

# Use of climate data for EEA activities

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**Climate change impacts,  
vulnerability and adaptation**

Copernicus Climate Data Store Workshop,  
3 March 2015, ECMWF, Reading, UK



# EEA networking with member countries (Eionet)



## EEA coverage

Member countries

Cooperating countries

\*Kosovo under UNSCR 1244/99

- **33 member** and six collaborating **countries** (ministries and **environment agencies**)
- Main target audience: **policymakers** at European and national levels
- Supporting and informing policy development and implementation by **data, indicators and assessments** (e.g. on climate change impacts, vulnerability and adaptation)
- **Networking:** annual Eionet workshop, expert meetings, user/contributor meetings Climate-ADAPT, other conferences like ECCA2015
- Supported by a **European Topic Centre**, see: <http://cca.eionet.europa.eu/>

# THE EUROPEAN ENVIRONMENT

## STATE AND OUTLOOK 2015



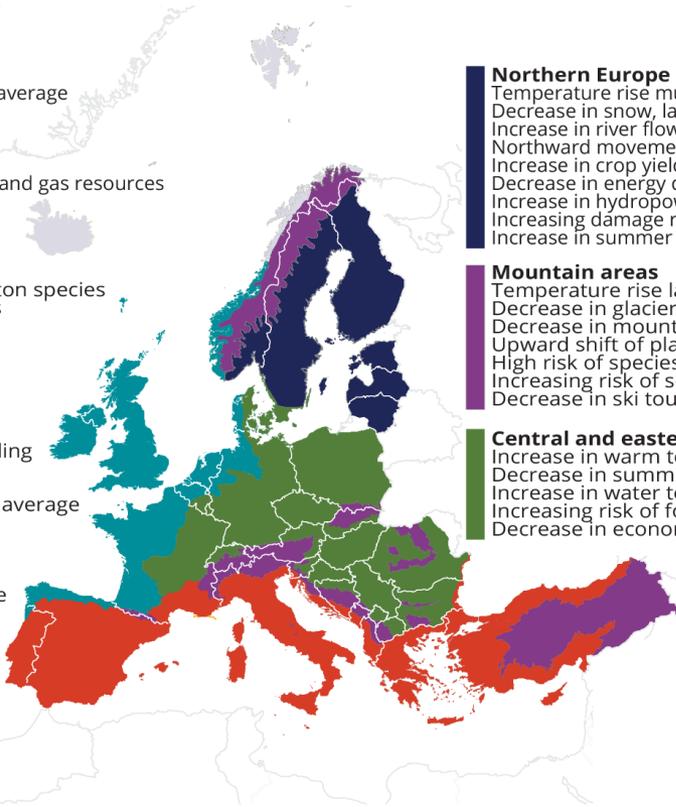
European Environment Agency



## Key observed and projected impacts from climate change for the main regions in Europe

SYNTHESIS REPORT	GLOBAL MEGATRENDS	EUROPEAN BRIEFINGS	COUNTRY COMPARISONS	COUNTRIES & REGIONS
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- Arctic**
  - Temperature rise much larger than global average
  - Decrease in Arctic sea ice coverage
  - Decrease in Greenland ice sheet
  - Decrease in permafrost areas
  - Increasing risk of biodiversity loss
  - Intensified shipping and exploitation of oil and gas resources
- Coastal zones and regional seas**
  - Sea-level rise
  - Increase in sea surface temperatures
  - Increase in ocean acidity
  - Northward expansion of fish and plankton species
  - Changes in phytoplankton communities
  - Increasing risk for fish stocks
- North-western Europe**
  - Increase in winter precipitation
  - Increase in river flow
  - Northward movement of species
  - Decrease in energy demand for heating
  - Increasing risk of river and coastal flooding
- Mediterranean region**
  - Temperature rise larger than European average
  - Decrease in annual precipitation
  - Decrease in annual river flow
  - Increasing risk of biodiversity loss
  - Increasing risk of desertification
  - Increasing water demand for agriculture
  - Decrease in crop yields
  - Increasing risk of forest fire
  - Increase in mortality from heat waves
  - Expansion of habitats for southern disease vectors
  - Decrease in hydropower potential
  - Decrease in summer tourism and potential increase in other seasons



- Northern Europe**
  - Temperature rise much larger than global average
  - Decrease in snow, lake and river ice cover
  - Increase in river flows
  - Northward movement of species
  - Increase in crop yields
  - Decrease in energy demand for heating
  - Increase in hydropower potential
  - Increasing damage risk from winter storms
  - Increase in summer tourism
- Mountain areas**
  - Temperature rise larger than European average
  - Decrease in glacier extent and volume
  - Decrease in mountain permafrost areas
  - Upward shift of plant and animal species
  - High risk of species extinction in Alpine regions
  - Increasing risk of soil erosion
  - Decrease in ski tourism
- Central and eastern Europe**
  - Increase in warm temperature extremes
  - Decrease in summer precipitation
  - Increase in water temperature
  - Increasing risk of forest fire
  - Decrease in economic value of forests

European Environment Agency 

Climate change impacts on ecosystems	Water use and water stress	Urban systems and grey infrastructure	Climate change & related envl. health risks
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Source: EEA (2012), Climate change, impacts and vulnerability in Europe 2012. An indicator-based report, EEA Report No 12/2012, European Environment Agency, Copenhagen, Denmark.

Related content



# The EU CC adaptation strategy (2013)

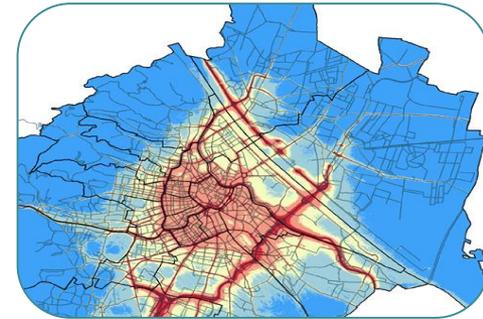
## Priority 1: Promoting action by Member States

- Action 1.** Encourage MS to adopt Adaptation Strategies and action plans
- Action 2.** LIFE funding, including adaptation priority areas
- Action 3.** Promoting adaptation action by cities along the Covenant of Mayors initiative



