedness and response for public health emergencies; (2) response to chemical, biological and radionuclear (CBRN) attacks, and (3) influenza preparedness and response. On the basis of the work of the HSC, the Commission adopted a Communication (COM 2005/605 final of 28.11.2005) on strengthening coordination of generic preparedness planning for public health emergencies at EU level.

A co-ordinated response during a public health emergency requires linking the relevant health crisis centres at the level of Member States, Commission and EU and international agencies. The requirements for proper command and control include: situational awareness of casualties and resources, co-ordination of the response and of communications, information analysis and management and simulation for event-analysis and training.

In order to be ready for any emergency or crisis, all of the abovementioned aspects have to be evaluated and tested. Performing specific focussed training events and exercises is one of a number of instruments available for assessing the level of readiness, and for identifying the gaps in the preparedness of the European Union in all its components. The Commission has established a three-year framework contract to provide the possibility to test and improve preparedness by means of simulated public health crises from scenarios drawn up to cover five targeted deliverables (case studies, table-top exercises, command post exercises, field exercises and specific staff training events).

### **The EU Health Programme**

As a logical extension of preparedness, there will be a need for awareness of change and of surveillance and monitoring. A number of tools are already available following the support given to projects under the EU health programme, particularly in the wake of extreme weather events in Europe over recent years.

Community funding of programmes has helped advance our state of knowledge of the public health dimensions of climate change. The EU Health Programme<sup>17</sup> supports projects and actions to improve health information and knowledge for the development of environmental health information systems: addressing environmental exposures, urban air pollution or monitoring of ultraviolet exposure and its effects on incidence of skin cancers and cataracts. Funding has been provided for:

- **EUROHEIS:** a European Health and Environment Information System for Risk Assessment and Disease Mapping; **Aphekom:** Improving knowledge and communication for decision making in Air pollution and Health in Europe), and **EUROSUN:** Quantification of sun exposure in Europe and its effects on health.

In line with the Environment and Health Action Plan, the EU Health Programme contributed work on environment determinants with a focus on actions to develop networks and exchange best practices; to address indoor air quality, taking into account the combination of effects of

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<sup>17</sup> Public Health Programme: <http://ec.europa.eu/eahc/>



building materials, household chemicals and thermal conditions in elderly homes; to address the quality of indoor air in schools. Funding was provided for example for

- **EuroHEAT** which deals with actions at different levels: from health system preparedness coordinated with meteorological early warning systems to timely public and medical advice and improvements to housing and urban planning

The actions under the Health Security strand focus on the development and coordination of early warning and surveillance systems in specific areas (e.g. cold spells, health effects of flooding, airborne allergens, ultraviolet radiation and vector-borne and other human and animal infectious diseases), in line with the Commission Communication on adaptation to climate change, including its health effects and evaluation of policy impacts. Funding was provided towards: **CEHAPIS**: Climate, environment and health action plan and information system; **EUROMOMO**: European monitoring of excess mortality for public health action; **HALINE**: Health Impacts of Airborne Allergen Information Network; **CLIMATE-TRAP**: Climate Change Adaptation by Training, Assessment and Preparedness.

### **The role of the European Centre for Disease and Control prevention (ECDC)**

One of the areas of competence of the European Centre for disease prevention and control, established by Regulation 851/2004/EC, concerns emerging health threats.

Within its terms of reference, the ECDC has thoroughly investigated the topic of impacts on health caused by climate change. On 28-29 May 2008, the ECDC hosted an international workshop on linking environmental and infectious diseases data in Sigtuna, Sweden. The ECDC then went on to develop a comprehensive feasibility study for a European Environment and Epidemiology Network (the E3 network) in conjunction with external consultants.

By connecting these sources of information, the E3 network should **bolster European early warning for climate-related disease events**. It should also enable **forecasting and risk mapping of infectious disease incidence in relation to environmental changes**.

In addition to exploring the possibilities of the E3 network, ECDC has launched several other projects focusing on the impacts of climate change on the spread of communicable diseases.

In 2007, ECDC commissioned a large-scale project aimed at assessing the magnitude and significance of vector-borne diseases in Europe. Climate change, as one of many drivers of vector-borne diseases, was a variable considered in the project. Key output of the project is identification of priority of vector-borne diseases for Europe, based on the likelihood of occurrence and the potential human health impacts.

ECDC is building upon the findings of the vector-borne project by focusing in more detail on specific priority diseases. One project that has already been launched will develop **risk maps for Dengue<sup>18</sup> in the EU**, based on a range of variables that includes climate change projections.

