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 o
for adaptation actors across Europe

Data sources:

- Questionnaire distributed through
EEA's NRCs for climate impacts and
- Complemented by own enquiry an

Target publication:

- Book by T. Capela Lourenço et al.
"*Adapting to an Uncertain Climate:*
- Coordinated by CIRCLE2 ERA-NET
- Publication in mid-2014

Chapter 3

How Is Uncertainty Addressed in the Knowledge Base for National Adaptation Planning?

Hans-Martin Füssel and Mikael Hildén

Key Messages

Fourteen European countries have provided information on the consideration of uncertainty in their knowledge base for adaptation planning, and there are substantial differences across countries and jurisdictions. Some key features are as follows:

- Almost all national-level climate change projections consider uncertainties related to emission scenarios, global climate models and downscaling methods.
- Many countries have established web portals that provide access to climate projections; their functionality and the presentation of uncertainty vary widely across them.
- Only a few countries have developed non-climatic (e.g. socio-economic, demographic and environmental) scenarios for use in climate change impact, vulnerability and risk assessments.

(continued)

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Country coverage

- 17 EEA member countries responded to survey
- 14 countries included in assessment ("at advanced stage")
- 8 countries represented by at least one case study in the book (asterisk; not presented here)
- 7 countries represented in national assessment as well as case study

	Stage of selected national adaptation activities		
	Climate impact assessment	National adaptation strategy	National adaptation action plan
Country	0: no activity; 1: in preparation; 2: finalized/adopted		
AT - Austria*	2	2	2
BE - Belgium	1+2	2	1+2
CH - Switzerland	2	2	1
CZ - Czech Republic	1+2	1	0
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
UK - United Kingdom*	2	2	1+2

Uncertainties in climate projections

- Climate projections differ widely in terms of their comprehensiveness.
- Most climate projections consider 2–5 different emissions scenarios.
- 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 (e.g. individual simulations, various quantiles, mean and uncertainty ranges).
- Five out of 18 climate change portals enable download of the raw data; eight 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	RCMs	Nr. of variables	Data down-load	Inter-active maps	Status
Austria	reclip:century	2011	2050‡	2	2	2	2	✓	✓	1
Belgium (W.)	Regional projections	2011	2100	1 ‡	3	3**	2	–	–	2
Belgium (F.)	CCI-HYDR & INBO	2009	2100	3 ‡	3	3**	4	–	–	2
Switzerland	CH2011	2011	2100	3	4*	9	6	✓	–	4
Czech Rep.	Projekt VaV 2007-2011	2011	2100	1‡	1‡	1‡	4	–	–	1
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**	8	–	–	1
	PNACC 2012	2013	2100	3	3	3**	3	✓	–	3
Finland	ACCLIM	2009	2100	3	19*	9	7	–	✓	2
France	Climat de la France au XXIe siècle	2012	2100	3	3	2**	21	✓	✓	2
Hungary	OMSZ 2008	2008	2100	1‡	2‡	2‡	2	–	–	1
Ireland	C4I	2008	2100	4	5	2**	12	–	–	1
The Netherlands	KNMI'06	2006	2050‡	n.a.‡	5	10	4	–	–	3
	Klimaateffectatlas	2009	2100	n.a.‡	?	?	47	–	✓	2
Norway	Klima i Norge 2100	2009	2100	3	6	10**	13	–	–	2
Poland	Projekcje klimatu	?	2100	1	4	7	2	–	✓	1
United K.	UKCP09	2009	2100	3	1‡ *	1**	9	✓	✓	3

Availability of non-climatic projections

- Dedicated non-climatic projections for CCIV assessments are only available in three countries (Finland, Netherlands, United Kingdom)
- Two other countries/regions provide relevant scenarios that were not specifically developed for CCIVA (Flemish Region/BE, Germany)
- All available non-climatic projections include 3–4 scenarios based on or 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 for 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 asssessment;
  - is the most comprehensive assessment;
  - is the only assessment using probabilistic climate projections.

  The UK is considering improvements for the next CCRA.

Guidance on adapting under uncertainty

- Only 6 out of 14 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.
  It would be important to learn from those experiences.

Guidance on adapting under uncertainty

Country	Date	Name	Further information
Austria	2011	Der Zukunft vorgreifen: Klimawandelanpassung und Unsicherheiten	Some information on sources of uncertainties and implications for adaptation planning (but not easily accessible)
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
The Netherlands	2009	Klimaatschetsboek Nederland	Explanation of sources of uncertainty; simultaneous presentation of results for the four 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
United Kingdom	2013	Climate change: Advise 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. Almost all countries have conducted CCIV assessments; the approach applied and the consideration of uncertainty therein varies widely from a generic qualitative discussion to a comprehensive probabilistic assessment.
7. Several countries provide specific guidance on adaptation decision-making under uncertainty.
8. There is a need to learn from stakeholders how they have used available scenarios and guidance material, and to involve them in improvements.

Thank you!

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