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Report on the current state of National Research Programmes on Climate Change Impacts and Adaptation in Europe

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Preface

Research on climate change, its impacts and adaptation is quite a new and emerging field of research worldwide and in the European Union. It is definitely one of the most dynamic scopes of applied environmental research. Its importance is proved by the implementation of the IPCC (Intergovernmental Panel on Climate Change) and the scope of its working groups I, II and III that cover the fields of impacts, vulnerability and adaptation, as well as mitigation, in a very broad and comprehensive approach. Although the UNFCCC (United Nations Framework Convention on Climate Change) and the Kyoto Protocol are tackling mostly the field of mitigation/reduction of GHGs (Green House Gases), the UNFCCC stresses also the importance of research on climate change impacts and adaptation measures.

The aim of this report is to achieve an up-to-date common knowledge base in the field of climate change impacts and adaptation initiatives within Europe. This embraces not only the EU member states but all of Europe.

This document investigates and gives account of all the European research Programmes related to climate change impacts and adaptation in terms of their most important actors (owner, manager), the Programmes' approaches (top down versus bottom up), major focus of research, budget, lifetime, relevant funded Projects, collaborations within and outside of Europe, and outlines their current role in relation to their national research system and national climate related policy. Moreover, it documents selected particularly innovative National Projects as well as National Organisations conducting direct research in this field.

Every Country is described according to the following structure:

Introduction

- I. Climate zone(s)
- II. Key vulnerabilities
- III. Extreme events
- IV. National Impact Scenarios
- V. National Adaptation Strategy
- VI. Climate Research Landscape

Programmes and Projects

- VII. National Programmes on Climate Change Impact and Adaptation
- VIII. National Projects not funded by a National Programme

Each Country is introduced by encompassing first its climate zones (I) and its most striking problems (II and III) with respect to the regional/national impacts of climate change. Then, the existing National Impact Scenarios (IV; if applicable) and the National Adaptation Strategy (V; if applicable) are described. Finally, the report traces the main features of the National research landscape (VI) where the Programmes/Projects, that are then documented (VII, VIII), are embedded, including an overview of the main pertinent National Organizations, too.

The study accounts for a wide range of Programme structures, with regard to Programme management and with regard to the scientific content, which is covered. CIRCLE will investigate these structures more in depth within its ongoing tasks and deliverables. There are quite a lot of countries in Europe without running programmes, however with some kind of institutional research funding on a Project-by-Project base. In such cases, the report provides contacts of responsible persons wherever this was possible.

Note

This study provides a status report of all the information that was accessible for the consortium and was collected through an ad hoc eleven-page inquiry that was delivered to all CIRCLE Partners and some further European countries. The feedback was about 86%. The analysis also exploits existing assessments by authoritative sources such as the Countries' latest available National Communication (NC) under the UNFCCC and the EEA (European Environmental Agency) Technical report no. 7/2005, Vulnerability and Adaptation to Climate Change in Europe. (Acknowledgements of further references are at the end of this report).

As a status report, the *Extended Country Report* will be updated throughout the envisaged running time of CIRCLE CA (2005-2007/8).

Executive Summary

Climate zone(s) (after Köppen-Geiger)

The Climate zones of the European Countries described in this report are consistent with the (Köppen-Geiger) classification showed in the following table (source: <http://geography.about.com/library/weekly/aa011700b.htm>)

Köppen-Geiger Climate Classification		
Symbol	Definition	Synthetic description
A - Tropical Climates - Wet, hot equatorial regions (between 23,5° N/S) (average temperature of coolest month > 18 °C)		
Af	Tropical wet	No dry season
Am	Tropical monsoonal	Short dry season; heavy monsoonal rains in other months
Aw	Tropical savanna	Winter dry season
B - Dry Arid and Semiarid Climates - arid desert and semiarid grassland climates (precipitation < potential evaporation and transpiration from vegetation)		
BWh	Subtropical desert	Low-latitude desert
BSh	Subtropical steppe	Low-latitude dry
BWk	Mid-latitude desert	Mid-latitude desert
BSk	Mid-latitude steppe	Mid-latitude dry
C - Mesothermal (mid-latitude) Climates - (humid subtropical, Mediterranean, and marine west coast climates) (average temperature of coldest month between 0 °C and 18°C, warmest month > 10 °C, seasonal climates)		
Csa	Mediterranean	Mild with dry, hot summer (warmest month > 22°C)
Csb	Mediterranean	Mild with dry, warm summer (warmest month > 22°C)
Cfa	Humid subtropical	Mild with no dry season, hot summer

