

# Advancing climate change information system to foster adaptation in Hungary

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**SZÉCHENYI** 2020



European Union  
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# OUTLINE

- 1. Different user needs**
- 2. From climate change information to decision making: the objective pathway**
- 3. The KlimAdat project**
- 4. Summary**

# USER NEEDS

## Who are the users and what are their needs?

- DECM C3S project launched a survey last year to find the answers:
  - 3 different types of users: data user, product user, non user  
→ have very different needs



Data user (e.g. impact researcher)



Product user (e.g. decision maker)

# DIFFERENT USER NEEDS



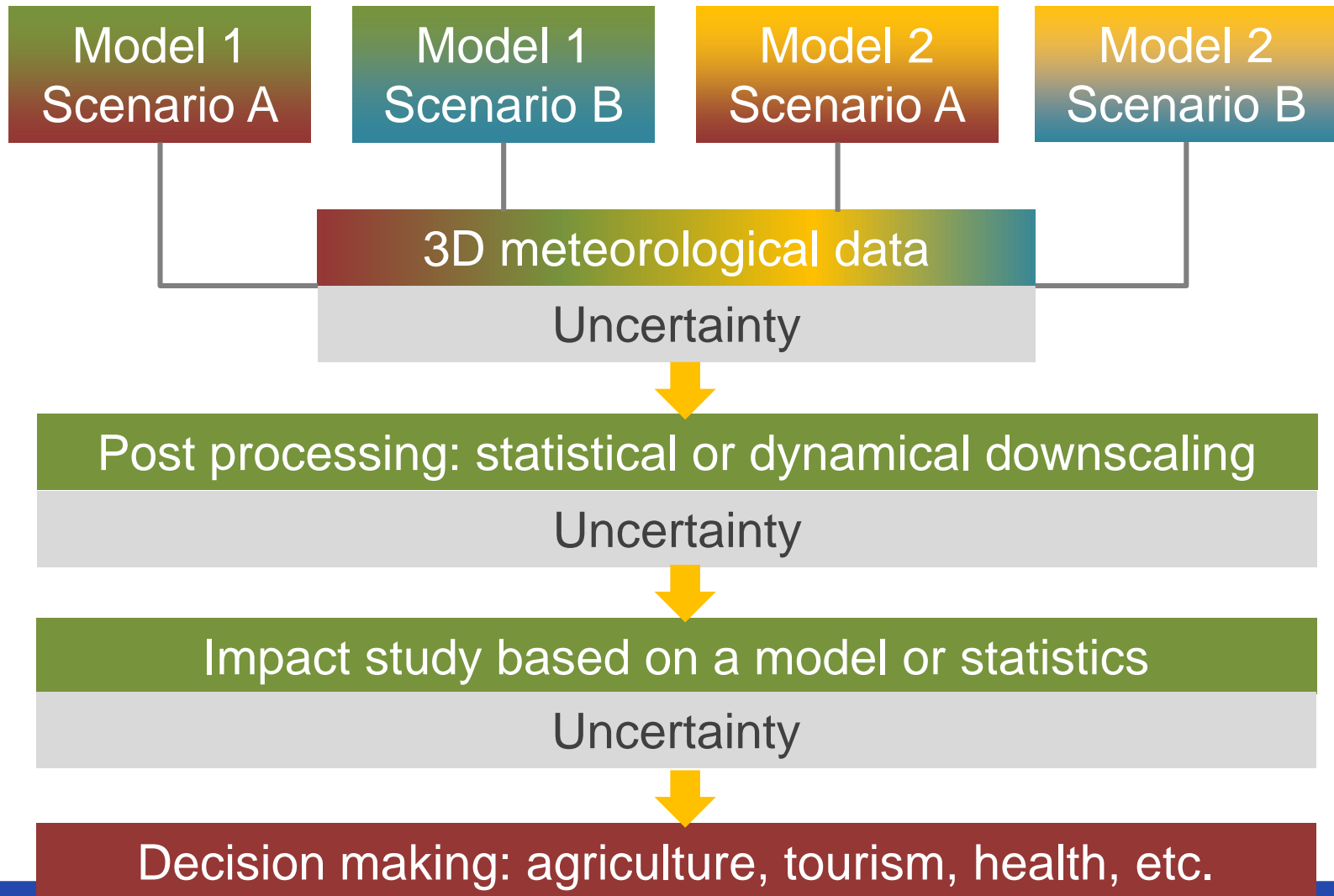
## Data user



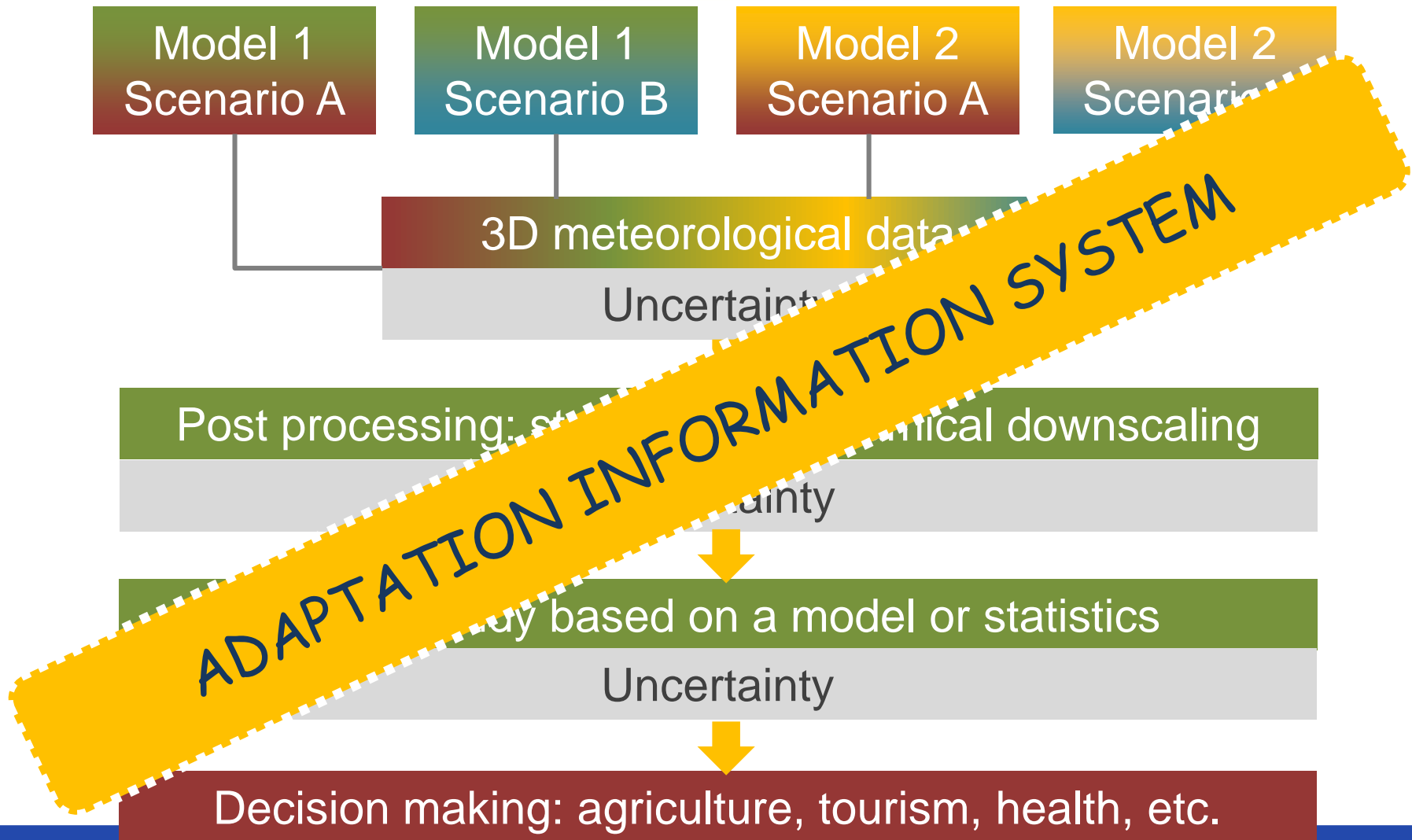
## Product user

CMIP, CORDEX, in-house data	<b>Source of data</b>	Research institutes, national services
RCP4.5, RCP8.5	<b>Scenarios</b>	Idealised scenarios (e.g. 1.5 °C warming)
Low: Climate indices, bias adjustment, statistical downscaling	<b>Post processing</b>	High: maps, graphs, etc.
>61% satisfied, but some areas need higher	<b>Model resolution</b>	69% satisfied
Accessing and downloading data	<b>Guidance</b>	Visualising, accessing, interpreting information