## Priority 2: Better informed decision-making

- Action 4.** Knowledge-gap strategy
- Action 5.** Climate-ADAPT

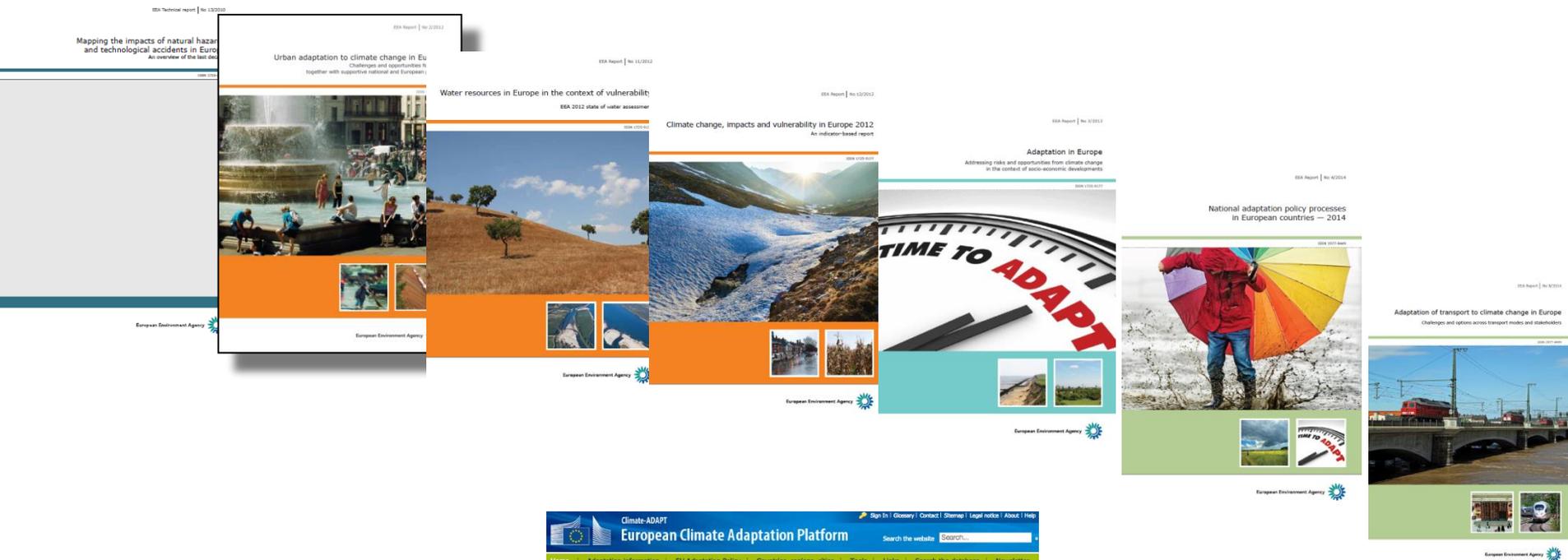


## Priority 3: Key vulnerable sectors

- Action 6.** Climate proofing the Common Agricultural Policy, Cohesion Policy, and the Common Fisheries Policy
- Action 7.** Making infrastructure more resilient
- Action 8.** Promote products & services by insurance and finance markets



# EEA activities on climate change impacts, vulnerability and adaptation



Supported by a European Topic Centre, see:

<http://cca.eionet.europa.eu/>

The screenshot shows the homepage of the European Climate Adaptation Platform (Climate-ADAPT). The header includes the EEA logo, the text "Climate-ADAPT European Climate Adaptation Platform", and navigation links: Sign In, Glossary, Contact, Sitemap, Legal notice, About, Help. A search bar is present with the text "Search the website".

The main content area features a large image of a modern building and the heading "About Climate Change Adaptation in Europe". Below this, a list of bullet points describes the platform's goals and features:

- Expected climate change in Europe
- Current and future vulnerability of regions and sectors
- National and transnational adaptation strategies
- Adaptation case studies and potential adaptation options
- Tools that support adaptation planning

Below the main content, there are several interactive elements:

- Adaptation Support Tool**: A circular diagram with numbers 1-5 and the text "How to adapt? Use the Adaptation Support Tool".
- What are European countries doing?**: A map of Europe with a "Choose a country" dropdown and a "GO" button.
- Find case studies on adaptation in Europe**: A map of Europe with location pins.
- Share your information**: A diagram showing a person icon connected to a network of other icons.

At the bottom, there are four columns of content:

- News**: A list of recent news items with dates and brief descriptions.
- Events**: A list of upcoming events with dates and locations.
- EU sector policies**: A list of policy areas including Agriculture & Forestry, Water, and Energy.
- EU information systems**: A list of information systems including WATERS ADAPT, WISE, and Biodiversity.

# National adaptation policy processes in Europe (EEA report published 14 Oct 2014)

- **Self-assessment** of 44 questions; 30 EEA member countries responded
- Mid 2013-mid 2014; two consultation processes of countries
- Key findings clustered around 8 Key Topics :
  - Public and policy awareness of the need for adaptation
  - Knowledge generation and use
  - Planning adaptation
  - Coordination of adaptation
  - Stakeholders involvement
  - Implementation of adaptation
  - Transnational cooperation
  - Monitoring, reporting and evaluation

EEA Report | No 4/2014

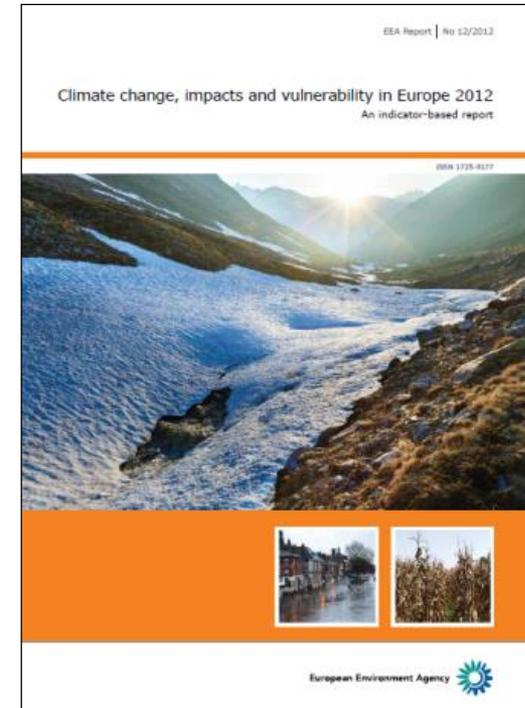
National adaptation policy processes  
in European countries – 2014



European Environment Agency 

# 2012 EEA indicator report on climate change, impacts and vulnerability

- **Coordination** by EEA
- **Authors and contributors (total 90):**
  - EEA and 3 European Topic Centres (CCA, ICM, BD)
  - Joint Research Centre (European Commission)
  - World Health Organisation (Regional Office for Europe)
  - European Centre for Disease Prevention and Control
  - Other organisations
- **External Advisory Group:**  
EC, EEA SC, WHO, ECMWF, IPCC, AMAP/SWIPA, etc.
- **Content:**  
Focus on indicators, but including additional information that is not suitable as EEA indicator
- **Data sources:**  
International databases, European and other research projects, academic publications
- **Extent:**  
300 pages, 42 indicators, >120 maps and figures



*To be updated and new report published in 2016*

# Content and structure of the 2012 CCIV report

Executive Summary

Technical Summary

Introduction

## 2. Changes in the climate system

- Key climate variables (5)
- Cryosphere (6)

