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**ECONOMIC COMMISSION FOR EUROPE**

**WORLD HEALTH ORGANIZATION  
REGIONAL OFFICE FOR EUROPE**

**MEETING OF THE PARTIES TO THE CONVENTION  
ON THE PROTECTION AND USE OF TRANSBOUNDARY  
WATERCOURSES AND INTERNATIONAL LAKES  
and  
MEETING OF THE SIGNATORIES TO THE PROTOCOL  
ON WATER AND HEALTH TO THE CONVENTION**

**Working Group on Water and Health**

Fifth meeting

Geneva, 5-7 December 2005

Item 9 (a) of the provisional agenda

**EXTREME WEATHER EVENTS, WATER AND HEALTH**

Prepared by the secretariat

1. An event is considered extreme, if some of its characteristics, such as magnitude, duration, speed of onset or intensity, lie outside a particular society's experiential or coping range, whether or not the event is rare. This happened during the 2002 Central European floods, the 2003 heat wave and the 2005 droughts in Spain and Portugal. Following some climate prediction scenarios, extreme weather events might become more frequent and intense. Floods, droughts and heat waves are recognized of having impacts on health.
2. Under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes <sup>1</sup> (Water Convention), Guidelines on Sustainable Flood Protection <sup>2</sup> were adopted in March 2000. These Guidelines recommend measures and good practices to prevent, control and reduce the adverse impacts of flood events on human health and safety, on valuable goods and property, and on the aquatic and terrestrial environment.

3. At the third meeting of the Parties to the Convention, a task force with Germany as lead country was set up (see ECE/MP.WAT/15/Add.2, programme element 2.1), which prepared, for example, the Seminar on Flood Prevention, Protection and Mitigation (Berlin, June 2004). The Seminar itself proposed to focus further work on three major areas: capacity building, policy guidance, and model provisions on flood prevention, protection and mitigation.<sup>3</sup> Further guidance was also needed to integrate environment and health considerations in the flood action plans and programmes, as well as further knowledge on the effects of climate change on floods and therefore on human health and ecosystems. Non-binding measures, like flood risk assessment and mapping, also need to be developed.

4. Articles 8, 12 and 13 of the Protocol on Water and Health directly refer to extreme weather events. Under article 8, the Parties to the Protocol should establish early-warning systems that identify outbreaks or incidents of water-related diseases, including those caused by extreme weather events. Under article 12, the Parties are requested to promote cooperation in relation to joint systems for surveillance and early warning; and under article 13, Parties should cooperate and assist each other to prevent, control and reduce transboundary effects of water-related diseases. The annex provides background information on extreme weather events and their health impacts and proposes activities to be carried out by an expert group on extreme weather events, water and health.

5. The Working Group may wish to:

(a) Note the added value of the proposed work of the expert group to the Water Convention's activity on flood protection, prevention and mitigation, carried out by a task force with Germany as lead country (see ECE/MP.WAT/15/Add.2, programme element 2.1; and MP.WAT/SEM.3/2004/3);

(b) Set up, under the existing work plan, an expert group on extreme weather events, water and health to undertake the tasks outlined in the annex;

(c) Invite countries to lead, and contribute to, the work of the expert group;

(d) Convene the first meeting of the expert group well in advance of the first meeting of the Parties to the Protocol;

(e) Request the expert group to report to the Protocol Parties at their first meeting about achievements and further work to be undertaken;

(f) Invite the Parties to the Protocol on Water and Health at their first meeting to consider continuing work on extreme weather events as set out in document MP.WAT/WG.4/2005/6 - EUR/05/5047554/6;

(g) Request the secretariat to inform the Water Convention's Working Group on Integrated Water Resources Management about the above decisions and the opportunities for joint action of the national water and health authorities.

## Annex

### **POSSIBLE ACTIVITIES OF THE WORKING GROUP ON WATER AND HEALTH RELATED TO EXTREME WEATHER EVENTS, WATER AND HEALTH**

#### **What are extreme weather events?**

1. An event is considered extreme, if some of its characteristics, such as magnitude, duration, speed of onset or intensity, lie outside a particular society's experiential or coping range, whether or not the event is rare. In 2003, for example, there were several noteworthy events across Europe, including annual temperature anomalies of 1–2 °C over Central and Western Europe, prolonged summer drought, a major heat wave, and severe wildfires in Portugal and the Mediterranean. Events can occur over short-time scales or beyond the synoptic time scale. Extreme events also occur on a range of spatial scales, from more concentrated events, such as windstorms, to more diffuse events, like heat waves.

