

Climate change impacts and adaptations at the Carpathian region – lessons learned from three EU project



Fourth Carpathian Convention Working
Group Meeting on Adaptation to Climate
Change
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Outline



- * Introduction of the projects (CARPATCLIM, CARPIVIA, CarpathCC) funded by the European Commission
- * Overview of climate change observed & predicted in the Carpathians
- * Sectors affected by the impact of climate change
- * Adaptation measures proposed for each sector
- * Conclusions & recommendations



Climate change impacts and adaptation projects 1/3 funded by the European Commission



- * led by the Hungarian Meteorological Service
- * harmonized historic climate data (1961–2010)
- * main aim: to improve climate data to investigate how the regional climate has changed over this period
- * produced a high-resolution database which is freely available: www.carpatclim-eu.org

Climate change impacts and adaptation projects 2/3 funded by the European Commission



- * Carpathian Integrated Assessment of Vulnerability to Climate Change and Ecosystem-based Adaptation Measures (CARPIVIA)
- * assessed the vulnerability to climate change of the Carpathian region's main ecosystems
- * produced an inventory of climate change effects and ecosystem-based adaptation measures.
- * further information: www.carpivia.eu

Climate change impacts and adaptation projects 3/3 funded by the European Commission



- * Climate change in the Carpathian Region (CarpathCC)
- * examined the vulnerability of water, soil, forests, ecosystems and related production systems
- * proposed concrete ecosystem-based adaptation measures
- * assessed the costs and benefits of adaptation measures
- * further information: www.carpathcc.eu

The Carpathian region covers territory in seven countries



(Source: UNEP/GRID-Arendal)

Parties of the
Carpathian
Convention:

- * Czech Republic
- * Hungary
- * Poland
- * Romania
- * Serbia
- * Slovak Republic
- * Ukraine

Observed (1961-2010) changing Carpathian climate

Increasing temperature

- * Strongest increase: western&eastern part of the Carpathians and in the lower elevations
- * in average by 0.6 °C to 1.6 °C, particularly in summer
- increase of the frequency&intensity of heat waves