## 3. Climate impacts on environmental systems

- Oceans and marine environment (5)
- Coastal zones (2)
- Freshwater quantity and quality (5)
- Terrestrial ecosystems (5)
- Soil (3)

(x): Number of “indicators”

## 4. Climate impacts on socio-economic systems and health

- Agriculture (4)
- Forests and forestry (2)
- Fisheries and aquaculture
- Human health (4)
- Energy (1)
- Transport
- Tourism

## 5. Vulnerability to climate change

- River flooding, water scarcity and droughts
- Integrated assessment of vulnerability
- Cities and urban areas
- Damage costs (1)

## 6. Indicator and data needs

# Climate change, impact and vulnerability indicators on EEA web site (many updated 2013/2014)

Category	Indicators	Category	Indicators
<b>Key climate variables</b>	<ul style="list-style-type: none"> <li>• Global and European Temperature</li> <li>• Temperature extremes</li> <li>• Mean precipitation and Precipitation extremes</li> <li>• Storms</li> </ul>	<b>Soil</b>	<ul style="list-style-type: none"> <li>• Soil organic carbon</li> <li>• Soil erosion</li> <li>• Soil moisture</li> </ul>
<b>Cryosphere</b>	<ul style="list-style-type: none"> <li>• Snow cover</li> <li>• Greenland ice sheet</li> <li>• Glaciers</li> <li>• Permafrost</li> <li>• Arctic and Baltic sea ice</li> </ul>	<b>Agriculture</b>	<ul style="list-style-type: none"> <li>• Growing season for agricultural crops</li> <li>• Agrophenology</li> <li>• Water-limited crop productivity</li> <li>• Irrigation water requirement</li> </ul>
<b>Oceans, marine environment, coastal areas</b>	<ul style="list-style-type: none"> <li>• Ocean acidification</li> <li>• Ocean heat content</li> <li>• Sea surface temperature</li> <li>• Phenology of marine species</li> <li>• Distribution of marine species</li> <li>• Global and European sea level rise</li> </ul>	<b>Forests and forestry</b>	<ul style="list-style-type: none"> <li>• Forest growth</li> <li>• Forest fires</li> </ul>
<b>Freshwater quantity and quality</b>	<ul style="list-style-type: none"> <li>• River flow</li> <li>• River floods</li> <li>• River flow drought</li> <li>• Water temperature</li> <li>• Lake and river ice cover</li> </ul>	<b>Human health</b>	<ul style="list-style-type: none"> <li>• Floods and health</li> <li>• Extreme temperatures and health</li> <li>• Air pollution by ozone and health</li> <li>• Vector-borne diseases</li> </ul>
<b>Terrestrial biodiversity and ecosystems</b>	<ul style="list-style-type: none"> <li>• Plant and fungi phenology</li> <li>• Animal phenology</li> <li>• Distribution of plant species</li> <li>• Distribution and abundance of animal species</li> <li>• Species interactions</li> </ul>	<b>Energy</b>	<ul style="list-style-type: none"> <li>• Heating degree days</li> </ul>
		<b>Vulnerability/risks</b>	<ul style="list-style-type: none"> <li>• Damages from weather and climate events</li> </ul>



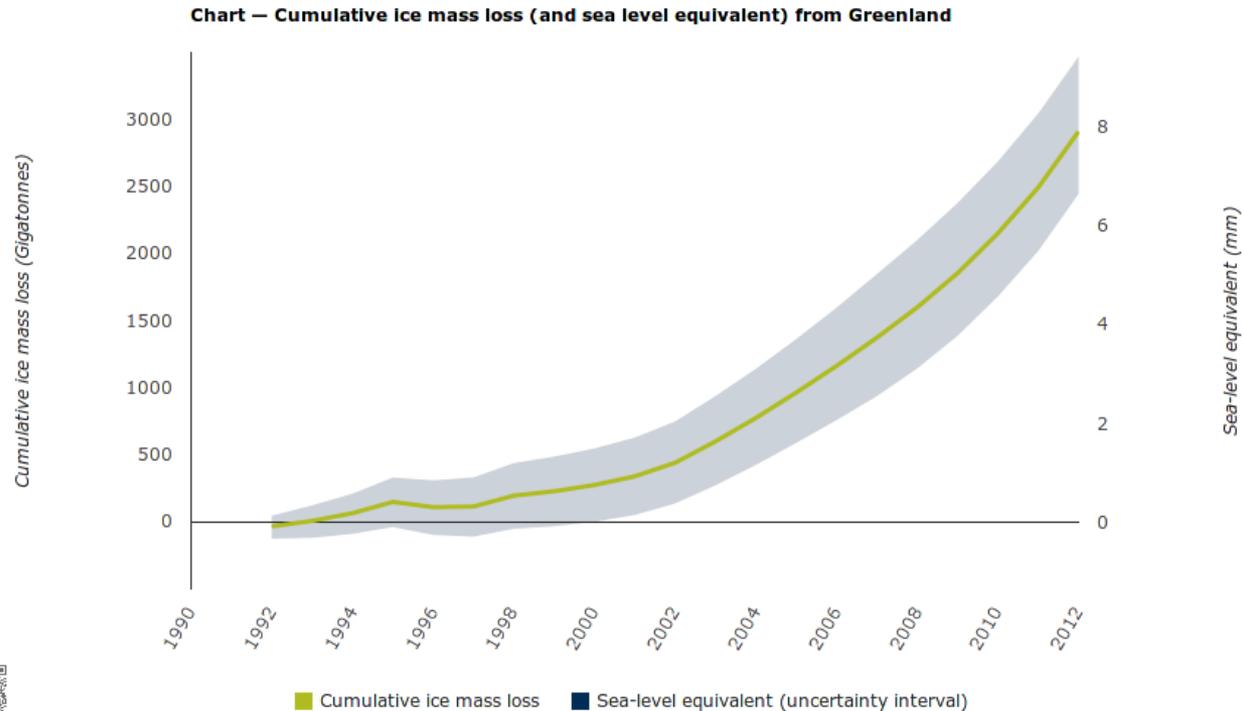
# Planned content developments 2016 CC IV report

- **Refocus** and reduce the underlying **indicator set**
- Include information on **policy context for adaptation (summary, EU policies, referring to 2014 report)**
- Include information on **vulnerability** beyond indicators (e.g. regional case studies; cross-border)
- Improved presentation of information related to **extreme climate and weather events**
  - EEA expert workshop in March 2015
- Additional information on **terrestrial ecosystems**
- Additional information on **marine ecosystems**
- Improved **coverage** of relevant **EU research projects**

# Organisation of 2016 CCIV report

- Lead: EEA climate change impact, vulnerability and adaptation group
- Various other EEA programmes involved
- External contributors:
  - European Topic Centres (ETC-CCA, ETC-ICM, ETC-BD)
  - JRC, WHO, ECDC, several EU projects
- External Advisory Group:
  - Commission (ENV, CLIMA, RTD, JRC)
  - EEA Scientific Committee
  - ECMWF
  - WHO Europe
  - UNEP Carpathian convention
  - Alpine Convention
  - AMAP
  - Countries' experts (DE, ES, SE, UK)
  - EPA network
  - several EU projects
- Review: Advisory Group, EEA member countries, Commission, further experts