Cwa	Humid subtropical	Mild with dry winter, hot summer
Cfb	Marine west coast	Mild with no dry season, warm summer
Cfc	Marine west coast	Mild with no dry season, cool summer
D - Microthermal (higher-latitude) Climates - (humid continental and sub-arctic climates) (cool temperate to cold: average temp. of warmest month > 10 °C, coldest month < 0 °C)		
Dfa	Humid continental	Humid with severe winter, no dry season, hot summer
Dfb	Humid continental	Humid with severe winter, no dry season, warm summer
Dwa	Humid continental	Humid with severe, dry winter, hot summer
Dwb	Humid continental	Humid with severe, dry winter, warm summer
Dfc	Sub-arctic	Severe winter, no dry season, cool summer
Dfd	Sub-arctic	Severe, very cold winter, no dry season, cool summer
Dwc	Sub-arctic	Severe, dry winter, cool summer
Dwd	Sub-arctic	Severe, very cold and dry winter, cool summer
E - Polar Climates (always cold, warmest month below 10 °C)		
ET	Tundra	Polar tundra, no true summer
EF	Ice Cap	Perennial ice
H - Highland Climates		

Table 1. Köppen-Geiger Climate zones Classification

(For further details please cp.

http://en.wikipedia.org/wiki/K%C3%B6ppen_climate_classification or
<http://geography.about.com/library/weekly/aa011700b.htm>).

Key vulnerabilities

South-Eastern Europe, the Mediterranean and Central European regions are likely to be Europe's most vulnerable regions to climate change, as stated by the EEA (Technical report no. 7/2005, Vulnerability and Adaptation to Climate Change). Furthermore, mountain regions, coastal zones, wetlands and the Mediterranean region are particularly vulnerable.

In accordance with the information collected by this report, the current key vulnerabilities in Europe are the following:

Key vulnerable areas

4 Mountains (especially the Alps)

- physical (fluvial and (peri-)glacial) geomorphologic processes mainly in the alpine region: avalanches, debris and mud flows, rock falls, floods;
- ecological impacts (changes in species composition, risk of loss of plant species and habitats);
- socio-economic impacts (tourism, winter sports, etc...);
- the Alps are particularly vulnerable to climate change and are already suffering from higher than average increases in temperature (temperatures in the Alps have increased by 1.8°C during the last 150 years compared to 0.7-0.8°C in the global average).

4 Coastal areas (especially on the Baltic, Mediterranean and Black Seas)

- aggravation of low coast submersion and hence quicker erosion, from sea level rise and storm-related floods. Coastal wetlands, lagoon coasts and delta zones, are particularly vulnerable, as well as estuaries and river deltas undergoing more salinisation;
- deterioration of natural ecosystems: coastal habitats and ecosystems on the Baltic, Mediterranean and Black Seas are particularly at risk.

Key vulnerable sectors

4 Water resources (especially in South and South-Eastern Europe)

- hydrology: the flood events experienced in recent years (especially in 2002) demonstrated Europe's vulnerability to hydrological extremes (IPCC Third Assessment Report (2001)). Besides, river flooding in winter may increase due to the expected concentration of precipitation in this period;

-
- water availability: water availability is already limited in parts of Europe where it is expected to further decrease (specifically in the Southern and South-Eastern Europe), due to both water supply decrease and water demand increase (especially in summer);
 - water quality: higher water temperature and low level of runoff, particularly in summer, could lead to deterioration in water quality.