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<sup>18</sup> [Dengue fever is a virus-based disease spread by mosquitoes. It is caused by several related viruses \(four different arboviruses\), and is spread by the bite of mosquitoes, most commonly the mosquito \*Aedes aegypti\*, which found in tropic and subtropic regions.](#)

Meanwhile, ECDC has also commissioned a **comprehensive risk assessment specifically focusing on the impact of climate change on food- and water-related diseases in the EU**. The goals for this project are to identify, assess and help prioritise the anticipated short- and long-term impacts of climate change on the patterns of transmission of food- and water-borne diseases, including salmonellosis, listeriosis, cryptosporidiosis and campylobacteriosis. Using the findings from this project, which are due towards the end of 2009, the next phase of the project will be to develop tools for Member States to facilitate their own similar risk assessments in this field.

ECDC has also launched a **project to develop tool kits for Member States on how to conduct vulnerability and adaptation assessments related to climate change and communicable diseases**. These tool kits will provide Member States with scientifically robust methodologies and decision-making algorithms for conducting vulnerability assessments and developing adaptation strategies focused on mitigating the transmission of communicable diseases.

During 2009, ECDC will be cooperating with the Swedish Presidency of the EU to help organise a workshop focused on zoonoses and climate change. The workshop is scheduled to take place on 2/3 July 2009 in Jönköping, Sweden.

### **The Community Statistical Programme**

The European Health Interview Survey (EHIS) – of which the first wave is now being implemented in the European Statistical System (ESS) - is monitoring health including environment related variables as part of Eurostat's data collections on health status and health determinants. The implementation of the new Regulation 1338/2008 of the European Parliament and of the Council establishing a framework for Community statistics in on public health and on health and safety at work, will be key for a sustainable health monitoring system, which will inter alia include data on human health in relation to climate change.

### **The role of the EU Framework Programmes for Research**

The fifth Framework Programmes for research have provided support to a number of projects in the field of climate change, such as the **PHEWE** project (Assessment and Prevention of acute Health Effects of Weather Conditions in Europe) and **cCASHh** (Climate Change and Adaptation Strategies for Human Health in Europe).

In the Sixth Framework Programme (FP6), the major projects relevant for the climate change effects on health are **EDEN** and **MICRODIS**. The EDEN project (Emerging Diseases in a Changing European Environment) is studying how changes in European environment and ecosystems, whether caused by altered human activity patterns or changes in climate, can influence the spatial and temporal distribution and dynamics of human pathogenic agents. The MICRODIS project (Integrated Health, Social and Economic Impacts of Extreme Events: Evidence, Methods and Tools) aims to build-up the scientific and empirical foundation on the relationship between extreme events and their health, social and economic impacts<sup>19</sup>.

Additional FP6 projects addressing to some extent health effects of climate change include **GAL2EN** (Global allergy and asthma European network), **INTARESE** (Integrated

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<sup>19</sup> [http://ec.europa.eu/research/environment/pdf/eur23460\\_en.pdf](http://ec.europa.eu/research/environment/pdf/eur23460_en.pdf)

assessment of health risks from environmental stressors in Europe) and **CIRCE** (Climate change and impact research: the Mediterranean environment)<sup>19</sup>.

Under the ongoing Seventh Framework Programme for Research (FP7), two projects, **ARCRISK** (Arctic Health Risks: Impacts on health in the Arctic and Europe owing to climate-induced changes in contaminant cycling) and **CLEAR** (Climate change, environmental contaminants and reproductive health) examining the health risks resulting for Arctic populations from climate change induced changes in the distribution of environmental pollutants have been launched in 2009<sup>20</sup>. A project on the health effects of changing surface UV radiation levels (**ICEPURE**, Quantification of changing surface UV radiation levels and its impact on human health) started this year as well<sup>21</sup>. Finally, the integrated project **ESCAPE** (European Study of Cohorts for Air Pollution Effects<sup>22</sup>) looking at air pollution effects on European populations, taking into account also climate change, was funded.

Starting from the third FP7 call for proposals, the Environment and Health sub-activity under the Cooperation programme includes a funding area on the Health impacts of climate change. Topics presented in the third call for proposals deal with climate change and water-related health issues and with the quantification of climate change impacts on health in low income developing countries. Other relevant projects addressing climate change issues, are **EUROSUN**, **PHEWE** and **cCASH**<sup>23</sup>.