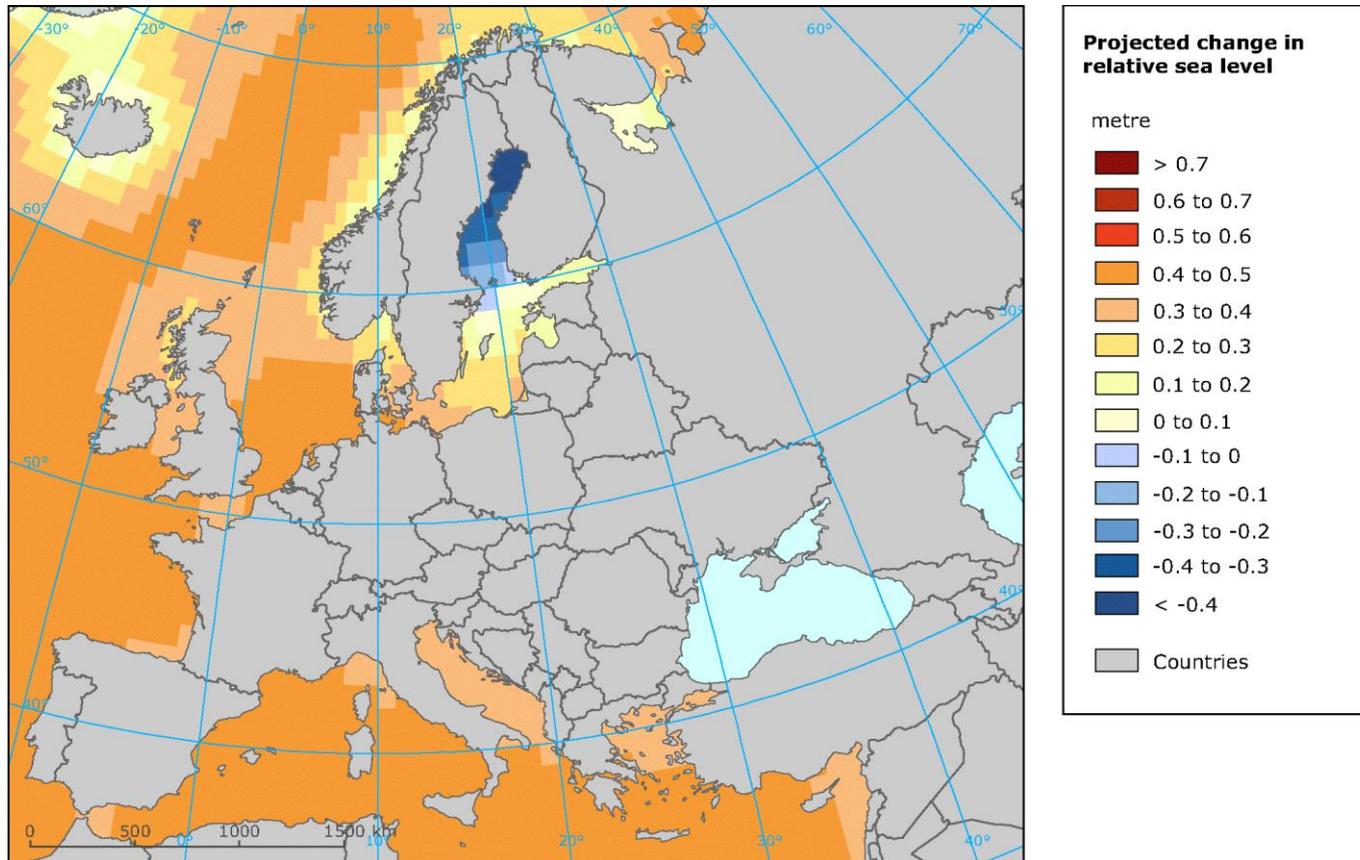
# Greenland ice sheet, example of CC indicator (1)



EEA web site: <http://www.eea.europa.eu/data-and-maps/indicators/greenland-ice-sheet-2/assessment-1>

- **Note:** Cumulative ice mass loss from Greenland derived as annual averages from 18 recent studies.
- **Data source:** adapted from Figure 4.15, Chapter 4 of IPCC Fifth Assessment Report, WGI report. Data was provided by Ian Allison (Lead Author of that chapter; Antarctic Climate and Ecosystems Cooperative Research Centre, Australia).  
[http://www.climatechange2013.org/images/report/WG1AR5\\_Chapter04\\_FINAL.pdf](http://www.climatechange2013.org/images/report/WG1AR5_Chapter04_FINAL.pdf)

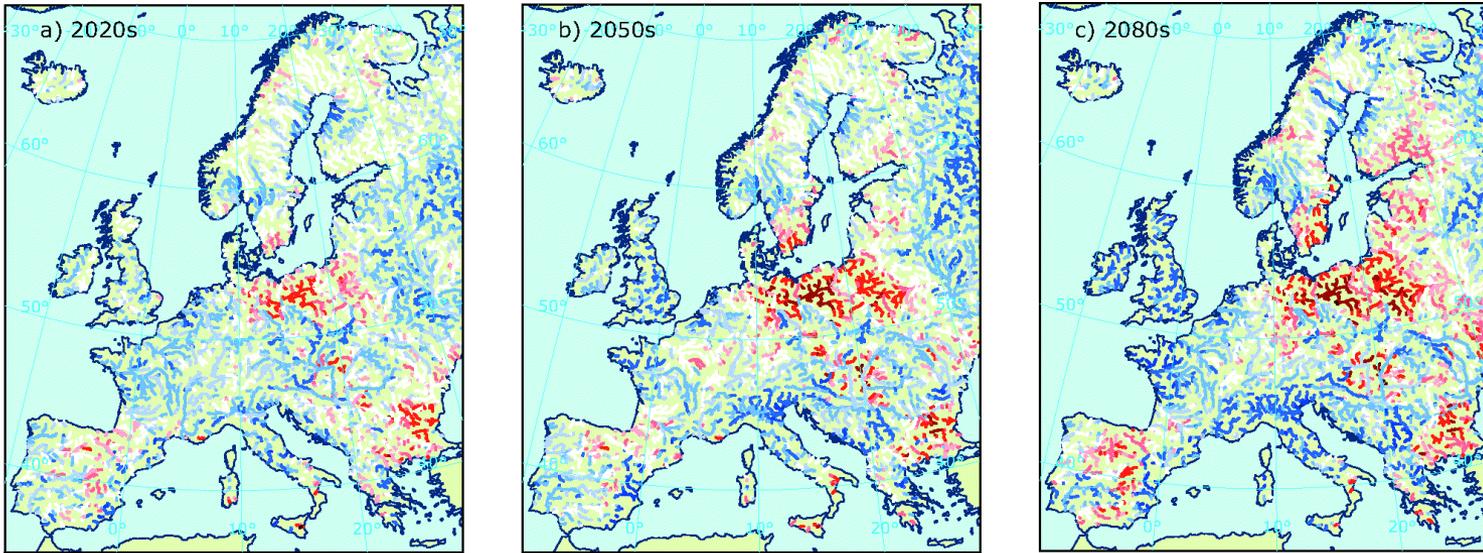
# Projected change in relative sea level, example of CC indicator (2)