# CLIMATE CHANGE INFO → DECISION MAKING: THE OBJECTIVE PATHWAY



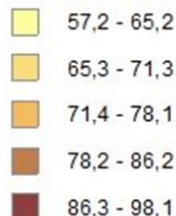
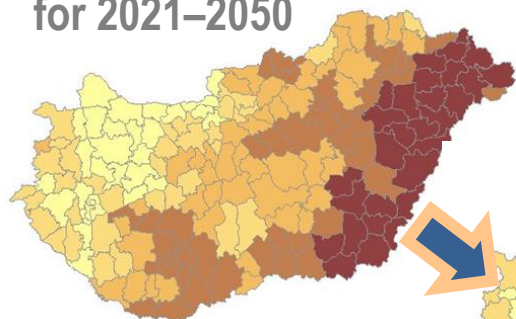
# CLIMATE CHANGE INFO → DECISION MAKING: THE OBJECTIVE PATHWAY



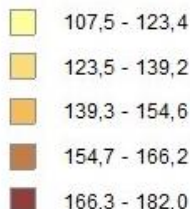
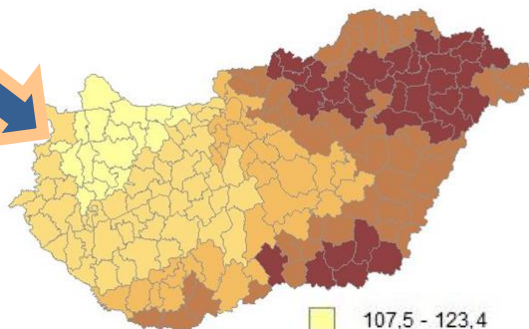
# LET'S SEE IT IN PRACTICE FOR HUNGARY

Question: should the hospitals be equipped with air-conditions in the future?

Heat wave days change [%]  
for 2021–2050



Excess mortality change [%] for 2021–2050



ALADIN  
A1B

ALADIN  
RCP8.5

RegCM  
A1B

RegCM  
RCP4.5

3D meteorological data

Uncertainty

Post processing

Uncertainty

Impact study

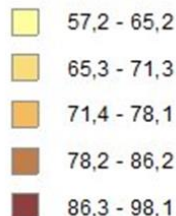
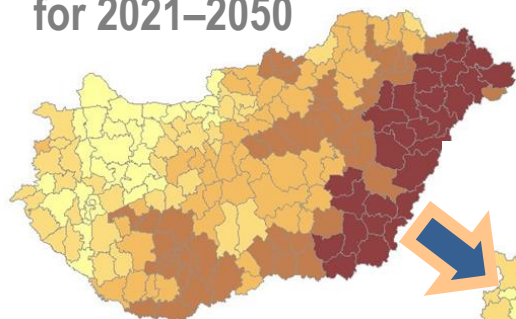
Uncertainty

Excess mortality due to heat waves will increase dramatically, mostly in Eastern Hungary by 2021-2050.

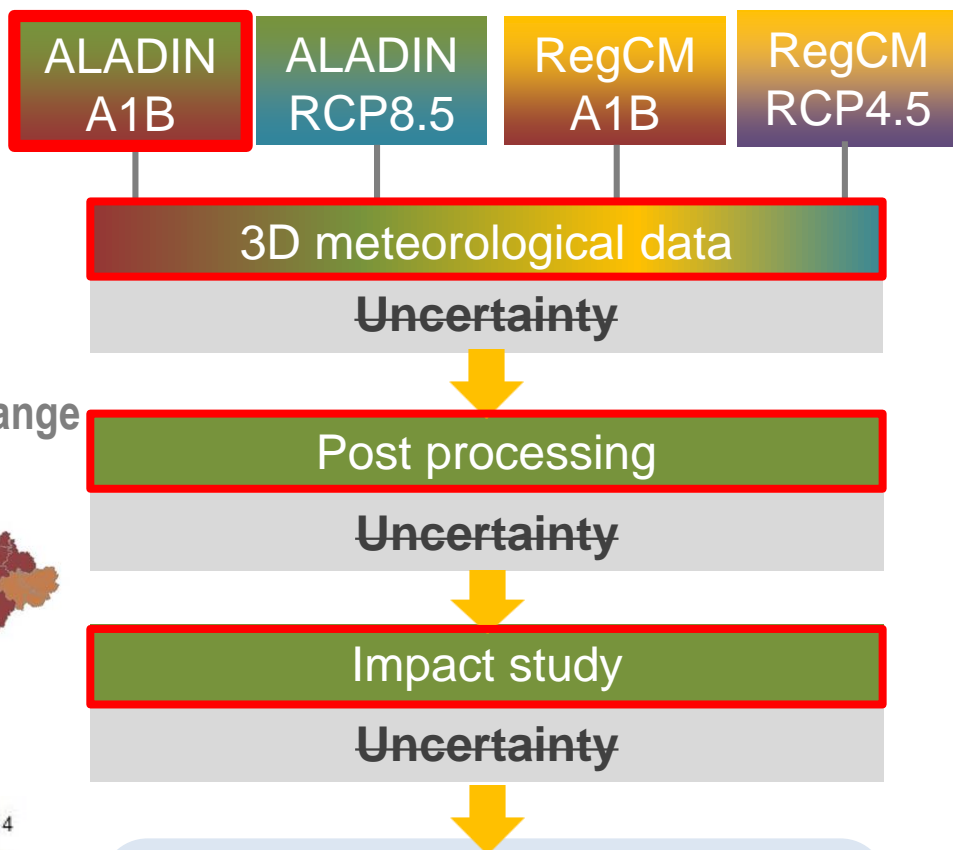
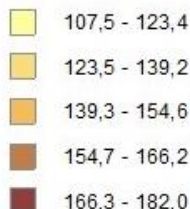
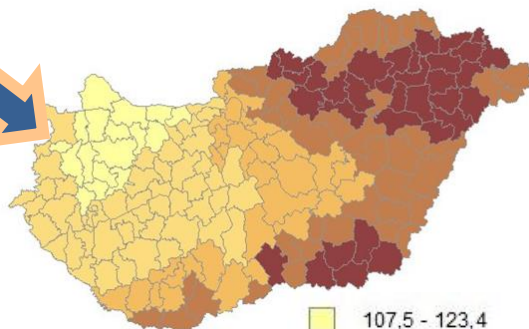
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# HOW COULD IT BE IMPROVED?