### **International cooperation, EU Enlargement and European Neighbourhood Policy**

Cooperation is necessary with international organisations and with the priority partner countries at global level as well as with the Enlargement and ENP countries at the European and regional levels, and to invite the neighbouring countries to participate in joint actions and encourage them to undertake the necessary work and measures, including the development of national strategies.

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<sup>20</sup> [ftp://ftp.cordis.europa.eu/pub/fp7/environment/docs/catalogue\\_projects\\_2008.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/environment/docs/catalogue_projects_2008.pdf)

<sup>21</sup> [ftp://ftp.cordis.europa.eu/pub/fp7/environment/docs/catalogue-projects-fp7envnmp\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/environment/docs/catalogue-projects-fp7envnmp_en.pdf)

<sup>22</sup> <http://www.escapeproject.eu/index.php>

<sup>23</sup> [http://ec.europa.eu/research/environment/themes/projects\\_en.htm#2](http://ec.europa.eu/research/environment/themes/projects_en.htm#2)

## 2. ANIMAL HEALTH

### 2.1. Direct and indirect impacts of climate change on animal health

Recent evolutions have indicated that climate change has already had an impact on animal disease occurrence, which is twofold:

**Non-statutory** diseases i.e. those not subject to EU veterinary legislation, which affect the animals' living conditions and are conducive to pathologies such as parasitic diseases (e.g. infestation/affection by nematodes and taenia), nutritional disorders, sunstroke or dehydration which can be very important for the farmers' economic situation, while the official animal health status for contagious infectious diseases remains unchanged.

**Statutory diseases i.e. those** covered by international and EU veterinary legislation, which influence the risk of occurrence of serious transmissible infectious animal diseases especially vector-transmitted diseases, diseases dependent on specific weather conditions and those transmitted by wildlife. These diseases are relevant in determining the animal health status of a country. This includes a number of **vector-borne diseases** such as Rift Valley Fever, Bluetongue, African Horse Sickness, African swine fever and West Nile Fever and most importantly Bluetongue with its emergence in the summer of 2006 in the Netherlands and current persistence and spread up to Sweden which is much further north outside the previously known range of virus distribution.

The dynamics of **non vector-borne diseases** such as infections with avian influenza, may also be influenced by changes to migratory routes of wild waterfowl. The EU has already experienced during early 2006 that very cold weather in some areas causing feed scarcity and unusual freezing of open waters forced wild waterfowl to change their flyways which has led to the introduction of highly pathogenic avian influenza of the H5N1 subtype into the EU. Some wild bird species have already decreased their range of migration, which could also contribute to the spread of certain infectious fish diseases to new areas. Virus persistence in the environment including in water may also be influenced by changes in temperature.

**Wildlife** plays an important role in transmission of animal diseases such as avian influenza, rabies, classical swine fever and tuberculosis. Reduced water availability will lead to increased congregation of animals and be conducive to conditions for the persistent circulation of pathogens.

### 2.2. Levers to improve EU capacity to react to Climate Change in relation to animal health

#### The role of the Community Animal Health Strategy<sup>24</sup>

Given that prevention rather than reacting to animal diseases is the focus of the new Community Animal Health Policy, it also aims at considering the clear influences of climate change on animal health.

The Strategy's Action Plan provides for enhanced data gathering, data exchange and the strengthening of existing animal disease surveillance systems. The development of a new Animal Disease Information System (ADIS) will provide better and more comparable epidemiological data to risk managers, enabling them to better identify, evaluate and respond to changing or emerging disease situations.

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<sup>24</sup> Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions COM 539 (2007) 539).

A **task force of epidemiological experts on animal disease surveillance (TFADS)** has been set up by the Commission to advise on improvements to current EU systems for animal disease surveillance and on new surveillance strategies, e.g. for West Nile Fever. In order to evaluate the risks of the occurrence of vector-borne diseases that are heavily influenced by weather conditions and climate change, weather forecasting and analysis will need to be included in the early warning systems.

For the establishment of **further vaccine banks for certain infectious animal diseases** to ensure better preparedness, the Commission has recently set up a task force to provide expert advice on this matter. Disease surveillance must be combined with a network of expert laboratories with the appropriate diagnostic capabilities to carry out testing for still exotic or rare diseases, e.g. Rift Valley Fever. For some diseases it will be necessary to further strengthen collaboration with laboratory experts in third countries that have specific experience of the disease concerned and to mobilise and coordinate scientific resources throughout the EU in order to provide scientific advice within the remit of EFSA in the area of Animal Health.