EEA web site: <http://www.eea.europa.eu/data-and-maps/indicators/greenland-ice-sheet-2/assessment-1>

- **Note:** The map shows the projected change in relative sea level in 2081-2100 compared to 1986-2005 for the medium-low emission scenario RCP4.5 based on an ensemble of CMIP5 climate models. Projections consider land movement due to glacial isostatic adjustment but not land subsidence due to human activities. No projections are available for the Black Sea.
- **Data source:** AR5 Sea Level Rise projections provided by Integrated Climate Data Center (University of Hamburg), <http://icdc.zmaw.de/>; [ftp://ftp.icdc.zmaw.de/ar5\\_sea\\_level\\_rise/](ftp://ftp.icdc.zmaw.de/ar5_sea_level_rise/)

# Projected change in river floods with a return period of 100 years, example of CC impact indicator (1)



Relative change in river floods with a return period of 100 years between future period and 1961–1990 (SRES A1B)

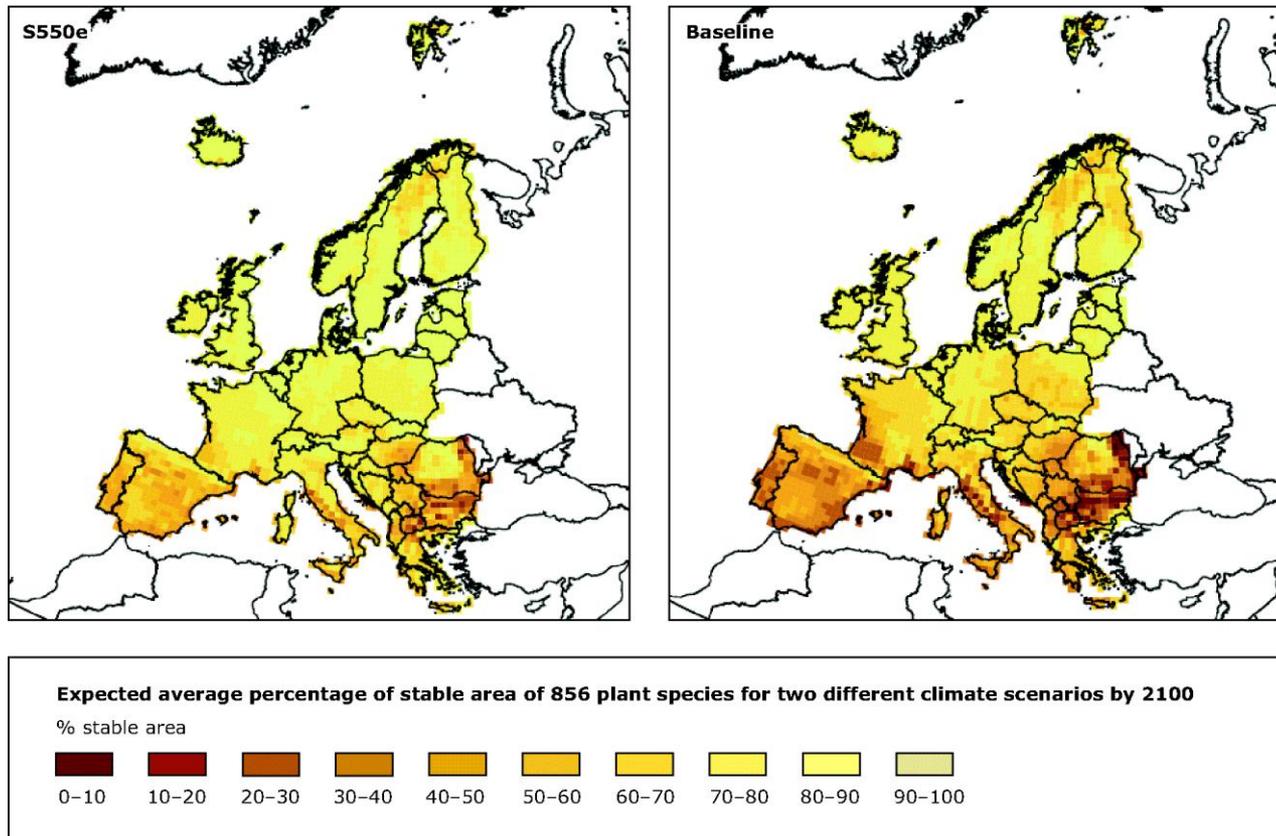


© 2012 JRC, European Commission

EEA web site: <http://www.eea.europa.eu/data-and-maps/indicators/river-floods-1/assessment>

- **Note:** Projected change in the level of a 100-year maximum level of river discharge between the reference period 1961–1990 and the 2020s (left), 2050s (centre) and 2050s (right) based on an ensemble of 12 RCM simulations with LISFLOOD for the SRES A1B scenario.
- **Data source:** Assessment of Future Flood Hazard in Europe Using a Large Ensemble of Bias Corrected Regional Climate Simulations provided by American Geophysical Union (AGU), <http://dx.doi.org/10.1029/2012JD017461>