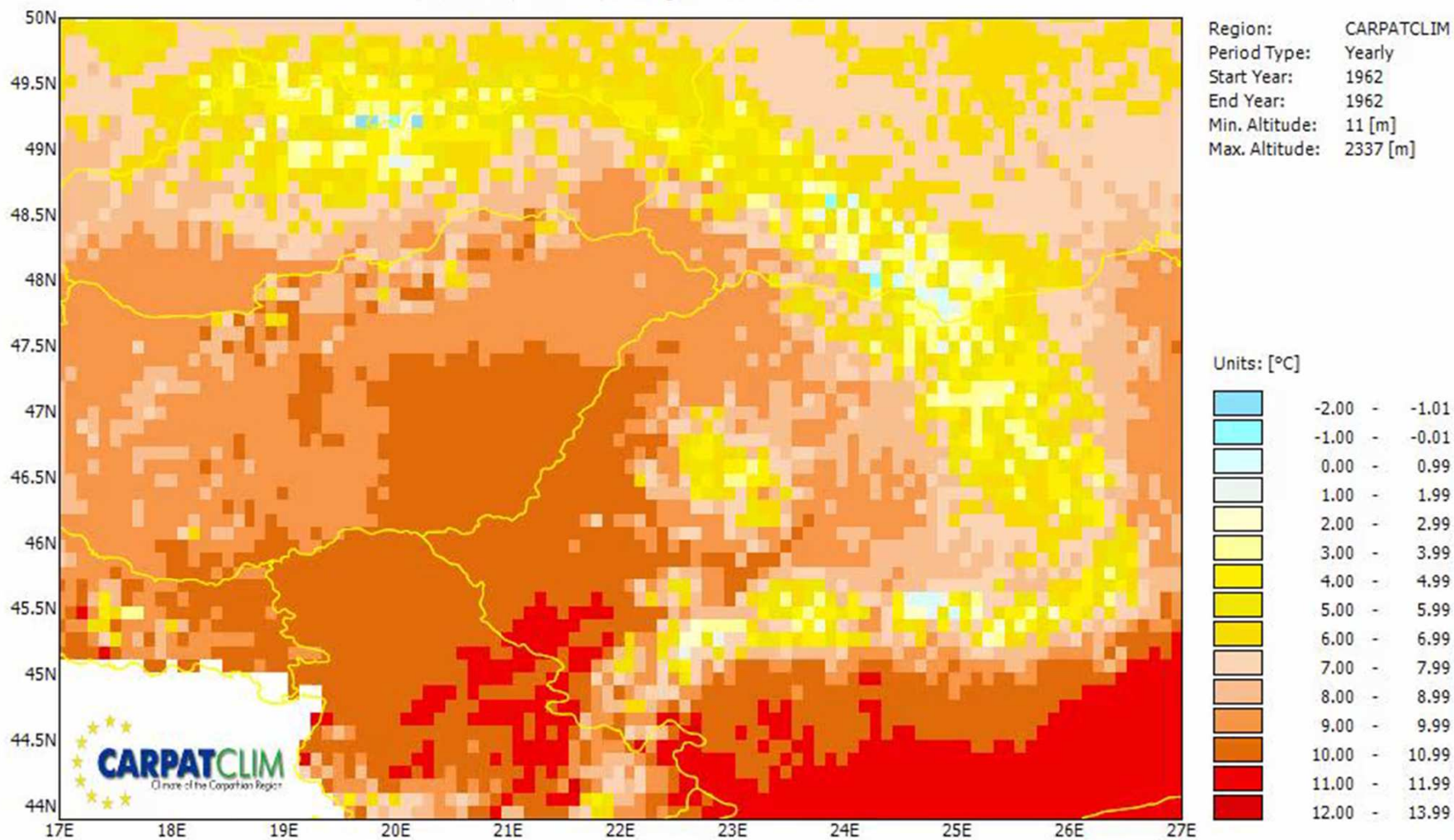
Precipitation changes

- * Show even higher spatial variability
- * Western&south-eastern areas: annual decrease
- * North-east part: annual increase