An **integrated approach to epidemiological, entomological and environmental data collection and analysis** is crucial to maximise synergy and to avoid duplication. There are also plans to mainstream human and animal health disease surveillance activities through enhanced co-operation and exchange of knowledge.

### **Enhancing Animal Disease Awareness and Preparedness**

As part of the **contingency plans for certain infectious animal diseases** Member States must ensure awareness and preparedness. These plans must contain pre-prepared information for farmers, veterinarians, related sectors and the general public, including descriptions of the diseases, preventive measures and practical control measures. Veterinary legislation further requires that simulation exercises be carried out regularly.

**Early detection of and response to a changing picture of diseases** is a key element within the Community Animal Health Strategy to ensure disease awareness and preparedness. Farmers, veterinarians, slaughterhouse staff, pet shop owners, private pet keepers (including those keeping exotic animals) and others that handle animals must be able to notice even slight changes in the animals' behaviour and production data.

Clear communication with stakeholders is crucial to make all those dealing with animals aware of their responsibility within the overall context of animal health, food safety and human health which together form the concept of "One World – One Health". Sensitivity to climate change is an aspect that has to be considered as a priority in the exercise of categorising animal health risks of relevance for EU intervention.

### **Response to animal health crises**

A longstanding capacity to react to animal health crises already exists in the Commission based on crisis preparedness, rapid exchange of information and close collaboration with the veterinary authorities of the Member States to swiftly respond and manage animal health crises. . It has proved effective in mitigating the impact of outbreaks of contagious diseases on animal and human health (e.g. highly pathogenic avian influenza of the H5N1 subtype). The scope of these measures can be extended to include other emerging diseases.

## **The role of research in the area of animal health and adaptation to climate change**

The Framework Programmes have provided support for a considerable number of projects relevant to animal health policy and of particular interest with regard to climate change and the areas of actions.

In the 7<sup>th</sup> Framework Programme, the animal health research is reinforced and focused to take into account the changes which are rapidly occurring at global level including especially with regard to climate change affecting directly the ecology and evolution of the infectious agents, their vectors and hosts giving rise to emerging and re-emerging threats.

For instance, the projects **ASFRISK** (Evaluating and controlling the risk of African swine fever in the EU) and **ARBOZOONET** (International network for capacity building for the control of emerging viral vector borne zoonotic diseases) which are currently ongoing under the 7<sup>th</sup> Framework Programme can also contribute significantly in the work of the adaptation of climate change with regard to animal health.

### **3. PLANT HEALTH**

#### **3.1. Direct and indirect impacts of climate change on plant health**

It is expected that global warming will affect cropping systems, plant breeding and natural vegetation such as forests, meadows and woodland, because climate is the main determinant of their geographical distribution. Currently the pressure on agriculture and forestry from insect pests and insect-borne diseases is less at higher latitudes, owing to the less favourable climatic conditions. In the northern geographical regions the problems from both non-quarantine and quarantine pests are considered to be fewer than those observed in the south.

Along with trade, which is considered to be the main pathway for the introduction of harmful organisms and invasive species, global warming plays a complementary role being the other important “driver of change” affecting both the incidence and severity of plant diseases. Overall, it can have certain adverse economic consequences on crop production by imposing additional costs on agricultural inputs like e.g. crop protection.

A considerable effect on pathways of exotic pest introduction in new geographic regions is anticipated: as climatic conditions become more favourable, new or migrant plant pests may become established and more widespread in areas that were previously considered being pest-free. An example is that of pine wood nematode *Bursaphelenchus xylophilus* currently causing great damage in Portugal. The nematode is a considerable threat for the northern areas in the EU and it has been estimated that if the average temperature increases above 20°C during July or August, a mortality of 50-90 % of conifers should be expected.

Depending on the geographical region, variation in temperature range and changes in precipitation patterns can result in prolonged and/or more frequent droughts or flooding. Indigenous plants will be subjected to greater environmental stress and will become more vulnerable to pests and diseases. In principle, fungal and bacterial pathogen outbreaks are expected to increase both in number and in terms of the severity of outbreaks in areas with

increased rainfall<sup>25</sup>. However, warmer summers may also favour certain thermophilic fungi.