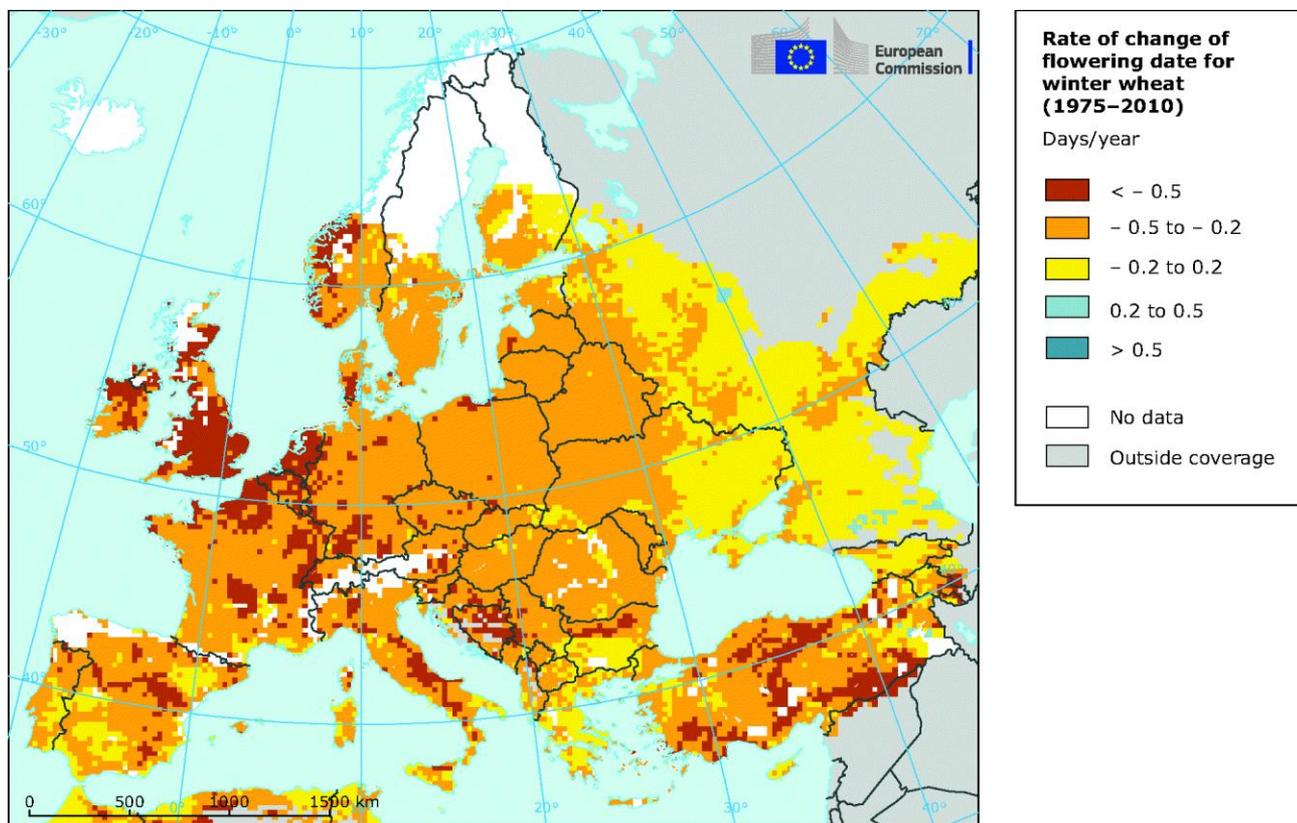
# Projected percentage of stable area of plant species for two different climate scenarios by 2100, example of CC impact indicator (2)



EEA web site: <http://www.eea.europa.eu/data-and-maps/indicators/distribution-of-plant-species-1/assessment>

- **Note:** The figure shows the expected average percentage of stable area of 856 plant species for two different climate scenarios by 2100. The S550e scenario corresponds to a stabilisation at 550 ppm CO<sub>2</sub> equivalent and a global mean temperature increase of 2°C, the baseline scenario corresponds to a global mean temperature increase of more than 3°C.
- **Data source:** Netherlands Environmental Assessment Agency (PBL), <http://link.springer.com/article/10.1007%2Fs10113-010-0161-1>

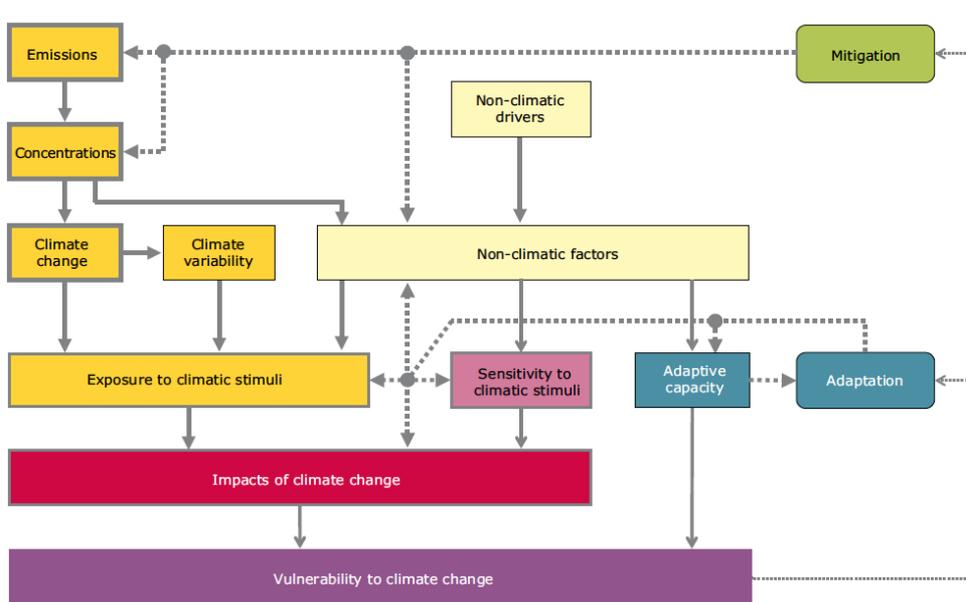
# Change of flowering date for winter wheat (1975-2010), example of CC impact indicator (3)



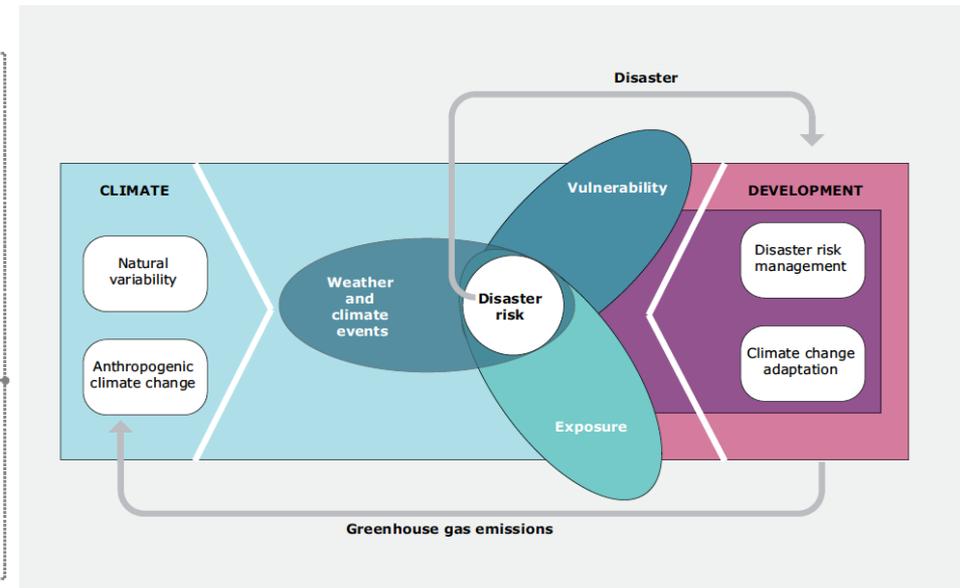
EEA web site: <http://www.eea.europa.eu/data-and-maps/indicators/timing-of-the-cycle-of-1/assessment>