- * Overall increase in winter&summer, decrease in spring

Observed changing Carpathian climate

Mean air temperature

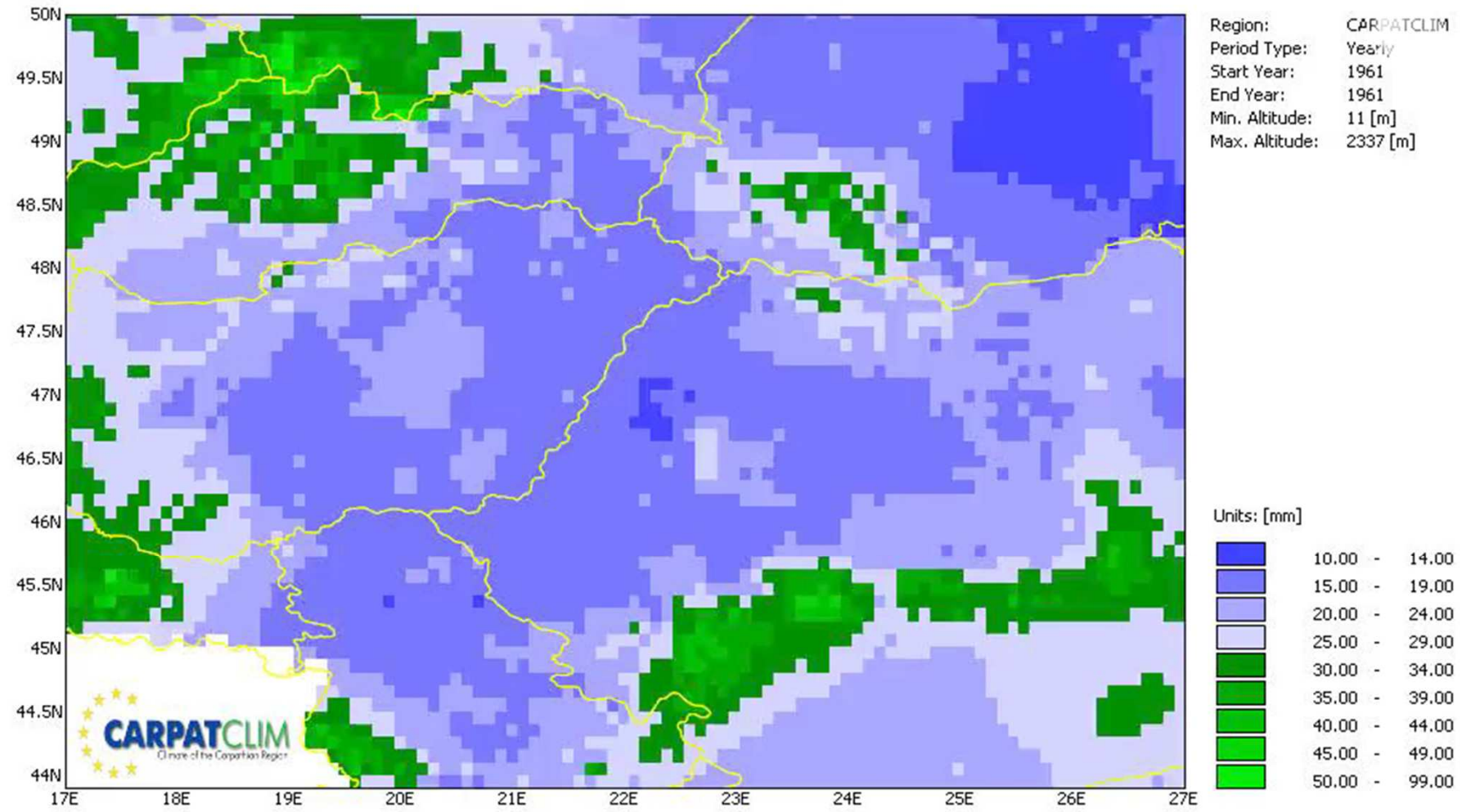
(Source: Ana Vukoje)



