

Consideration of uncertainties in national-level information for adaptation planning

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Overview

- Climate projections
- Non-climatic projections
- Climate change impact (CCIV) assessments
- Guidance for adaptation decision-makers

Study context

Question:

- Which information and guidance on uncertainties is available for adaptation actors across Europe?

Data sources:

- Questionnaire distributed through the EPA IG Adaptation
- Complemented by own enquiry and academic literature
- Further information will be collected through NRCs

Target publication:

- Book *“Adaptation decision-making and uncertainty – a practitioner’s guide”* (tentative title)
- Coordinated by CIRCLE2 ERA-NET
- Publication in late 2013

Country coverage

	Stage of selected national activities		
	Climate impact assessment	National adaptation strategy	National adaptation action plan
Country	1: in preparation; 2: finalized/adopted		
AT - Austria*	2	2	2
CH - Switzerland	2	2	1
DE - Germany*	1+2	2	2
ES - Spain	2	2	2
FI - Finland	2	2	2
FR - France*	1+2	2	1+2
HU - Hungary*	1+2	2	1+2
IE - Ireland*	1	2	1
NL - Netherlands*	2	2	2
NO - Norway	2	1	2
PL - Poland	1	1	1+2
PT - Portugal*	2	2	1
UK - United Kingdom*	2	2	2

- 21 EEA member countries addressed in first survey (via EPA IG Adaptation; further information to be included from NRCs)
- 12 countries responded
- 10 EEA member countries included in assessment (grey; "at advanced stage")
- 8 countries represented by at least one case study (asterisk; not presented here)
- 5 countries represented in national assessment as well as case study

Uncertainties in climate projections

- Climate projections differ widely in terms of their comprehensiveness (i.e. number of climate variables and their statistics).
- Most climate projections consider 2–5 different emissions scenarios. (The scenarios for the Netherlands applied a different approach.)
- Almost all climate projections are based on multi-model ensembles of 2–19 different global climate models (GCMs); some projections also consider perturbed-physics ensembles.
- All climate projections used regional climate models to downscale the coarse GCM projections; five climate projections additionally applied empirical-statistical downscaling methods.
- All major sources of uncertainty are covered to some degree in (almost all of) the climate projections assessed here.
- There are large differences in the presentation of different sources of uncertainty in maps and graphs.
- Four out of 13 climate change portals enable download of the raw data; six portals allow for the interactive creation of maps.
- The official status of climate projections varies widely across countries.

Uncertainties in climate projections

Country	Name of projection (or portal)	Date	Time horizon	Emission scenarios	GCMs ⁽¹⁾	Down-scaling ⁽²⁾	Nr. of variables ⁽³⁾	Data download	Interactive maps	Status ⁽⁴⁾
Austria	reclip:century	2011	2050 [‡]	2	2	2	2	✓	✓	1
Switzerland	CH2011	2011	2100	3	6	(20)	2	✓	—	4
Germany	Deutscher Klimaatlas	2011	2100	5	4*	11	9	—	✓	2
	Regionaler Klimaatlas	?	2100	4	3*	3	23	—	✓	1
Spain	Escenarios regionalizados de cambio climático	2009	2100	2	3	9*	3 - 15	—	—	1
	PNACC 2012	2013	2100	3	3	3*	3	✓	—	3
Finland	ACCLIM	2009	2100	3	19*	9	9 - 12	—	✓	2
Ireland	C4I	2008	2100	4	5	2*	12	—	—	1
Netherlands	KNMI'06	2006	2050 [‡]	n.a. [‡]	5	10	4	—	—	2
	Klimaateffect-atlas	2009	2100	n.a. [‡]	?	?	47	—	✓	2
Norway	Klima i Norge 2100	2009	2100	3	6	(22)*	13	—	—	2
Poland	Projekcje klimatu	?	2100	1	4	7	2	—	✓	1
United Kingdom	UKCP09	2009	2100	3	1 [‡] *	1*	9	✓	✓	3

(1) An asterisk (*) denotes that a perturbed physics ensemble was produced by at least one of the GCMs.

(2) A bracketed number indicates the number of GCM/RCM combinations considered rather than the number of regional climate models (RCMs). An asterisk (*) denotes that empirical-statistical downscaling models were applied in addition to RCMs.

(3) “Difficult” to count due to multitude of seasonal aggregations and other statistics.

(4) 1: No official status; 2: De facto standard; 3: Use officially recommended; 4: Use officially required

Availability of non-climatic projections

- Dedicated non-climatic projections for climate impact, vulnerability and risk assessments are available in three countries only (FI, NL, UK)
- All available non-climatic projections include 3–4 scenarios based on / linked to the IPCC SRES storylines
- The projections include ca. 10–25 variables from these key areas:
 - Demography
 - Economy
 - Land use
 - Environment
 - *Energy, transport and agriculture (not all)*

Availability of non-climatic projections

Country	Date	Name	Content
Finland	2005	FINADAPT scenarios for the 21st century	Downscaled scenarios of population, sector-specific GDP, household consumption, nitrogen deposition and land use consistent with 3 out of 4 SRES scenario families
	2007	Assessing the adaptive capacity of the Finnish environment and society under a changing climate: FINADAPT	
Netherlands	2006	Welfare, Prosperity and Quality of the Living Environment (WLO)	The 4 WLO scenarios comprise 26 variables related to demography, economy, housing, industrial areas, mobility, energy, agriculture and environment. They were evaluated again in 2010 and they build the basis of the IC11 scenarios.
	2010	Bestendigheid van de WLO-scenario's	
	2011	Socio-economic Scenarios in Climate Assessments (IC11)	
United Kingdom	2001	Socio-economic scenarios for climate change impact assessment (SES)	The 4 SES scenarios aligned with the 4 SRES scenario families provide quantitative projections until 2050 for 12 variables and qualitative projections for further topics from similar topic areas as the Dutch scenarios.