4 **Agriculture**

- in Southern and Central Europe, where agriculture represents an important economic sector, the adverse effects of projected climate change impacts on agricultural areas, regionally and nationally, may be significant;
- under a changing climate with drier conditions, rising temperatures and increased risk of droughts and heat waves especially in the Southern Mediterranean, an overall reduction of crop yields is projected;
- irrigation water requirements for agricultural purposes would increase mainly in Southern and South-Eastern Europe;
- vegetation shift may endanger Southern and Central Europe agricultural productivity.

4 **Ecosystems (especially marine ecosystems and wetlands)**

- a vertical and horizontal shift of vegetation and ecosystems towards higher altitudes and elevations could determine ecosystems disruption;
- changes in both species distribution and composition are expected, particularly for species presently at the limit of their distribution, especially for marine and fresh water ecosystems. The combination of this climatic factor with the present habitat fragmentation, due to land use, may increase the risk for ecosystems and biodiversity loss;
- ecosystems resilience is likely to decrease, especially for marine ecosystems;
- the risk of forest fires may probable be higher in many parts of southern and continental Europe;
- salinisation, droughts and heat waves may lead to significant alterations to habitat conditions (especially of salt marshes and sand dune, mountain heaths, peat lands).

4 **Tourism**

- the tourist infrastructure related to the coastal zone, the primary tourist resource in Europe, is at risk from projected climate changes, including sea level rise and extremes. Tourist natural resources such as beaches, lagoons and wetlands are particularly at risk, especially in the South-East Mediterranean;

-
- the winter sports industry in Northern Europe and the Alps is expected to experience considerable loss due to the projected temperature rise and the associated snow-cover reduction.

Extreme events

Heat wave in 2003: the severe heat wave that affected the major part of Western Europe in summer 2003 had serious adverse effects on human health (especially on the elderly), as well as on water and agricultural resources. (France was the hardest hit country in Europe by the health impacts of the 2003 heat wave). Consequently, many countries started a deeper study and consideration of the impacts of climate change and adaptation measures in pertinent sectors such as health, agriculture, but also hydroelectric power supply and tourism.

Floods in August 2002 and summer 2005: the recent floods in 2002 and 2005 caused heavy direct damages to human health, infrastructures and natural resources. Further indirect health effects included gastrointestinal infections, due to contamination of food and water, and psychological effects. Therefore, these events have motivated countries considering a reorganisation of their health care services. Moreover, the need for an effective flood-risk-management strategy has been commonly recognized.

National Impact Scenarios

According to the information collected so far, several Countries (e.g. Denmark, Finland, Portugal, Sweden, the Netherlands and the UK) have started or are on the way of implementing an all-embracing multi-sectoral assessment of the projected climate change impacts at national level. However, only a few of them provide an integrated approach (e.g. Portugal, Finland and the Netherlands).

These evaluations use the most advanced science, computing technologies and the latest available data and information. Most of the existing assessments generally make use of the standard IPCC climate, non-climate, and socio-economic scenarios, developed and applied to sectoral impact models.

4 Climate scenarios: to provide input for impact assessments, most studies developed climate scenarios from General Circulation Model (GCM) simulations. Such models are normally resolved at a resolution typically of a few hundred

kilometres, therefore much coarser than what impact and vulnerability assessments require. Therefore, when possible, different downscaling techniques were applied to interpret GCM results. Since Regional climate modelling (RCM) is very resources and technical skills demanding, its development and application are currently quite limited to a few excellence climate centres in Europe (the mostly used models have been the HadCM 2/3 and/or ECHAM 3/4/5).

4 Socio-economic scenarios: socio-economic assessments largely made use of the Socio-economic scenarios by the IPCC Special Report on Emissions Scenarios (SRES). Since SRES scenarios have a global value, and do not account for national or sub-national socio-economic conditions, most analysis implemented different procedures to downscale SRES scenarios.

The following table summarizes the National Impact Scenarios presently available for each Country, as described in this report, as well as their sources.

