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Effect of Climate Change on Water-Related Risks in Cyprus

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Αμφιθέατρο Κεντρικών Γραφείων, CNP INSURANCE HOLDINGS, Λευκωσία

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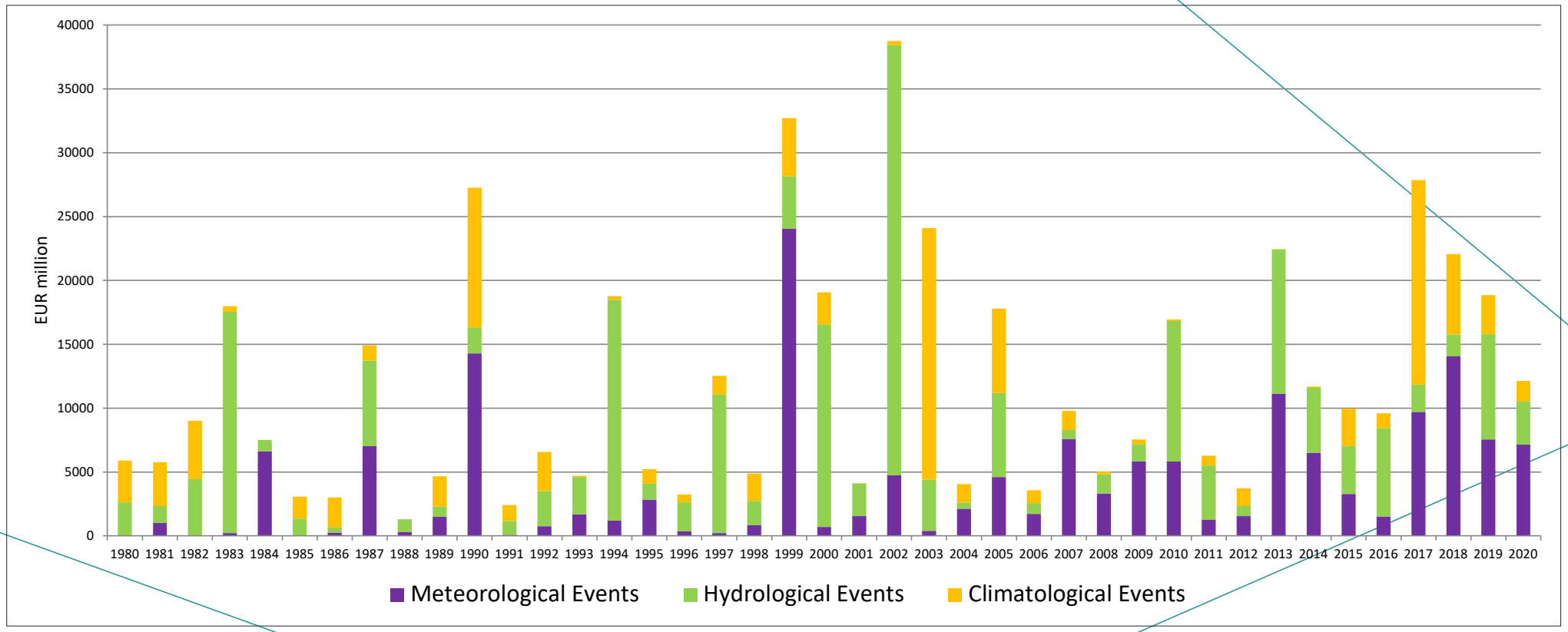
Economic damage caused by weather and climate-related extreme events in the EU