High temperatures in winter and spring will prolong the vegetation period by altering the growth cycles of host plants and reducing their tolerance. More generations of insects will be seen per growing season. Both the insect population and the amount of *fungi inoculum* surviving during the winter period will increase, resulting in more infection foci in the next cropping season. Additional data show that, during warm summers, certain insect species have extended their geographic range further northward. It will become increasingly difficult to produce virus-free propagating material stocks, such as seed potatoes, even at northern latitudes because warmer winters will favour the survival of aphid species and facilitate the spread of virus diseases during the summer. In addition, higher winter temperatures and longer water-logging periods will create favourable conditions for the development of root rot and blight.

On the other hand, high CO<sub>2</sub> concentrations in the atmosphere, along with the rise in temperature, could possibly result to an increase of the produced biomass overall affecting crop yields. Partial melting of the ice and the permafrost (the layer of permanent ice under the surface) may lead to a reduction of the arctic tundra and to the expansion of forests northwards. Other plants, including new crop species and varieties, might find more suitable growing conditions and the tendency for cereal production at mid-to-high latitudes will increase.

Hence, it would be reasonable to assume that most insect pests have the potential to become more damaging due to global warming. It is also likely that the pests' natural enemies may increase, making the overall effect less predictable. This is because in many cases there is a fine balance between pests/diseases, their natural enemies and their host plants.

Regarding plant health, it is recognised that the recent rapid increase in agriculture (e.g. Western corn rootworm *Diabrotica virgifera virgifera*), forestry and public green sites (e.g. Pinewood nematode *Bursaphelenchus xylophilus*, Pitch canker *Gibberella circinata* and Red palm weevil *Rhynchophorus ferrugineus*) pest incursions, into the EU necessitates the establishment of closer links between plant health and environmental policy.

### **3.2. Levers to improve EU capacity to react to Climate Change in relation to plant health**

The existing legislative tool of the Community Council Directive 2000/29/EC along with the Commission Decisions providing for emergency measures consist the frontline of defence against the introduction into and spread within the Community of quarantine harmful organisms. According to this legislation, Member States notify new outbreaks of already existing but not yet established harmful organisms. In addition, they provide for plant health controls to be carried out at the Community points of entry or points of destination, as well as for the detection of newly appearing plant pests.

The Commission has already in place a system for the control, inspection and evaluation of the situation, using as main tool the EUROPHYT, the EU database of intercepted consignments and harmful organisms (the plant health equivalent of the Rapid Alert System for Food and Feed (RASFF)). A network of experts of the National Plant Protection

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<sup>25</sup> [http://www.foresight.gov.uk/Infectious%20Diseases/t7\\_2a.pdf](http://www.foresight.gov.uk/Infectious%20Diseases/t7_2a.pdf)

Organisations, meets monthly at the relevant regulatory committee to discuss the situation and to decide on the management of the phytosanitary risk deriving from recent or earlier outbreaks of quarantine harmful organisms. A plant health panel within the European Food Safety Authority can provide scientific justification or assessment of pest risks.

### **The role of Research**

The EU is maintaining a constant effort on plant health research within successive Framework Programmes for Research. In the 6<sup>th</sup> and 7<sup>th</sup> Framework Programmes, about 25 research projects are directly or indirectly supporting the Community plant health regime and plant protection in general. These research projects are tackling plant health issues following different angles such as the use of biocontrol agents, containment measures, plant resistance, sustainable use of plant protection products or more integrated approaches such as Integrated Pest Management (IPM).

Some of them are world leaders in their field such as **ENDURE** (European Network for the Durable Exploitation of Crop Protection Strategies) or **BIOEXPLOIT** (Exploitation of Natural Plant Biodiversity for the Pesticide-Free Production of Food). **EUPHRESCO** is a successful so called **ERA-NET**, aiming at coordinating and integrating different national European phytosanitary research programmes.

The intention is to maintain this research effort in response to needs arising from globalisation, climate change and other drivers, in concertation between European institutions and services, national authorities, the research community and other stakeholders.

## **4. CONCLUSIONS**

The White Paper on "Adapting to climate change: Towards a European framework for action" suggests increasing the resilience of health and social systems and underlines the need to ensure adequate surveillance and control of the health impacts of climate change, such as epidemiological surveillance and the control of communicable diseases or the effects of extreme events. In order to implement the actions foreseen in the Paper, the following steps for the health side will need to be given priority through the EU Health Programme, through the Community Animal Health Strategy and through existing legislation on Communicable Diseases, animal disease control and on plant health, and through the work plans of relevant agencies:

- Development of **guidance on surveillance**, which will have to be matched by support for implementation and capacity development, such as microbiological support for food hazards detection and entomological knowledge and capacity. It is expected that this guidance will be prepared by 2011.
- Development of **extreme weather health action plans** will need to be integrated into the preparedness planning of health authorities and services in order to help Member States assess their health-related vulnerabilities to climate change and develop health-related adaptation strategies.
- Strengthening of close **co-operation between human animal and plant health services** in the Commission and Member States and enhancing in particular surveillance which will need to be further linked with knowledge and intelligence bases, such as meteorological



monitoring, entomological data, water quality records, air quality measures, remote sensing information, geology, population density and many other information sources across Europe; the value of such information has been amply demonstrated by the European Environment and Epidemiology network.

