Adaptation to climate change in Hungary

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Motivation

Multi-disciplinary research efforts for climate change impacts on different sectors have only recently started to be harmonized in Hungary. To prepare targeted and sustainable adaptation strategies, it is essential to elaborate an objective approach helping to quantify the exposure, vulnerability and adaptation capacity of any sector. A memorandum of understanding has been signed between Iceland, Liechtenstein, Norway and Hungary to establish the 2009–2014 Programme of the European Economic Area Grant entitled **Adaptation to Climate Change in Hungary**.

The Programme has three main pillars:

1. **National Adaptation Geo-information System (NAGiS)**
2. Local climate change adaptation capacity building
3. Pilot projects focusing on climate change adaptation measures at local and regional level

National Adaptation Geo-information System

Web: nater.mfgi.hu

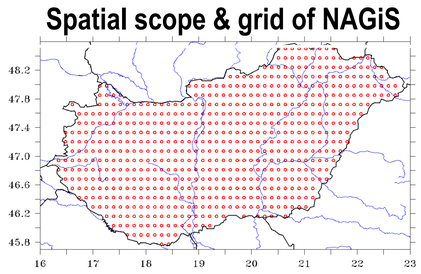
Main objectives:

- To support decision making on the adaptation to climate change by operation of a multifunctional geo-information database based on several other database
- To develop the methodologies for data collection and processing, climate modelling, impact and vulnerability assessments in line with INSPIRE requirements
- To operate a web-based “one-stop-shop”, an information hub for all stakeholders, decision makers, researchers

Climate change projection in NAGiS prototype

Experiment	ALADIN-Climate 4.5	RegCM 3.1
Forcings	ARPEGE-Climat	ECHAM → RegCM
Resolution	10 km	10 km
Scenario	SRES A1B	SRES A1B

Spatial scope & grid of NAGiS



NAGiS prototype:

- 0.1-degree resolution homogenized gridded dataset from meteorological observations for 1961–2010 – CARPATCLIM
- Climate projections for 2 targets:
  2021–2050: „short-term” planning
  2071–2100: long-term strategy, robustness & significance

Impact studies based on meteorological data:

- Hydrology: ground water, drinking water
- Natural ecosystems
- Agriculture, forestry

Improvement of climate scenarios

Web: rcmter.met.hu

Main objectives:

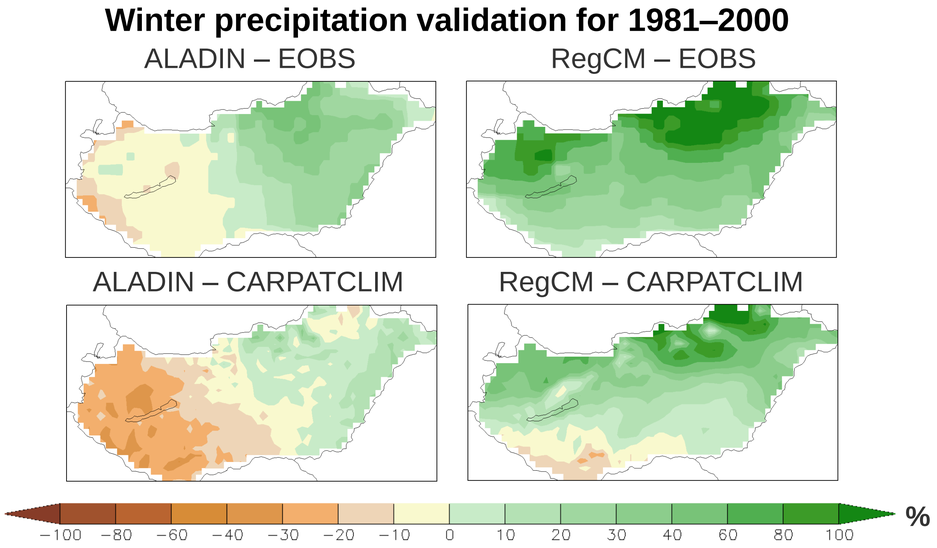
- Development of climate model data providing future climate information for NAGiS
- Quantification of climate projection uncertainties
- Provision of climate model data for impact assessments
- Training & support the users to apply projection results & uncertainty information