National Impact Scenarios		
Country	Sources used in this report	Content
CIRCLE CONTRACTORS		
AUSTRIA	Partners' contribution + 3rd NC	Some projections (for Alpine and mountain areas)
BELGIUM	4th NC	Few Scenarios based on IPCC Scenarios for Belgian area and RCM for Europe
FINLAND	Partners' contribution + Finland's Adapt. Strategy	Full assessment (RCM)
FRANCE	4th NC	Some Scenarios (RCM for France, Western Europe and the Mediterranean)
GERMANY	Info not available yet	Waiting for 4th NC
HUNGARY	3rd NC	Only general global projections for agriculture
ISRAEL	Partners' contribution + 1st NC	Some Scenarios (RCM) but need further research
ITALY	3rd NC	IPCC Scenarios for the Mediterranean area
NORWAY	Partners' contribution+ 3rd NC	Some Scenarios (RCM for Northern Europe, downscaling to Norway)
PORTUGAL	Partners' contribution + 4th NC	Integrated comprehensive assessment (RCM for Southern Europe)
SWEDEN	4th NC	Full assessment (RCM for Europe and the Baltic Sea)
THE	Partners' contribution	Integrated assessment of 7 Scenarios

NETHERLANDS		(RCM for Western Europe)
CIRCLE OBSERVERS		
ICELAND	3rd NC	Some (direct impacts) Scenarios (GCM, RCM)
IRELAND	3rd NC	Some Scenarios (GCM, RCM for the North Atlantic Region)
DENMARK	4th NC	Full assessment (GCM, IPCC TAR)
POLAND	3rd NC	Few Scenarios (GCM)
RUSSIA	3rd NC	Some Scenarios (GCM)
UK	UKCIP Report 2005	Full assessment (GCM, RCM for Europe and UK)

Table 2. National Impacts scenarios

The broad knowledge gathered by such research initiatives is of great importance also to support adaptation planning.

National Adaptation Strategy

European policy framework

In Europe research in support of planning of national and international adaptation measures started only recently, as confirmed also by the EEA (Technical report no. 7/2005, Vulnerability and Adaptation to Climate Change in Europe). Therefore adaptation, unlike mitigation, as a policy response to climate change, is still in its early stages of development. At present, there is not a EU level adaptation policy framework, although a discussion has started since the end of 2005 within the second phase of the European Climate Change Programme (ECCP) (<http://europa.eu.int/comm/environment/climat/eccp.htm>).

National Adaptation Strategies

At National level Adaptation Strategies currently exist only in Finland and are under preparation in France, the UK and Norway.

- 4 Finland is the only European Country which developed a National Strategy for Adaptation to Climate Change (published in 2005 by the Ministry of Agriculture and Forestry of Finland);
- 4 The French National Adaptation Strategy is presently under development;

4 The UK's first Adaptation Policy Framework is already in progress, under the guidance of Defra (Department for Environment Food and Rural Affairs);

4 Norway is currently in the process of developing adequate response strategies to the impacts of climate change, both sector by sector and as an overall strategy.

Many other European countries have taken the first steps in including climate change adaptation within the framework of their National Climate Policy, in addition and complementarily to mitigation. As a consequence, a broad range of adaptation actions have been implemented at different governmental levels and various sectors. From these efforts a variety of theoretical and practical knowledge has resulted specifically on possible options to adapt to projected climate changes impacts.

Examples of adaptation measures implemented by the Countries

Most of the existing adaptation measures focus on flood defence, originated by the significant losses suffered from extreme weather events in recent years (e.g. 2002 floods and 2003 heat waves). Adaptation measures are either planned or taking place in the context of natural hazard prevention, environment protection and sustainable resource management that are also beneficial for adapting to climatic change. These measures are generally aimed more at reducing vulnerability to current climate variability and extreme weather conditions, rather than at preventing the potential adverse effects of the projected climate changes.

The following table summarizes the most remarkable examples of Climate Change Adaptation measures implemented by each Country.