## From objectivity's side

- ✓ More RCM simulations to be taken account
  - ✓ More sophisticated post processing (e.g. modelling urban climate)
  - ✓ More methods to estimate impact
- 



Uncertainty-based decision making

## From users' side

- ✓ Data outside country borders (e.g. for hydrology)
- ✓ No fixed 30-year periods
- ✓ High spatial and temporal resolution (what is high depends on the impact area)

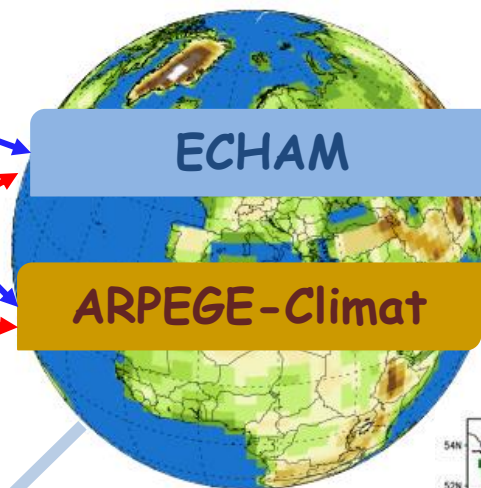
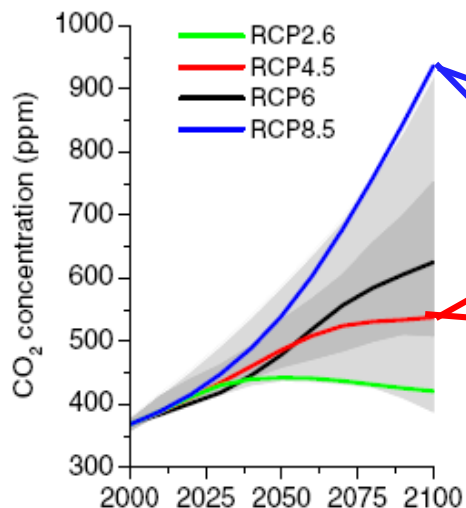
*Information gained from user consultations, workshops*

# THE KLIMADAT PROJECT (2016–2020)

- **KlimAdat:** Assessment of climate change impacts in Hungary with regional climate model simulations and developments of a representative climate database
- Funded by the Hungarian Government and the European Union
- **Main goals:**
  - Developing **RCM mini ensemble** of OMSZ based on ALADIN-Climate and REMO, using RCP4.5 and RCP8.5
  - Creating a **GIS system** containing post-processed RCM data tailored to the user needs
  - Continuing **education** via workshops and publication