Observed changing Carpathian climate

Maximum 5-day total rainfall

(Source: Ana Vukoje)



Predicted (2021-2050) changing Carpathian climate

More extreme events

- * Number of hot days: increasing, while number of winter days decreases (greatest decline: north-west)

Changes in mean temperature & precipitation

- * The summer season may become the driest
- * The winter is expected to be the wettest season by the end of the 21th century

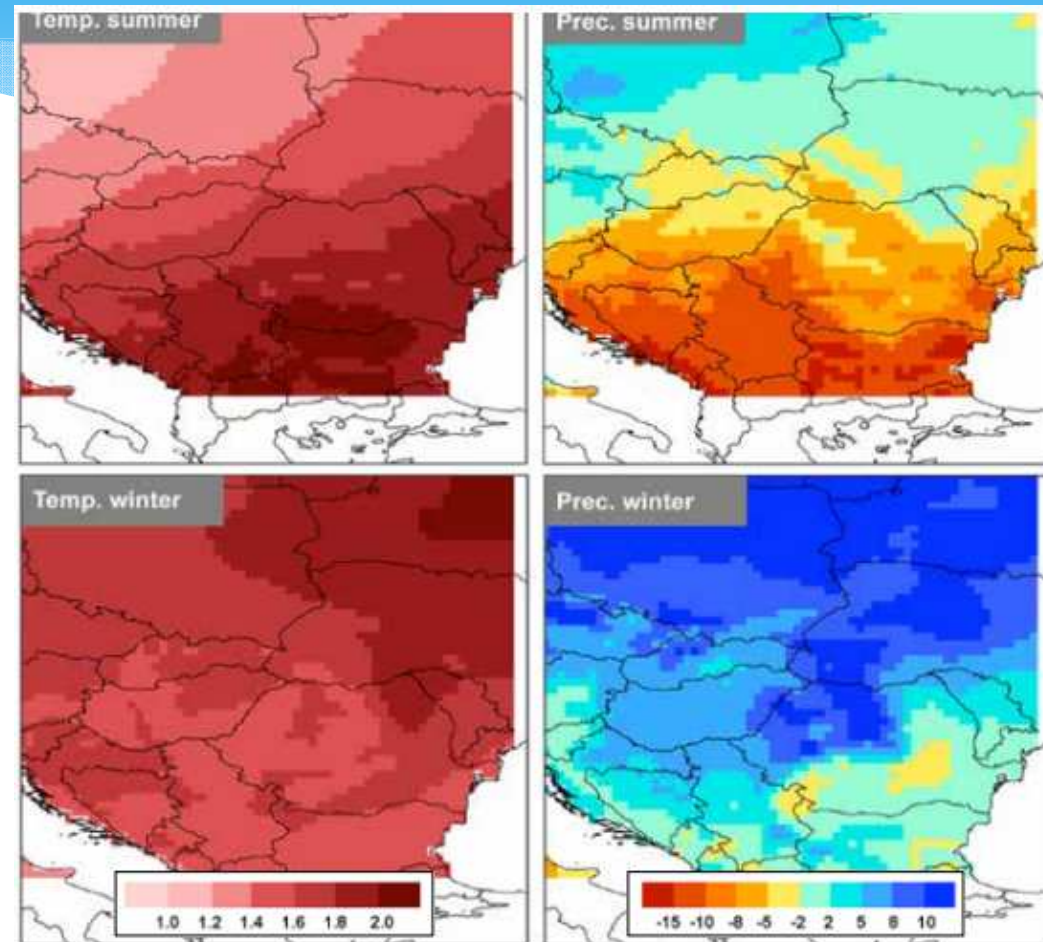


Figure 9: Changes in daily mean air temperature (°C) (left) and precipitation (%) (right) in the greater Carpathian region in winter (DJF) and summer (JJA) as the multi-model mean for the years 2021–2050 relative to 1971–2000 (absolute differences in mm), for the A1B greenhouse gas emissions scenario with 14 different GCM-RCM combinations from the ENSEMBLES project (source: CARPATCLIM).

Vulnerabilities of six important sectors 1/6

Water resources

- * Reduced snow cover
- * Sudden&heavy rainfalls
- * Changes in precipitation pattern → increase: the risk of floods, erosion, landslide risk
- * Declining river water levels → drought events
- * Declining groundwater level → availability&quaility of drinking water



(Source: Saskia Werners)

Adaptation measures 1/6

Water resources

- * Adjusting permits for water use or pollution discharge
- * Introducing smart irrigation systems
- * Planting forests and combating illegal logging in catchment areas in order to reduce nutrient loading and soil erosion
- * Restoring floodplains near rivers and streams to buffer extreme runoff and reduce flows of nutrients
- * Ensuring legal frameworks are in place to support planning and implementation of adaptation measures

Vulnerabilities of six important sectors 2/6

Forests and forestry

- * The way climate change affects forests: depend on forest structure, species composition, natural conditions, applied management, air pollution
- * Drought, windstorms → can trigger the pest outbreaks (bark beetles, defoliating species) and moving in of new species (Romania)
- * Forest decline → affects wood production, biodiversity and other ecosystem services



(Source: sciencedaily.com)

Adaptation measures 2/6

Forests and forestry

- * Promote&encourage sustainable forest management
 - * Supporting and harmonizing regional and European forest monitoring schemes, including those tracking newly emerging pests and pathogens
 - * Increasing awareness about the role of forests in integrated watershed management
- particularly in biodiversity maintenance, water regulation and erosion control

Vulnerabilities of six important sectors 3/6

Wetlands

- * Increased temperature → dry out wetlands
- * Wetland loss → reduces habitat for plant & animal species, habitat fragmentation → threatened: migratory birds and amphibians
- * The most vulnerable wetland habitats: peatlands



(Source: wildlifetrust.org)

Adaptation measures 3/6 Wetlands

- * Developing monitoring systems for aquatic ecosystems in the region
- * Integrating wetland protection with flood control practices
- * Supporting programmes aimed at wetland and peatland restoration, floodplain rehabilitation
- * Creating new wetlands and lakes to enhance local water retention capacity and support biodiversity

Vulnerabilities of six important sectors 4/6

Grasslands

- * Increase in temperature, extreme events, tree line shifting upward, agricultural intensification → reduce the quality and coverage of grasslands → habitat fragmentation & species loss
- * Increased nutrient input (mulching & use of fertilizers) → increase the presence of invasive species & affect water quality → not suitable for grassland management



(Source: Barbara Szabo)

Adaptation measures 4/6 Grasslands

- * Implementing agro-environment measures and the EU nature & biodiversity Natura2000 management plans
- * Diversifying species and breeds of crops and animals
- * Managing through (extensive) grazing and mowing
- * Avoiding the abandonment of land or mulching or fertilizing techniques
- * Avoiding overgrazing

Vulnerabilities of six important sectors 5/6

Agriculture

- * Maize and wheat yields will decline (become feasible at higher altitudes)
- * Sunflower, soya and winter wheat yields might increase (due to higher temperature & migration of the northern limit of these crops)
- * Pest threaten is predicted to rise → productivity loss
- * Traditional mixed agro-ecosystems may disappear (due to land abandonment and land use change)



(Source: network.hu)

Adaptation measures 5/6 Agriculture

- * Supporting small-scale traditional farms as important economic activities delivering multiple ecosystem services
- * Supporting agro-environment programmes
 - to maintain&enhance biodiversity and viability of semi- natural grasslands&mixed agro-ecosystems