Adaptation measures		
Country	Sources used in the present report	Content
CIRCLE CONTRACTORS		
AUSTRIA	Partners' contribution + 3rd NC	Environmental and natural hazards risks management (for forest ecosystems, avalanches, erosion, torrents control)
BELGIUM	Partners' contribution + 4th NC	floods and water resources risk management, forestry
FINLAND	Partners' contr. + Finland's Adaptation Strategy	forestry, infrastructure (transport, buildings) and hydropower generation
FRANCE	Partners' contribution + 4th NC	natural hazards prevention, integrated natural and environmental resources management
GERMANY	Info not available yet	Waiting for 4th NC

HUNGARY	Partners' contribution + 3rd NC	adaptation measures against droughts damages
ISRAEL	Partners' contribution + 1st NC	fight against desertification, forestry protection
ITALY	Partners' contribution + 3rd NC	environmental and water resources protection, coastal zone management
NORWAY	Partners' contribution+ 3rd NC	forestry and infrastructure (buildings and roads)
PORTUGAL	Partners' contribution + 4th NC	National Contingency Plan for Heat waves
SWEDEN	Partners' contribution + 4th NC	physical planning and the built environment, forestry, management of ski resorts
THE NETHERLANDS	Partners' contribution + 4th NC	coastal and riverine zones management, ecosystem management (nature, biodiversity), agriculture, spatial planning
CIRCLE OBSERVERS		
ICELAND	3rd NC	infrastructure (e.g. harbour) design
IRELAND	Partners' contribution + 3rd NC	forestry, Integrated Coastal zone management (ICZM)
DENMARK	Partners' contribution + 4th NC	forestry, coastal protection
POLAND	Partners' contribution + 3rd NC	coastal protection
RUSSIA	3rd NC	flooding hazards
UK	3rd NC UKCIP Report 2005	river flood risk management, coastal zone flood defence, building regulations, health, agriculture

Table 3. Adaptation measures

The analysis of this information clearly shows that European Countries need to develop adaptation measures mostly in the sectors:

- 4 public health
- 4 water resources management
- 4 management of ecosystems.

Implementation of long-term planned proactive adaptation measures and policies is still to be performed by the major part of the countries.

Furthermore some features such as the roles and responsibilities of the stakeholders in the adaptation process and the implications of non-climatic factors have not been fully developed or considered in most of the undertaken studies or initiatives, in spite of the common acknowledgment of their importance.

Climate research landscape

EU Climate policy

EU climate policy has mainly focused on mitigation, rather than adaptation, in the recent past.

A fundamental measure, among others, is the EU-wide carbon trading scheme started in 2005 (European Commission, 2004).

The European Commission, in its proposals for a post-2012 climate change strategy, as well as in various Environment Councils (e.g. December 2004, March 2005), reaffirms the proposed EU target of 2 °C global temperature increase above pre-industrial levels to avoid serious adverse climate change effects. Furthermore it stresses the need for a European approach to climate change (European Commission, 2005) and underlines the importance of the **EU Action Plan on climate change** in the context of development cooperation (details on the EU Action Plan are given in the Annex to the EU Council Conclusion “Climate change in the context of development cooperation” (7523/03 DEVEN 195 ENV 586)).

It also emphasizes the need to anticipate and adapt to the consequences of some unavoidable climate change, as well as, the importance of incorporating the consideration of climate risks into poverty reduction strategies and National Strategies for sustainable development.

The European Climate Change Programme (**ECCP**), launched by the EU Commission in June 2000 and currently under its 2nd phase since October 2005, is now the Commission’s key instrument to consider and further develop the **EU’s climate policy** (http://europa.eu.int/comm/environment/climat/home_en.htm).

Under this programme, for the first time, **a working group on adaptation has been established**. This working group will discuss the EU role in adaptation policies, with the aim to:

- 4 integrate adaptation fully into relevant European policy areas,
- 4 identify key cost-effective practices in support of adaptation policy planning,
- 4 promote learning.