- Reinforcing capacity to develop the **modelling of health effects** as a function of extreme weather and obtaining the data to define the needs for improved forecasting heat waves.
- Reinforcement of **public health policies and training**, including effective surveillance and emergency response systems, and sustainable prevention and control programmes.
- Assessment of the effects of climate change on **vulnerable social groups**.
- Further efforts towards **identifying efficient health measures** and public health response, including the strengthening of emergency medical services, early warning, education and outreach to vulnerable population groups, and better accessibility to key determinants of health, such as clean water, energy and sanitation. This aspect will be included in the work on Health Inequality, which is currently being developed.
- **International collaboration**, in particular with agencies and international bodies such as the WHO, OIE and FAO, are an important dimension, as pointed out in the White Paper. Further work lies ahead, including:
  - **Cooperating with the WHO** and within the WHO Framework for Action in the European Region and the WHA resolution on climate change and health complements the WHO actions within the territory of the EU.
  - **Better integrating of surveillance networks for animal diseases** by enhancing co-operation with neighbouring countries into a wider context, such as in the framework of the Neighbourhood Policy (ENP). Cooperation with third countries, in particular with the priority partner countries at the global level as well as with Enlargement and ENP countries at the European and regional levels. Further promotion of climate change preparedness assessments as an integral part of security assessments can be achieved by actively encouraging the neighbouring countries to conduct joint actions, and to undertake the necessary work and measures, including the development of national strategies.
  - **Stepping up animal disease surveillance and control** by fostering preventive measures as already envisaged by the Community Animal Health Strategy and improved data collection by means of the Animal Disease Information System (ADIS). It will provide more detailed information on outbreaks of animal diseases in Member States and be better aligned with international disease reporting systems, such as WAHIS (World Animal Health Information System) of the OIE (World Organisation for Animal Health) and the Crisis Management Centre (CMC) and the Global Early Warning System (GLEWS).
- Better integrating the Commission's work into the broader context of surveillance networks for animal diseases by **enhancing co-operation with neighbouring countries**, such as via the Euro-Mediterranean Union and the ENP and within the frame of GF-TADS, the **Global Framework for the Progressive Control of Transboundary Diseases**, established by the OIE and FAO (Food and Agriculture Organisation).

- Further aiming at ensuring a **co-ordinated approach in responding to animal disease outbreaks** by proper implementation by Member States of contingency plans, preparedness, surveillance and preventive measures; the broad harmonisation of legislation on control measures and trade rules in relation to various infectious diseases - including those which may be impacted by climate change - allows for extensive Community action.
- Continuing to provide as appropriate, **co-financing for surveillance, eradication and emergency vaccination** depending on the disease situation. The Commission is already strengthening its existing surveillance and early detection systems in collaboration with Member States and expert groups in particular with respect to vector-borne diseases, which are now either becoming more widespread or are appearing in previously unaffected areas of the EU territory.
- As with human and animal health, the uncertainty of global warming effects on crop production and forestry presupposes the need for a **reliable evaluation of the associated risks** for new introductions of quarantine harmful organisms, since any adverse consequences may affect not only food and feed safety, but also food security<sup>26</sup>.
- **Establish closer links between plant health and environmental policy.** Additional to the protection of agriculture and horticulture, the EU is expected to safeguard the health of ecosystems, natural habitats, forests and the European landscape against foreign harmful organisms.
- The **evaluation of the existing Community Plant Health legislative framework** will consider how better preparedness can be achieved for tackling new challenges, including the consequences of climate change.

With the targeted Community policies in place and by means of the review and, where necessary, the updating of relevant EU legislation, the health sector will be equipped to integrate within the proposed European framework for action.

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<sup>26</sup> [ftp://ftp.fao.org/docrep/fao/meeting/013/ai785e.pdf](http://ftp.fao.org/docrep/fao/meeting/013/ai785e.pdf)