2. Extreme weather events that occurred in different European countries with increased frequency and intensity over the last 30 years are floods, heat waves and droughts, cold spells and windstorms. According to climate models, it is expected that increased greenhouse gas emissions may change the frequency, intensity and duration of extreme events, such as more hot days, heat waves, heavy precipitation events and fewer cold days.<sup>5</sup>

3. Floods and droughts (heat waves) are those extreme events, which are of relevance to the Protocol on Water and Health as they are water related and potentially cause water-related diseases. Floods are the most common natural disaster in Europe (see also Table 1). The risk of floods will probably increase during the coming decades. This risk consists of two levels: firstly, the magnitude and frequency of floods are likely to increase in the future as a result of climate change, i.e. higher intensity of rainfall as well as rising sea levels. Secondly, the impact of flood events may increase, because more people live in areas at risk of flooding and also more economic assets (business and industry) are located in such areas. Moreover, human activities such as the clearing of forests, the straightening of rivers, the suppression of natural flood plains and inadequate land-use planning, have contributed significantly to increasing the risk of floods.

4. It is further likely that an increased level of summer drying over most mid-latitude continental interiors might occur, with associated risk of droughts with potential decrease of water quantity and quality.<sup>6</sup> A severe widespread and long-lasting summer drought occurred in Europe in summer of 2003. It resulted from interplay of scarce precipitation and record-high temperatures, exceeding 40 °C in several European countries, beating national records. The heat wave in Southern Europe, accompanied by deficient precipitation, has led to wildfires, problems in water supply and energy production, and crop failures.

#### **What are the health concerns in relation to extreme weather events?**

5. Floods, as already identified in the Guidelines on Sustainable Flood Protection, affect health directly and indirectly. Persons might drown, get injured or contract infectious diseases

or suffer from more long lasting consequences (see Tables 1 and 2). In Europe, however, there is a small risk of communicable diseases following flooding, given the pre-existing diseases, public health infrastructure, water-system infrastructure and type of water system, water treatment and sewage disposal. Extreme rainfall and runoff events may increase the total microbial loads in watercourses and in drinking-water reservoirs.

6. Droughts and heat waves can affect human health directly and indirectly. The heat wave in 2003 caused more than 35,000 deaths, but also affected water quality and quantity. However, knowledge on the connection between droughts, heat waves, water quality and health outcomes is scarce.

7. Most of the health impacts of the above-mentioned extreme events are preventable. In order to mainstream prevention and adaptation measures under the Protocol on Water and Health and the Water Convention, an expert group should be established.

### **Suggestions for activities of the expert group**

8. As stated in the annex to the draft workplan (MP.WAT/WG.4/2005/6-EUR/05/5047554/6), support should be provided to the scientific communities and decision-makers to limit the impacts of extreme weather events on the environment, particularly to reduce effects on human health and ecosystems.

9. In order to carry out this task, which arises from relevant provisions of the Water Convention and the Protocol on Water and Health, the expert group should:

(a) Identify the main concerns related to the impacts of extreme weather events on water quality and quantity, as well as human health;

(b) Identify the ongoing processes to be strengthened, to reduce the health impacts of extreme weather events using the instruments provided by the Water Convention and its Protocol;

(c) Assist Parties in the development and implementation of reasonable targets, including: (i) target definition and setting; (ii) identification of baseline conditions; (iii) implementation of targets; and (iv) evaluation and monitoring of achievements.

(d) Assist Parties in implementing effective measures to reduce the burden on health of extreme events in order to achieve the defined targets, by: (i) stock taking of existing early-warning systems; (ii) identifying the most effective early-warning systems; (iii) assisting in implementing effective early-warning systems and all their components in order to allow early public health action and detection of water-related disease outbreaks (see article 8 of the Protocol on Water and Health); and (iv) assisting Parties in strengthening environmental health impact assessment of structural and non-structural response measures.

10. Interim results and possible future activities of the expert group should be brought forward to the Meeting of the Parties to the Protocol in 2006. It is expected that the Meeting of the Parties would agree on the continuation of activities related to extreme weather events as outlined in document MP.WAT/WG.4/2005/6-EUR/05/5047554/6, annex, programme element 2.3.