Vulnerabilities of six important sectors 6/6

Tourism

Positive effects from CC

- * Rising temperature in summer
→ bring additional tourists to the mountains

Negative effects from CC

- * Decline in snow depth&duration
→ limited winter sport possibilities



(Source: Andreas Beckman)

Adaptation measures 6/6

Tourism

- * Develop year-round, resilient destinations with good accommodations (e.g. wellness&conference hotels)
- * Develop ecotourism, health and active tourism
- * Evaluate investments in tourism infrastructure in the light of projected snow and water availability
- * Develop climate-friendly winter sport projects, relaxation and entertainment activities
- * Continue to diversify resorts and markets

Strengthened knowledge&information sharing – lessons learned from the projects



- * Increase awareness for sustainable development
- * Strengthen monitoring activities and enhance data availability&accessibility
- * Develop modelling activities for future research
- * Map and assess Carpathian ecosystems goods&services
- * Exchange information&experience with other mountain regions

Policy responses to create a path to a climate-proofed Carpathian Economy

– lessons learned from the projects



- * Develop, monitor and update national adaptation strategies
- * Using ecosystem-based management approach
- * Rather plan regionally than nationally → Carpathian Convention
- * Create&improve policies and frameworks, such as “Strategic Agenda on Adaptation to Climate Change in the Carpathians”
- * Consideration need to be built into future activities & work of Carpathian Convention Working Groups

Responses at the institutional and organizational level – lessons learned from the projects

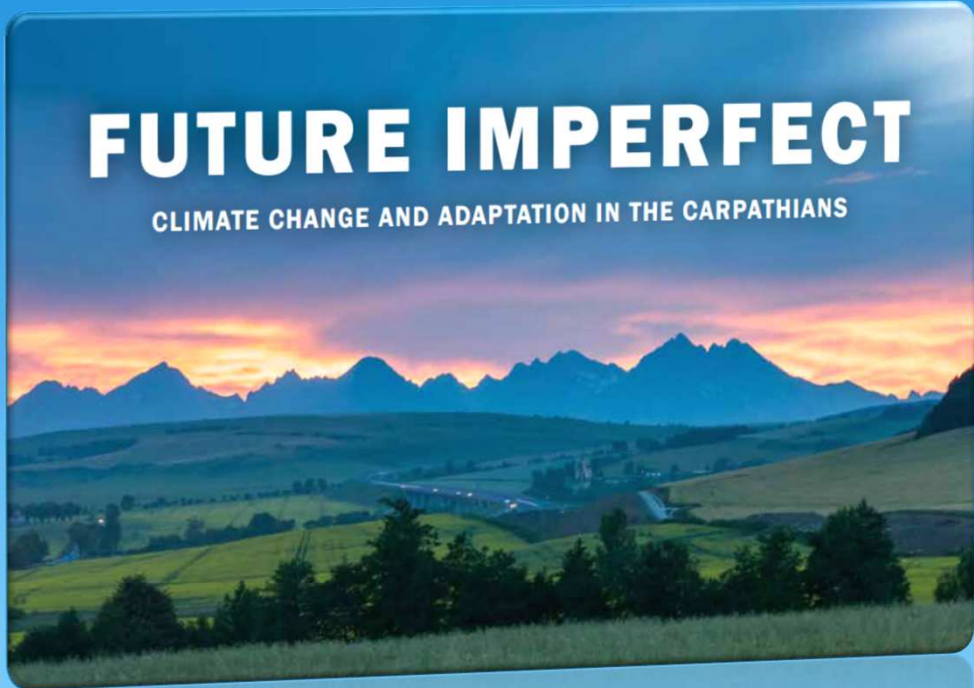


- * A designated pan-Convention policy-, funding-, coordination and communication context for climate change adaptation would be desirable
- * Avoid duplication of adaptation measures between the Carpathian&Danube processes
- * Integrate Carpathian objectives into the Danube river basin management planning
- * Create financial instruments to facilitate benefit&burden sharing support different sets of better-adapted new activities

Future climate change adaptation measures – the following actions are recommended



- * Develop capacity building Program to enhance the connectivity of the Carpathian region
- * Enhance information management&awareness raising
- * Climate proof of infrastructure&investments
- * Develop forestry measures for CC adaptation
- * Develop flood risk&drought mitigation measures based on natural solutions (eg. wetland restoration)
- * Create more dynamic biodiversity management
- * Support the establishment of the Carpathian Convention WG on Climate Change to advice the Secretariat&the Parties on relevant projects&initiatives to be taken



Thanks for your attention!

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