The Hungarian CRIGiS Project

Vulnerability and Impact Studies with a focus on Tourism and Critical Infrastructures

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CRIGiS in the NAGiS system

- Agreement between Hungary and European Economic Area (EEA) to implement Program ‘Adapting to climate change in Hungary’
- CRIGiS (and 2 other projects) were initiated to extend the NAGiS to further sectors
- Main objectives
  - To develop methodology for quantifying the effects of climate change in various sectors
  - Integration of produced data layers into NAGiS database
- KRIGiS focused on three main areas:
  - healthcare, critical infrastructure and tourism
OMSZ contribution to the NAGiS system

- Gridded data based on observation (MASH-MISH)
  - 1961-2010
  - Daily data: maximum and minimum temperature, precipitation, global radiation
  - Seasonal data: relative humidity
  - Annual data: wind speed
- Gridded data based on climate models (ALADIN-Climate 4.5 and RegCM)
  - Daily data: maximum, minimum and mean temperature, precipitation, global radiation, wind speed (2, 10 m)
  - Monthly data: relative humidity
  - SPI for 3, 6, 12 months
Structure of the CRIGiS project

WP1: Projektmenedzsment / Project management
(OMSZ, OKK, BM OKF, SZTE)

Konzultáció a felhasználókkal / Consultation with the users

WP2
Diszsemináció, kommunikáció / Dissemination, communication
(OMSZ, OKK, BM OKF, SZTE, BCE)

WP3
A höhullámok okozta többlethalálozásra vonatkozó vizsgálatok
Study of heatwave-induced excess mortality
(OKK, OMSZ)

WP4
A szélsőséges időjárási helyzetek közúti balesetekre gyakorolt hatásának vizsgálata
Assessment of road accidents within extreme weather events
(BM. OKF, OMSZ)

WP5
A klímaticus viszonyok turizmusra gyakorolt hatásának vizsgálata
Effects of climate conditions on tourism
(OMSZ, SZTE, BCE)

Hatás- és sérülékenységvizsgálatok / Impact and vulnerability studies
Main data of the project

- Duration of the project: 30.04.2015-31.12.2015
- Consortium:
  - Hungarian Meteorological Service (OMSZ), lead partner
    - Climate data, tourism
  - National Public Health Centre (OKK)
    - heatwave
  - National Directorate General for Disaster Management (BM OKF)
    - Road accidents
  - University of Szeged, Department of Climatology and Landscape Ecology (SZTE)
    - tourism
Methodology

- Determination of climate and impact indicators
- Calculation of climate indicators on the base of observed data for the NAGiS grid
- Determination of a connection between the climate and impact indicators, test for some pilot region
- Determination of climate indicators in the future (2021-2050, 2071-2100) for the NAGIS grid
- Establishment of the impact indicators in the future on the base of the disclosed connections
- Analysis of the changes
Climate data

- Data in the NAGiS
  - Observed data: 1961-2010
- New parameters excluded from NAGiS (e.g., daily wind speed, relative humidity and cloudiness)
- New periods according to impact indicators (observed and model outputs)
- Calculation of climate indicators for the NAGiS grid and other points (road network) and statistical regions
Study of the excess mortality related to heatwaves

- Input data:
  - Daily mean temperature averaged for NUTS4 statistical regions
  - Mortality data for NUTS4 statistical regions
- Days with heatwaves: days with temperature exceeding the 90% percentile of daily mean temperature
- Determination of the excess mortality related to heatwaves in the reference period
- Determination of expected degree of the excess mortality related to heatwaves in the periods 2021-2050, 2071-2100
1. Excess mortality on days above threshold temperature (%/days), 2005–2014
2. Additional excess mortality due to climate change (%/year) at NUTS4 level, 2021–2050
3. Additional excess mortality due to climate change (%/year) at NUTS4 level, 2071–2100

<table>
<thead>
<tr>
<th></th>
<th>Range of excess mortality (%)</th>
<th>Country-wide number of death cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2014</td>
<td>0-45</td>
<td>783/year</td>
</tr>
<tr>
<td>2021-2050</td>
<td>107-182</td>
<td>2030/year</td>
</tr>
<tr>
<td>2071-2100</td>
<td>531-668</td>
<td>5800/year</td>
</tr>
</tbody>
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Impact and vulnerability assessment of road accidents within extreme weather events

- Input data:
  - Number of road accidents recorded at the National Directorate General for Disaster Management (2011-2014)
  - Heat days
  - Days with precipitation in winter
  - Excess number of accidents related to the countrywide average
  - Calculation of climate indicators for the future, determination of expected number of road accidents
  - Analysis of the changes
1. Vulnerability of road accidents related to wet winter days in 2011–2014
2. Vulnerability of road accidents related to wet winter days in 2021–2050
3. Vulnerability of road accidents related to wet winter days in 2071–2100
1. Vulnerability of road accidents related to hot days in 2011–2014
2. Vulnerability of road accidents related to hot days in 2021–2050
3. Vulnerability of road accidents related to hot days in 2071–2100
Effects of climate conditions on tourism

• Examination of tourism climatic indices
  • TCI – Tourism Climatic Index
  • CIT – Climate Index for Tourism
    • for different tourist activities (eg urban, beach and cycling tourism)
• Input data: temperature, relative humidity, wind speed, sunshine duration, precipitation, cloudiness
• Modification of TCI and CIT to the Hungarian conditions
• Determination of original and modified indicators for the NAGiS grid
  • For 1961-1990, 2021-2050 and 2071-2100
• Comparision of indicators and different economic data of tourism (booking, number of ticket to open air events)
1. mTCI categories in April, 1961-1990
2. mTCI categories in April, 2021-2050
3. mTCI categories in April, 2071-2100
CIT categories for urban tourism in different periods
Annual course of CIT – Siófok

Beach tourism
Urban tourism
Cycling tourism
Summary
Prepared data layers

• Excess mortality related to heatwaves
  • 24 data layers
• Effects of extreme weather events on road accidents
  • 17 data layers
• Effects of climate conditions on tourism
  • 180 data layers
Summary of the project results

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Thank you for your attention!