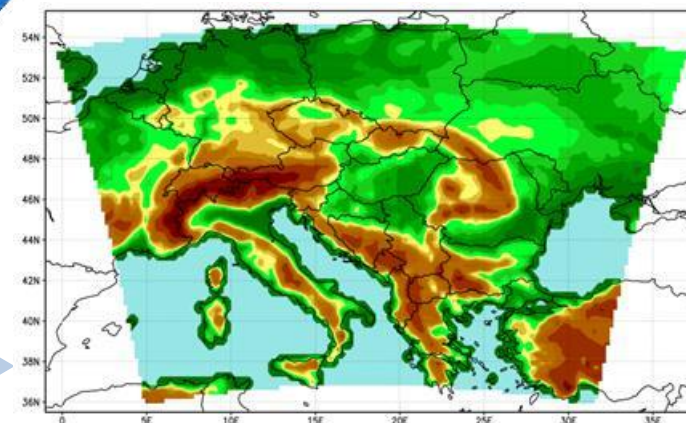
# RCM SIMULATIONS IN KLIMADAT



LBCs: 2 different GCMs and 2 RCP scenarios



Downscaling on Euro-CORDEX 44° domain



Further downscaling to Central and South Europe on 10km resolution

# FULFILLING USER NEEDS: DATA USER



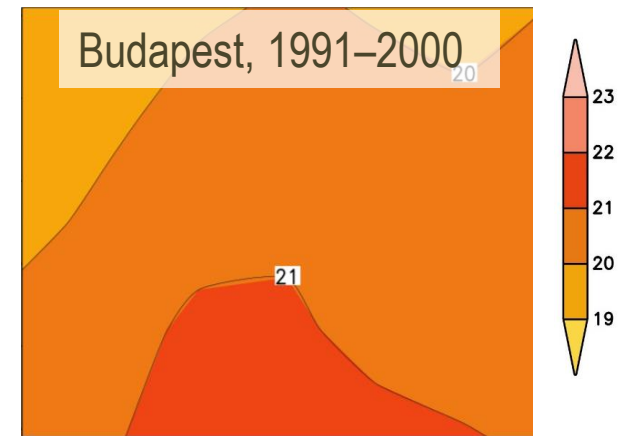
## Ingredients for a dynamical impact model

- Gridded data
- Raw or bias corrected data
- High temporal resolution (e.g. daily, or hourly data)
- Individual ensemble members have to be used



### RCM, 10 km resolution

Summer mean temperature [°C]



Requires lots of computation space, tailored guidance from the climate modelers to select, interpret and use RCM data.

# FULFILLING USER NEEDS: DATA USER



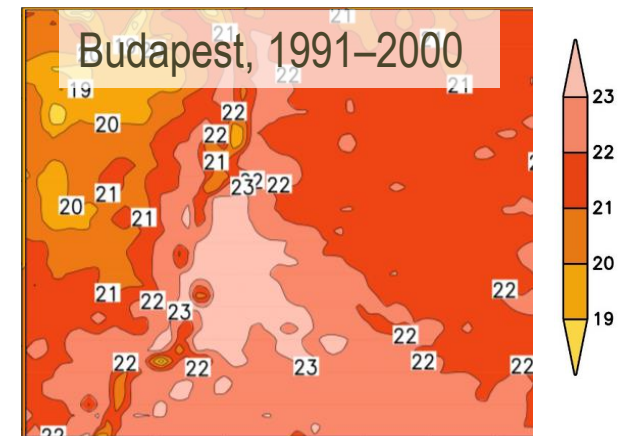
## Ingredients for a dynamical impact model

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### Surface model, 1 km resolution

Summer mean temperature [°C]



Requires lots of computation space, tailored guidance from the climate modelers to select, interpret and use RCM data.

# FULFILLING USER NEEDS: **PRODUCT USER**

## Ingredients for statistical estimations on impacts, decision making:

- Gridded or spatially averaged data (e.g. for county-level)
- Information on 30-year mean change or bias corrected future data
- Period should be flexible (e.g. 2021-2050, 2031-2060, etc.)
- Climate indices
- Communicating uncertainty information, e.g.:

- Smallest and largest change
- Probability of certain scenarios (e.g. temperature change  $> 1\text{ }^{\circ}\text{C}$ )



Our GIS  
design plans



# SUMMARY

- For targeted and sustainable adaptation high quality observed and modelled information is needed
- Building an information system that meets these requirements started in 2013 in Hungary
- The aim of the ongoing KlimAdat project is to
  - further develop the RCM ensemble system
  - Develop an informative and user friendly GIS system, that serves certain impact users' and decision makers' needs
  - Train and educate users
- How these fit into the large European climate services (e.g. C3S)?
  - Large focus is on serving national needs + providing information that inseparably contains uncertainty

# THANK YOU FOR YOUR ATTENTION!

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