- **Note:** The flowering date is defined as the day at which a modelization of the winter wheat reaches a development state of 100 in a scale 0 - 200 defined for the WOFOST growth model (Van Keulen H, Wolf J (1986) Modelling of agricultural production: weather soils and crops, Simulation monographs. Pudoc, Wageningen).
- **Data source:** Monitoring Agricultural ResourceS (MARS) provided by Joint Research Centre (JRC), <http://mars.jrc.ec.europa.eu/mars>

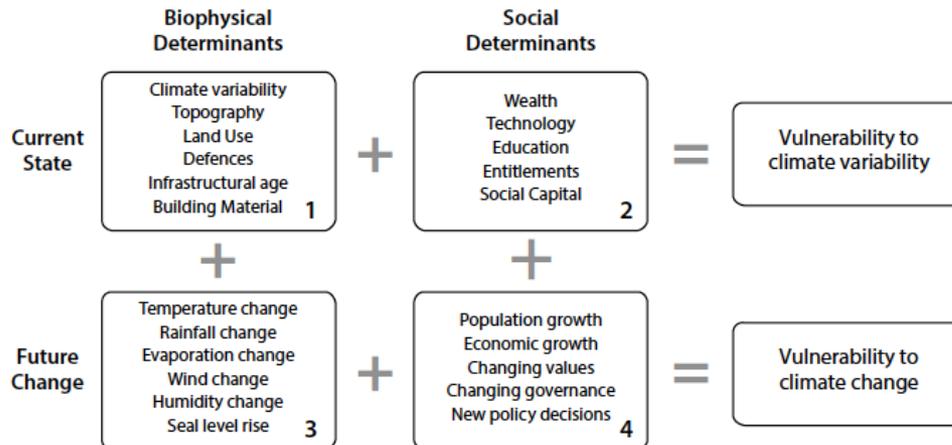
# Methods for climate change vulnerabilities and risks information



Source: IPCC, fourth assessment report (2007)

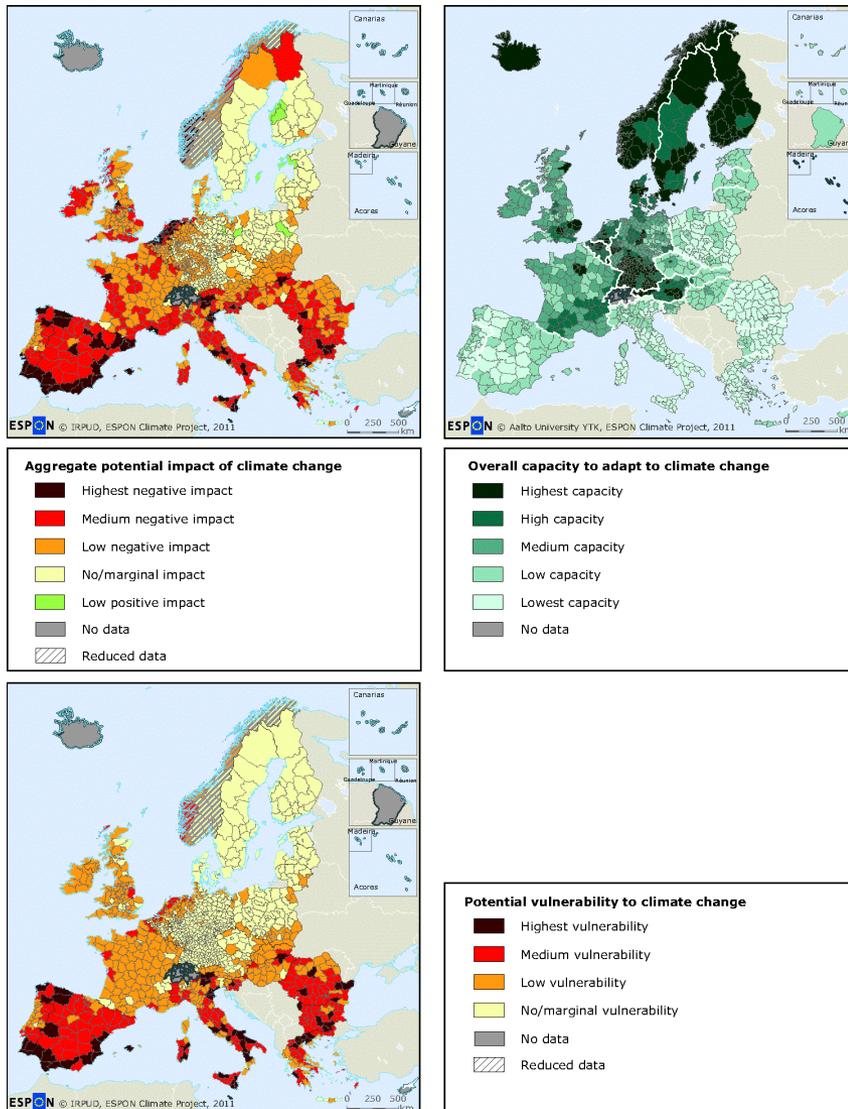


Source: IPCC, Special Report Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)



Source: UNEP/Global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA), Guidance on Assessing Vulnerability, Impacts and Adaptation to Climate Change (2013)

# Example: *aggregated vulnerability* (ESPON climate project)



## Method:

- Projections of the CCLM climate model (A1B scenario) were used comparing 1961–1990 and 2071–2100. **Eight climate change variables** were calculated and **supplemented by two variables** on 'triggered' changes in river flooding and coastal storm surge flooding. These exposure indicators were related to 22 sensitivity indicators.
- Individual impact indicators were calculated** for protected natural areas, forest fire-prone forests, soil organic carbon and soil erosion (**environmental**), and agriculture and forestry, energy production and consumption as well as summer and winter tourism (**economic**).
- The **resulting individual impact indicators were aggregated, using different weights**, to determine the physical, cultural, social, economic and environmental impacts of climate change (at NUTS3 level).
- Similarly, **15 indicators** on the economic, technological, educational and institutional **adaptive capacity were aggregated**.