Model simulations:

- 2 regional climate models
- New model versions, forcing fields, emission scenarios, domains
- Core simulations:
  1. Sensitivity studies (domain size, parameterization)
  2. Re-analysis and GCM-driven validation runs (homogenized and gridded reference data)
  3. Climate change projections
- Uncertainties: scenario (temperature) and model uncertainties (precipitation)

Experiment	ALADIN-Climate 5.2	RegCM 4.3
Forcings	ARPEGE-Climat → ALADIN	HadGEM → RegCM
Resolution	10 km	10 km
Scenario	RCP8.5	RCP4.5

Winter precipitation validation for 1981–2000



Trainings for users of climate information:

- Aim: consultation about user needs, possibilities and **limitations** of model data
- First workshop was held in June, main conclusions:
  - Points of data use: public accessibility, availability, spatial and temporal resolution (quality is secondary)
  - Current resolution is not sufficient for every study (interpolation of model data instead of modifying the impact model)
  - Uncertainty information: some good examples, but users need help to avoid ad hoc model data selection

Extension of NAGiS to further sectors

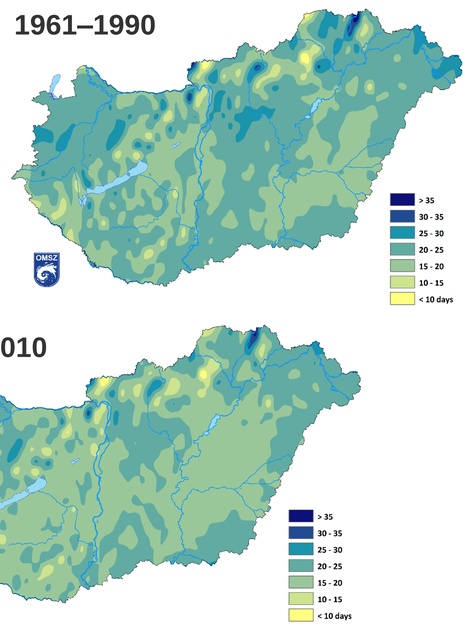
Web: kriter.met.hu

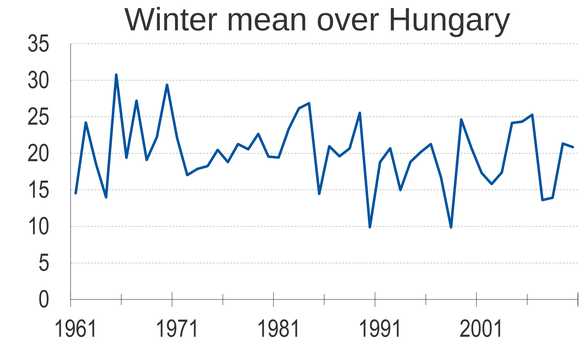
Main objectives:

- To assess the vulnerability due to climate change which will foster the development of adaptation strategies and objective decision making
- To prepare indicators based on observations and model projections
- Focus on 3 sectors:
  1. Heatwave-induced excess mortality
  2. **Impacts of extreme weather events on road accidents**
  3. Climatic conditions on tourism

Zero crossing days with precipitation [days/yr] based on observations

(Tmin < 0, Tmax > 0, P > 0)





Conclusions

1. High-quality meteorological information is necessary
2. Impact and vulnerability assessments should be achieved on objective and quantitative basis
3. Ideal path of development: information not only about projection uncertainty, but uncertainties in every level
4. Iterative consultation between meteorologists and users are indispensable
5. Importance of training, even decision makers (not fully hopeless)

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