**Table 1: European floods in which more than 10 people died, 1995 –2004**

<b>Year</b>	<b>Country</b>	<b>Location</b>	<b>Victims and Damage</b>
July 2005	Romania	Alba, Tulcea, Giurgiu, Vrancea, Bacau, Braila, Galati departments	24 Deaths 14.669 Affected (US\$ 603.656.000)
March 2004	Turkey	Erzurum, Batman, Bitlis, Konya, Silifke	15 Deaths
July 2002	Turkey	Rize province	39 Deaths
August 2002	Germany	Basse-Saxe, Saxe-Anhalt, Saxe, Bavière, Bade-Wutemberg, Thuringe	27 Deaths 108 Injured 330.000 Affected (US\$ 9.129.229.000)
September 2002	France	Gard, Hérault, Vaucluse, Rhone, Provence departments	23 Deaths 2.500 Affected (US\$ 1.190.000.000)
August 2002	Czech Rep	Prague, Central Bohemia, Southern Bohemia, Pilsner, Carlsbad, Usti districts	18 Deaths 200.000 Affected (US\$ 2.000.000.000)
July 2001	Poland	Malopolskie, Swietokrzyskie, Donoslaskie, Oploskie, Slaskie, Warminsko-Mazurkie, Podlaskie, Gdansk, Slupsk regions	27 Deaths 15.000 Affected (US\$ 700.000.000)
January 2001	Greece	Athens, Corinth, Cape Sounion, Zakynthos	11 Deaths 450 Affected
October 2000	Italy	Piémont, Val d'Aoste, Ligurie	29 Deaths 43.000 Affected (US\$ 434.143.000)
September 2000	Italy	Soverato (Near Catanzaro, Calabria)	16 Deaths 22 Injured
June 2000	Spain	North-East	16 Deaths 500 Affected
November 1999	France	Aude, Tarn, Herault, Pyrenees-Orientales	36 Deaths 3.000 Affected (US\$ 2.990.000)
June 1999	Romania		19 Deaths 3 Injured 4.578 Affected
July 1999	Romania	Northern & Western parts of Romania	15 Deaths 22 Injured 3.840 Affected
July 1999	Serbia Montenegro	Belgrade, Podunavlje, Sumadija, Morava, Pomoravlje & Bor Districts	11 Deaths 60.339 Affected

<b>Year</b>	<b>Country</b>	<b>Location</b>	<b>Victims and Damage</b>
May 1998	Italy	Campania Region	147 Deaths 100 Affected (US\$ 28.700.000)
August 1998	Turkey	Beskoy (Trabzon province)	60 Deaths 1000 Affected
July 1998	Slovakia	Sabinov, Presov districts	54 Deaths 61 Injured 10.850 Affected (US\$ 24.500.000)
June 1998	Romania	Bacau, Vaslui, Vrancea (Northethn Moldavia), Salaj, Mures, Neamt, Cluj, Alba, Sibiu, Hundoara (Transylvania)	23 Deaths 12.000 Affected (US\$ 150.000.000)
June 1998	Turkey	Diyarbajir	22 Deaths
May 1998	Turkey	Zonguldak, Karabul, Bartin	10 Deaths 47 Injured 1.200.000 Affected (US\$ 1.000.000.000)
June 1997	Poland	Katowice, Opole, Walbrzych provinces	55 Deaths 162.500 Affected (US\$ 4.300.000.000)
July 1997	Czech Rep	Moravia, Bohemia regions	29 Deaths 2.409 Injured 87.725 Affected (US\$ 150.300.000)
July 1997	Romania	Alba, Arad, Bihor, Bistrita-Nasaud, Botosani, Braila, Buzau, Dimbovita, Galati, Hundedoara, Maramures, Mures, Sibiu, Timis, Tulcea, Vaskui, Vrancea, Prahova, Bacau, Iasi, Suceava, Teleorman, Olt, Dolj, Caras-Severin	20 Deaths (US\$ 110.000.000)
November 1997	Portugal	South	11 Deaths
June 1996	Italy	Tuscany, Lucca, Massa, Carrara, Udine, Florence, Veneto, Emiglia Romagni, Lombardia	26 Deaths (US\$ 1.000.000.000)
January 1996	Portugal	Central and North Regions	10 Deaths 1.050 Affected (US\$ 13.000.000)
July 1995	Turkey	Ankara, Istanbul, Senirkent	74 Deaths 10.000 Affected (US\$ 65.000.000)

<b>Year</b>	<b>Country</b>	<b>Location</b>	<b>Victims and Damage</b>
November 1995	Turkey	Izmir, Antalya, Isparta	63 Deaths 300.000 Affected (US\$ 1.000.000.000)
January 1995	France	Basse-Normandie, Champagne-Ardennes, Bretagne, Pays de Loire, Ile-de-France	16 Deaths 3.000 Affected (US\$ 570.000.000)