## Data source:

- ESPON Climate, 2011, [http://www.espon.eu/main/Menu\\_Projects/Menu\\_AppliedResearch/climate.html](http://www.espon.eu/main/Menu_Projects/Menu_AppliedResearch/climate.html)

*See also other projects e.g. PESETAII (JRC) (published 2014) and CLIP-C (ongoing)*

# European Climate Adaptation Platform Climate-ADAPT

- **Supports** governmental policy and decision makers developing and implementing climate change adaptation strategies, policies and actions
- **Complementary** to national and sectoral platforms
- **Launched 2012** (DG CLIMA, EEA)
- **EEA maintains and updates**, with Commission, and supported by ETC CCA
- **New functionalities** since May 2014

The screenshot shows the homepage of the European Climate Adaptation Platform (Climate-ADAPT). The header includes the logo and navigation links: Sign In | Glossary | Contact | Sitemap | Legal notice | About | Help. The main navigation bar contains: Home | Adaptation information | EU Adaptation Policy | Countries, regions, cities | Tools | Links | Search the database | Newsletter. The main content area features a large image of a modern building with a curved facade, titled 'About Climate Change Adaptation in Europe'. Below this is a search bar and a navigation menu. The page is divided into several sections: 'New to adaptation? Use the Adaptation Support Tool', 'What are European countries doing?', 'Find case studies on adaptation in Europe', 'Share your information', 'News', 'Events', 'EU sector policies', and 'EU information systems'. The 'News' section lists several articles from May 2014, including 'Protecting farms from extreme weather with Agrirwizard guide', 'Presentations from Carpathian Convention WG on adaptation', and 'Assessing the world's...'. The 'Events' section lists events from June 2014, including the 'Sixth International Conference on Climate Change: Impacts and Responses' in Reykjavik, Iceland, and a webinar on 'Prepare your city for extreme weather events'.

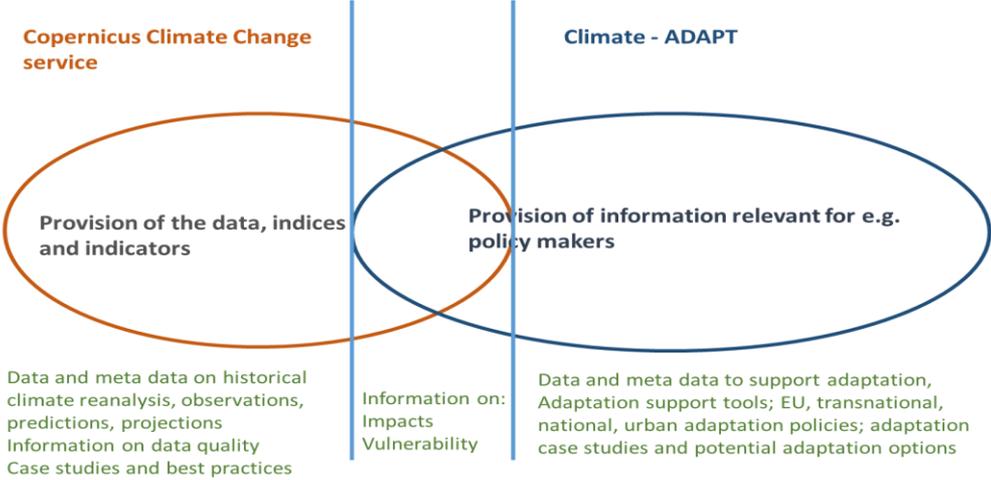
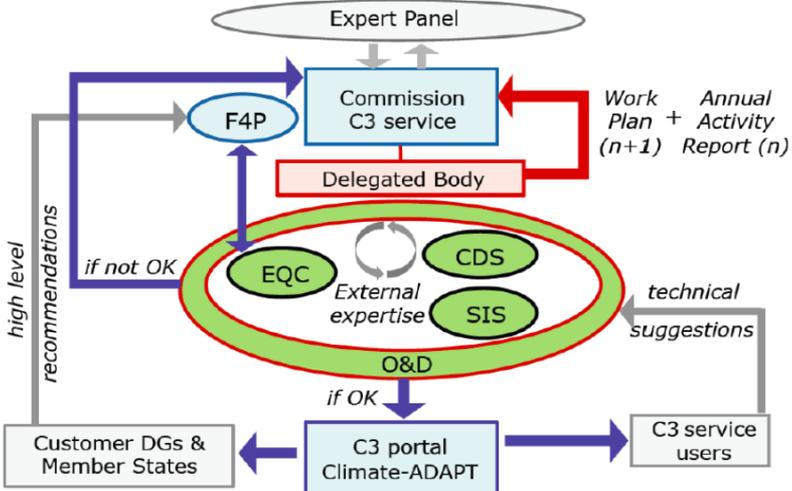
<http://climate-adapt.eea.europa.eu>

# Map viewer

Information and maps from various projects, see example on water stress

The screenshot displays the 'European Climate Adaptation Platform' map viewer. The interface includes a top navigation bar with the logo, 'CLIMATE-ADAPT' text, and links for 'Sign In', 'Glossary', 'Contact', 'Sitemap', 'Legal notice', and 'About'. A search bar is also present. Below the navigation bar is a menu with categories like 'Home', 'Adaptation information', 'EU sector policies', 'Countries, regions and cities', 'Tools', 'Links', and 'Search the database'. A secondary menu lists 'General', 'Adaptation support tool', 'Case study search tool', 'Map viewer', 'Uncertainty guidance', and 'Guidelines for project managers'. The main content area features a map of Europe with a color-coded overlay representing water stress levels. A 'Table of contents' panel on the right lists various map layers, including 'Topography', 'Annual average water stress (base line)', 'Annual average water stress (2050, SUE)', and 'Annual average water stress (2050, EcF)'. A legend below the table of contents defines the color coding: yellow for 'Low water stress', orange for 'Mid water stress', and red for 'Severe water stress'. On the left side of the map, there are navigation controls for zooming and panning. Below the map, there are two sections: 'Show a single map' with dropdown menus for 'Climate impact' (set to 'All climate impacts') and 'Adaptation sector' (set to 'All adaptation sectors'); and 'Show a set of maps' with a list of project categories: 'Climate variables - projected changes (ESPON Climate Change project)', 'ESPON Climate Change project', and 'Vulnerability and risk for the water sector'. An 'About this map viewer' link is also visible.

# Potential linkages between C3S and EEA activities (including Climate-ADAPT)



# Conclusions

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- **EEA supports and informs policy development and implementation** (data, indicators and assessments on climate change impacts, vulnerability and adaptation)
- **EEA main audience are policymakers** and **EEA collaborates with member countries** (environment agencies) and with many other organisations
- **EEA manages** (in collaboration with the European Commission) and **updates the European Climate Adaptation platform Climate-ADAPT** for sharing information and connecting adaptation communities
- The **Copernicus climate change service (C3S)** is expected to provide in-situ and satellite-based observations (essential climate variables), re-analysis data, climate change predictions and projections
- **C3S information can contribute** to EEA climate change and impact indicators; maps in the map viewer of Climate-ADAPT; and as searchable database items
- **Meetings to discuss collaboration between EEA and ECMWF** are planned (high-level, 11 March, and technical meetings afterwards)
- Exchanges on **how best to enhance and use the knowledge base on CC IVA and climate services** involving stakeholders, providers and users is needed (e.g. on Climate Services, 17 March, Brussels and the European Adaptation Conference, 12-14 May, Copenhagen)

# Thank you

See for more information:

<http://www.eea.europa.eu/themes/climate>

<http://climate-adapt.eea.europa.eu/>

<http://www.eea.europa.eu/soer>

