Examples of use of climate data for EEA indicators and Climate-ADAPT

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Climate change impacts and adaptation (EEA)
Main EEA products using climate data

1. Climate change impacts indicators (CLIM) (updated every 1-3 years) and EEA climate change assessments (every 4 years)

2. Climate-ADAPT (updated “daily”)
A typical data flow

ECVs

climate indices

Post-processing steps:
1. Changing the format
2. Inclusion into databases
3. Preparing maps or timeseries
4. Preparing meta data

WMS

EEA CLIM indicators

Climate - ADAPT

EEA
1. Climate change impacts indicators
An EEA climate change impact indicator:

- is a measure that can be used to illustrate and communicate **complex** climate change phenomena in a **simple way**
- comprises **specification** and **assessment(s)** including **key messages**
- uses quantitative data on **observed changes** and **projections**
- includes information on **uncertainties**
- has **policy** defined purposes
- uses well defined **criteria**
- is published on **EEA web pages (IMS)** and in **Climate-ADAPT**
- supports development of **adaptation policies**
Types and sources of data

Type:
- **Climate variables** (ECVs) (e.g. daily min, max, mean air temperature, total precipitation amount, …)
  - 23 indicators use directly at least one of the GCOS ECVs
- **Climate indices** (e.g. drought index, cold spell index, soil moisture index, …)
  - 7 indicators use different indices
- **in-situ** and/or **modelled** datasets (e.g. animal phenology data, distribution of species)

Sources:
- **Research projects** and programmes (EURO4M, ERA-CLIM2, UERRA,…)
- **Met** offices and **Climate** Services (ECMWF, UK MO, KNMI, …)
- **Global** and **European** organisations (WHO, ECDC, CRED, JRC, …)
- **Scientific** literature, through scientific databases

Criteria:
- Thematic and policy **relevance**
- Scientific **soundness**
- Geographical **coverage**
- **Appropriate** geographical characterization
- **Long** time series
- **Reliable** data supply
- **Clear** methodology
<table>
<thead>
<tr>
<th>Indicator name</th>
<th>ECV or climate index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global and European Temperature</td>
<td>T2m</td>
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<tr>
<td>Temperature extremes</td>
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<tr>
<td>Mean precipitation</td>
<td>Pcp</td>
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<tr>
<td>Storms</td>
<td>FF&amp;DD</td>
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<tr>
<td>Snow cover</td>
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<td>Greenland ice sheet</td>
<td>IcS</td>
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<td>Glaciers</td>
<td>Gla</td>
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<tr>
<td>Permafrost</td>
<td>Permafrost and seasonally frozen ground (stage III)</td>
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<td>Arctic and Baltic sea ice</td>
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<tr>
<td>Ocean acidification</td>
<td>Ocean Acidity (stage III)</td>
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<tr>
<td>Ocean heat content</td>
<td>OHC</td>
</tr>
<tr>
<td>Sea surface temperature</td>
<td>SST</td>
</tr>
<tr>
<td>Phenology of marine species</td>
<td>SST</td>
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<tr>
<td>Distribution of marine species</td>
<td>SST</td>
</tr>
<tr>
<td>Global and European sea level rise</td>
<td>SL</td>
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<td>Storm surges</td>
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<td>Soil organic carbon</td>
<td>LAI, FPR</td>
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<tr>
<td>Soil erosion</td>
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<tr>
<td>Water-limited crop productivity</td>
<td>Crop moisture index (stage II), Soil moisture (stage III)</td>
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<td>Irrigation water requirement</td>
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<tr>
<td>Forest fires</td>
<td>Fid</td>
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<tr>
<td>Extreme temperatures and health</td>
<td>Heat stress index (stage II)</td>
</tr>
<tr>
<td>Air pollution by ozone and health</td>
<td>O3A</td>
</tr>
<tr>
<td>Heating degree days</td>
<td>Residential Energy Demand Temperature index (stage II)</td>
</tr>
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</table>
Structure

Key messages

Assessment (narrative on observed trends and projected climate change answering policy question)

Specification (description of data and methodology)

Data:
- Observations (in situ, remote sensing, reanalysis)
- Climate projections

Meta data
- Units,
- Methodology,
- Uncertainty,
- Data providers,…
Describing climate change/impacts

Past trends
>30 years

Future projections
21st century

Describing climate system with climate variables

Describing climate change impacts on environmental systems

Describing climate change Impacts on socio-economic systems and health

Set of 45 climate change impacts indicators
European temperature (trends)

Policy question: How much have global and European temperatures increased since pre-industrial period?

To answer the PQ we need:
• long time series of air surface temperature (~ 150 years)
• Data in a reasonable spatial resolution over the globe
• Data in high spatial resolution
• Seasonally aggregated data
• Presenting uncertainties

Policy Question: What are the projected changes in temperature and precipitation in Europe?

To answer the PQ we need:

- Reliable multi-model projections by RCMs from EURO-CORDEX
- High spatial resolution datasets to assess regional differences
- RCMs driven by boundary conditions from different GCMs to assess ranges
- Different RCPs
- Projections for the whole 21st century
- Annual or seasonally aggregated data
- Bias corrected data in case of projections from impact models

Policy Question: What are the trends and projections in snow cover extent and snow mass in Europe?

To answer the PQ we need:

- Different indices; snow cover extent and snow mass from different sources (GlobSnow project, Global Snow Lab, Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE))
- Observations are based on in-situ and satellite observations show
- Projections based on GCMs and different RCPs

2. Tools in Climate-ADAPT
Climate observations and projections in Climate-ADAPT

- Map viewer and time series tool
- Spatial information on different ECVs and indices including time series
- Raster and vector maps with climate indices
- Various types of data providers
- Data stored at the source
- Combining different datasets in one map

Link: climate-adapt.eea.europa.eu/tools
Climate-ADAPT thematic mapviewer (v2)

- Five groups of data sources, connected to Climate-ADAPT with WMS
- Static maps, mainly on projections
- Possibilities to combine layers on impacts and vulnerabilities
- Basic structure (keep it simple)
- Information on the maps searchable in the Climate-ADAPT database
Climate-ADAPT timeseries tool

- An expert tool for presenting the timeseries of selected climate variables in Europe
- Developed by JRC
- 16 different sets ECVs or indices mainly based on observations
- Includes metadata portal
- Includes data from different sources using Web Features Service (WFS) and Web Map Service (WMS)
Climate-ADAPT timeseries tool

Selection of a ECV or an index for a selected timestamp

Options for spatial aggregation

Temporal presentation of selected ECV
Conclusions

- EEA CLIM indicators present both past trends and future projections,
- EEA CLIM indicators provide information on uncertainty of data, quality of input data, description of methodology,
- majority of EEA CLIM indicators could in future be based on the data and information provided by C3S,
- C3S could be a key contributor to EEA climate change impact assessments,
- Climate-ADAPT includes also tools for spatial and temporal visualisations of selected climate indices (using map viewer and time series tool),
- Climate-ADAPT tools like mapviewer and time series tool could in future include also outputs (like aggregated maps, timeseries of different indices, …) from C3S.
Thank you for your attention

http://www.eea.europa.eu/themes/climate
http://climate-adapt.eea.europa.eu
### Indicators and ECVs

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<td>River flow</td>
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<td>Crop moisture stress index</td>
<td>Not ECV, but index</td>
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<tr>
<td>Floods and Health</td>
<td>Link not identified</td>
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**As proposed in C3S**

- **C3S stage II**
- **C3S stage III**
- **GCOS**
- **Not defined**