A consultation process has been already started with a wide range of stakeholders.

National Climate Research Landscape

The section of this report about the Climate research landscape describes how far the relevant National Research Programme/Programmes is/are linked to and

embedded in the overall National Climate research frame. The Climate Research structure of each Country is here illustrated. (This topic will be further developed and deepened under CIRCLE Deliverable I b-1: *Extended programme Scientific Content Report*, reviewing and analysing the scientific preferences and policy contexts of the above mentioned National Research Programmes.)

National Programmes on Climate Change Impacts and Adaptation

The collected information indicates that most (about 89%) of the considered European Countries have a National Programme on Climate Change Impacts and Adaptation: only the Russian Federation and Poland do not yet have any National Programme related to Climate Change issues.

Almost all the Programmes (about 92%) encompass basic climate science (climate, climate change, climate protection) and most of them (about 84%) focus on climate change impacts assessment. A lower part of them (about 64%) covers adaptation issues, too. A few of them (about 24%) deal with further different issues.

The following table summarizes, for each Country, the relative National Programme/Programmes on Climate Change Impacts and Adaptation, their focus of research, duration and budget.

National Programmes on Climate Change Impacts and Adaptation								
Country	N.	Name	Focus of research				Duration and Budget	
			Climate	Impacts	Adaptation	Other		
CIRCLE CONTRACTORS								
AUSTRIA	1	proVision	X	X	X	X	(2004-2006)	7 M €
	2	StartClim	X	X	X	X	(2003-2006)	790,000 €
	3	FloodRisk	X	X	X	X	(2003-2007)	1.4 M €
BELGIUM	1	SSD	X	X	X		(2005-2010)	65.4 M €
FINLAND	1	Finnish Project Programme for Global Change	X	X	X		(2004-2006)	8 M €
FRANCE	1	GICC	X	X	X		(1999-2010)	~20 M €/year
GERMANY	1	Research for Climate Protection and Protection from Climate Impacts	X	X	X		(2006-2009)	~30 M €
	2	DEKLIM	X	X			(2001-2006)	~39 M €
	3	GLOWA		X	X		(2000-2009)	~75 M €
HUNGARY	1	NKP II	X				(2003-2008)	2100 billion HUF
	2	JÁP	X	X		X	(2004-2008)	11 billion HUF
ISRAEL	1	Name not available yet	X		X		(2006-2008) for 2005	~200,000 €
ITALY	1	Strategic Programme for Sustainable Development and Climate Change	X	X			(2006-onward) (2006-2009)	~54 M €
NORWAY	1	NORKLIMA	X	X	X		(2004-2013)	~11 M €
PORTUGAL	1	Climate Change	X	X			(2005-2007)	1,030,000 € CIRCLE related

SWEDEN	1	Name not available yet		X		X	(2006-2010/12) ~0,5 M €/year
	2	Rosby Centre	X	X			(2006-onward) ? €
	3	Climate 2004	X	X	X		(2004-2007) 10 MSEK/year
THE NETHERLANDS	1	CCSP	X	X	X		(2004-2011) 80 M €
	2	NRP-CC including: - Scientific assessments and policy analyses Programme - Vulnerability, Adaptation and Mitigation (VAM) programme - NWO Global change programme	X	X	X		(2002-2006) ? €
	3	Other Research Programmes	X	X	X		(?) ? €
CIRCLE OBSERVERS							
DENMARK	1	DKC, Danish Climate Centre	X				(1998-onward) 5.5 M DKK/year
ICELAND	1	VO, Climate and Energy	X			X	(2004-2007) 780,000 €
IRELAND	1	ERTDI, Environmental Research Technologies and Innovation	X	X	X		(2000-2006) ~ 7M €/year
POLAND	/						
RUSSIA	/						
UK	1	UKCIP, UK Climate Impacts Programme	X	X	X		(1997-2005);(2005-onward) 800.000-900.000 €/year from DEFRA

Table 4. National Programmes on Climate Change Impacts and Adaptation