Source: "EM-DAT: The OFDA/CRED International Disaster Database - [www.em-dat.net](http://www.em-dat.net) - Université Catholique de Louvain - Brussels - Belgium"



**Table 2: The health outcomes of floods in Europe, with examples**

Outcome	Comment	Examples
Deaths	Most flood related deaths can be attributed to high floodwater velocities; rapid speed of flood onset; deep floodwaters, where floodwater is in excess of 1 metre depth; long duration floods; debris load of floodwaters; characteristics of accompanying weather and clean up activities in the aftermath of floods.	See table 1.
Injuries	Surveillance of morbidity following floods is limited and little information is available	A community survey conducted following the 1988 floods in Nimes, France found that 6% of households reported mild injuries (contusions, cuts, and sprains) related to the flood.
Vector and rodent borne diseases	A small risk of vector borne and rodent borne diseases has been observed, depending on the diseases present.	Leptospirosis outbreak occurred after the flooding in the Czech Republic (Kriz 1998; Kalashnikov et al. 2003) in 1997 and in the Russian federation in 2002 (Mezentsev et al. 2003). In 2002 floods rabbit-borne Tularemia was observed (Briukhanov et al. 2003). In Bucharest, Romania, people that had had their basements flooded, reported higher rates of vector borne infections (Han et al, 1999)
Water borne diseases	Small risk of communicable disease following flooding, although severe occurrences are rare due to the public health infrastructure (including water treatment and effective sewage pumping)	No increase in infectious disease was observed following the 1988 flash flood in Nimes, 1995 river floods in eastern Norway, or 2002 floods in UK Outbreaks of Norwalk-like virus, Campylobacter and rotavirus infections occurred in Finland after the 1994 floods (Kukkula et al. 1997). Finland reported 13 waterborne disease outbreaks with an estimated 7300 cases during 1998–1999, associated with untreated groundwater from mostly flooded areas. (Miettinen et al. 2001) Outbreaks of shigella dysentery were reported after the 2002 floods in Central Europe (Tuffs A & Bosch X).

<b>Outcome</b>	<b>Comment</b>	<b>Examples</b>
		The Russian Federation reported outbreaks in several territories of acute enteric infections of different origins as well as viral hepatitis A (Kalashnikov et al. 2003).
Respiratory disease	Very little information is available	Following the floods in the north-eastern Republic of Sakha (Yakutia) in July 1998, a high incidence of respiratory diseases was observed by the International Federation of Red Cross (IFRC, personal communication)

**Source:**

Hajat S, Ebi KL, Kovats S, Menne B, Edwards S, Haines A. 2003. The human health consequences of flooding in Europe and the implications for public health: a review of the literature. *Applied Environmental Science Public Health* 1:13-21.

Few R, Ahern M, Matthies F, Kovats S. 2004. Floods, health and climate change: a strategic review. Tyndall Centre for Climate Change Research Working Paper 63.

Notes:

- 1/ 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, referred to in the following text as the Water Convention (<http://www.unece.org/env/water/pdf/watercon.pdf>).
- 2/ The Guidelines on Sustainable Flood Protection, which were adopted in March 2000 (UNECE, 2000), have already been incorporated into national legislative acts or programmes in many countries and also in some international agreements (see MP.WAT/SEM.3/2004/3) (<http://www.unece.org/env/water/publications/documents/guidelinesfloode.pdf>).
- 3/ These recommendations are given in the report of the 2004 Seminar on Flood Prevention, Protection and Mitigation (MP.WAT.SEM.3/2004/3). (<http://www.unece.org/env/documents/2004/wat/sem.3/mp.wat.sem.3.2004.3e.pdf>)
- 4/ Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, done in London, 17<sup>th</sup> June 1999 (MP.WAT/2000/1, EUR/ICP/EHCO 020205/8Fin) (<http://www.unece.org/env/documents/2000/wat/mp.wat.2000.1.e.pdf>).
- 5/ IPCC Third Assessment Report 2001, Synthesis Report (<http://www.ipcc.ch/pub/un/syreng/spm.pdf>)
- 6/ IPCC Third Assessment Report 2001, Synthesis Report (<http://www.ipcc.ch/pub/un/syreng/spm.pdf>)
- 7/ Programme element 2.3, contained in the annex to the Draft workplan for activities under the auspices of the Meeting of the Parties of the Protocol on Water and Health deals with extreme weather events and describes the work to be undertaken (MP.WAT/WG.4/2005/3-EUR/05/5047554/3) (<http://www.unece.org/env/documents/2005/wat/wg.4/mp.wat.wg.4.2005.6.e.pdf>).