Availability of national CCIV assessments

- All countries considered (except Poland) have published CCIV assessments covering key climate-sensitive sectors and systems.
- The CCIV assessments differ considerably in their method, scope, extent, level of quantification and consideration of uncertainties.
- About half of the assessments are (predominantly) quantitative whereas the other half are (predominantly) qualitative.
- Several assessments present uncertainty deriving from climate projections quantitatively; uncertainty arising from non-climatic projections or from impact models is rarely considered explicitly.
- The UK Climate Change Risk Assessment (CCRA)
 - is the only legally mandated CCIV assessment;
 - is the most comprehensive assessment;
 - is the only assessment using probabilistic climate projections.The UK is considering improvements for the next CCRA.

Availability of national CCI V assessments

Country	Date	Name	Comment
Austria	2010	Klimaänderungsszenarien und Vulnerabilität	Qualitative; part of the NAS
Switzerland	2007	Climate Change and Switzerland 2050: Expected Impacts on Environment, Society and Economy	Mostly qualitative; uncertainty is discussed qualitatively
Germany	2005	Climate Change in Germany. Vulnerability and Adaptation of climate sensitive Sectors	Quantitative; uncertainty resulting from different emissions scenarios and climate models is shown
	2008	Deutsche Anpassungsstrategie an den Klimawandel	Qualitative; part of the NAS
Spain	2005	ECCE - A preliminary General Assessment of the Impacts in Spain Due to the Effects of Climate Change	Quantitative; based on a comprehensive review of available studies; uncertainty is addressed differently depending on the underlying study
Finland	2012	Miten väistämättömään ilmastonmuutokseen voidaan varautua (ISTO)	Mostly qualitative
Ireland	2008	CLIMATE CHANGE: Refining the Impacts for Ireland	Quantitative; many uncertainties are presented quantitatively
	2009	A Summary of the State of Knowledge on Climate Change Impacts for Ireland	Qualitative; based on literature review
Netherlands	2012	Effecten van klimaatverandering in Nederland 2012	Quantitative; uncertainties covered by 4 KNMI'06 scenarios
Norway	2010	Adapting to a changing climate: Norway's vulnerability and the need to adapt to the impacts of climate change	Mostly qualitative; uncertainties are mentioned in the text
Poland	2010	Opracowanie wskaźników wrażliwości sektora transportu na zmiany klimatu	Only one sector; semi-qualitative; consideration of uncertainties not known
United Kingdom	2012	The first UK Climate Change Risk Assessment	Comprehensive; quantitative; probabilistic (results for 10 th /50 th /90 th percentile); legally mandated every 5 years

Guidance on adapting under uncertainty

- Only 5–6 out of 10 countries address climate uncertainties explicitly in guidance material for adaptation decision-makers.
- Two other countries have published relevant guidance for specific sectors or are in the process of developing such documents.
- The most comprehensive effort at assisting public and private adaptation decision-makers has been made in the UK.

Guidance on adapting under uncertainty

Country	Date	Name	Further information
Austria	2011	Der Zukunft vorgehen: Klimawandelanpassung und Unsicherheiten	Some information on sources of uncertainties and implications for adaptation planning (but not easily accessible)
Switzerland	–		
Germany	2010	Klimalotse	Some recommendations on how uncertainties (related to emission scenarios, global and regional climate models, and development of society and economy) can be addressed
	2012	Stadtklimalotse	Recommendations on flexible planning under uncertainties
Spain	–		A User Guide is under development where climate uncertainties are addressed
Finland	2012	Finland's water resources and climate change	Guidance documents on water management (including storm water runoff and dam safety) in a future climate
	2012	The energy calculation test years in a future climate	Guidance for builders on future climatic reference conditions
Ireland	–		
Netherlands	2009	Klimaatschetsboek Nederland	Explanation of sources of uncertainty; simultaneous presentation of results for 4 KNMI06 scenarios
	2009	Socio-economic Scenarios in Climate Assessments	Guidance for the combination of socio-economic scenarios with climate scenarios
Norway	2009	Klima i Norge 2100	Explanation of sources of uncertainty in climate projections; very brief discussion on dealing with this uncertainty
	2012	Klimaprojeksjoner og usikkerhet	Guidance on the consideration of climate uncertainties for municipalities
Poland	–		
United Kingdom	2013	Climate change: Advice by sector	Comprehensive guidance documents on adapting to climate change, including the consideration of uncertainties, (in the UK and/or England) are available at these web portals
	2013	UKCIP: Tools	
	2012	Climate Ready	

Conclusions

1. As adaptation activities expand, an expanding demand for more detailed and varied climate scenarios also brings uncertainties to the forefront.
2. The consideration and communication of uncertainty in information relevant for adaptation planning differs substantially across countries.
3. Almost all national climate change projections consider uncertainties related to emission scenarios, climate models and downscaling methods.
4. Many countries have established web portals that provide access to climate projections but with large differences in their functionality.
5. Only a few countries have developed specific non-climatic scenarios for use in climate change impact (CCIV) assessments.
6. Many countries have conducted CCIV assessments; the approach applied and the consideration of uncertainty therein varies widely.
7. Several countries provide specific guidance on adaptation decision-making under uncertainty.
8. There is a need to learn from stakeholders how they used available scenarios and guidance material, and to involve them in improvements.

Thank you!

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