Averages to about €12 billion / year

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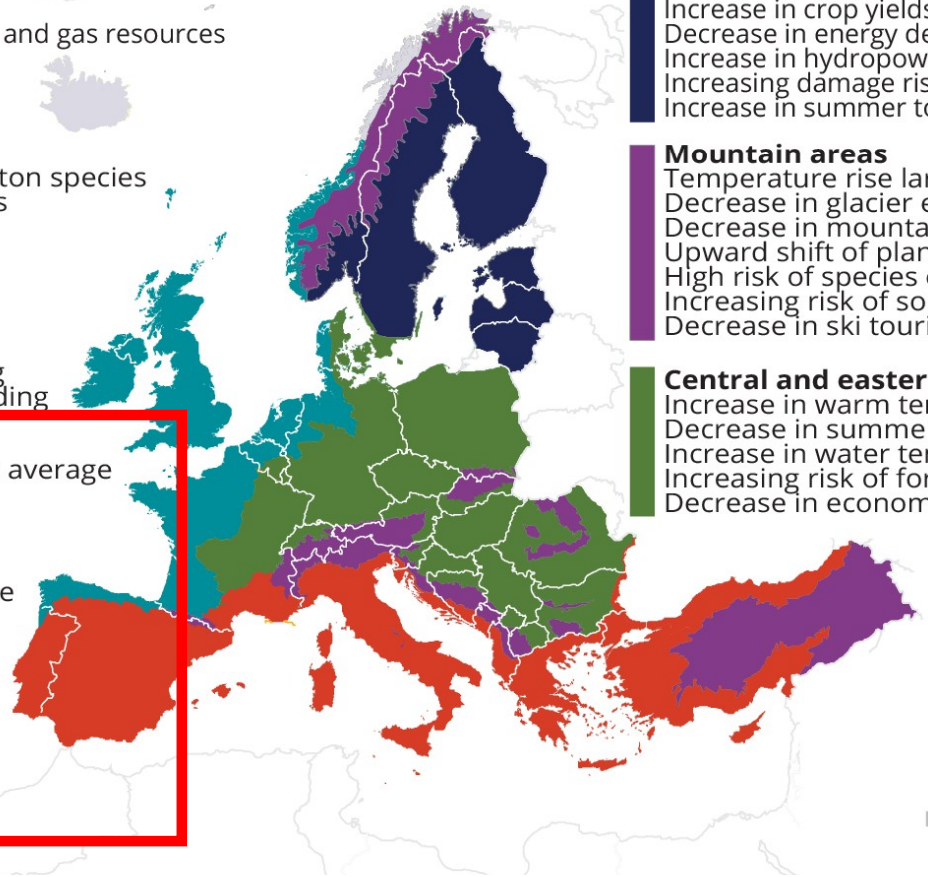
Key observed and projected impacts from climate change for regions in Europe

Arctic
Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Intensified shipping and exploitation of oil and gas resources

Coastal zones and regional seas
Sea-level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward expansion of fish and plankton species
Changes in phytoplankton communities
Increasing risk for fish stocks

North-western Europe
Increase in winter precipitation
Increase in river flow
Northward movement of species
Decrease in energy demand for heating
Increasing risk of river and coastal flooding

Mediterranean region
Temperature rise larger than European average
Decrease in annual precipitation
Decrease in annual river flow
Increasing risk of biodiversity loss
Increasing risk of desertification
Increasing water demand for agriculture
Decrease in crop yields
Increasing risk of forest fire
Increase in mortality from heat waves
Expansion of habitats for southern disease vectors
Decrease in hydropower potential
Decrease in summer tourism and potential increase in other seasons



Northern Europe
Temperature rise much larger than global average
Decrease in snow, lake and river ice cover
Increase in river flows
Northward movement of species
Increase in crop yields
Decrease in energy demand for heating
Increase in hydropower potential
Increasing damage risk from winter storms
Increase in summer tourism

Mountain areas
Temperature rise larger than European average
Decrease in glacier extent and volume
Decrease in mountain permafrost areas
Upward shift of plant and animal species
High risk of species extinction in Alpine regions
Increasing risk of soil erosion
Decrease in ski tourism

Central and eastern Europe
Increase in warm temperature extremes
Decrease in summer precipitation
Increase in water temperature
Increasing risk of forest fire
Decrease in economic value of forests

European Environment Agency

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Key observed and projected impacts from climate change in the Mediterranean (Water-related Impacts)

- Temperature rise larger than European average
- Decrease in annual precipitation
- Decrease in annual river flow
- Increasing risk of biodiversity loss
- Increasing risk of desertification
- Increasing water demand for agriculture
- Decrease in crop yields
- Increasing risk of forest fire
- Increase in mortality from heat waves
- Expansion of habitats for southern disease vectors
- Decrease in hydropower potential
- Decrease in summer tourism
  (and potential increase in other seasons)

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Water-Related Risks and Impacts

- Water Scarcity
- Flood Risks
- (Water Quality Deterioration)

Water-Related Risks

- Agriculture
- Tourism
- Municipalities

Sectoral Impacts

- Operational Risks
- Reputational Risks
- Regulatory Risks

Business Risks

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Water-Related Risks

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- **Water Scarcity**

Water-Related Risks

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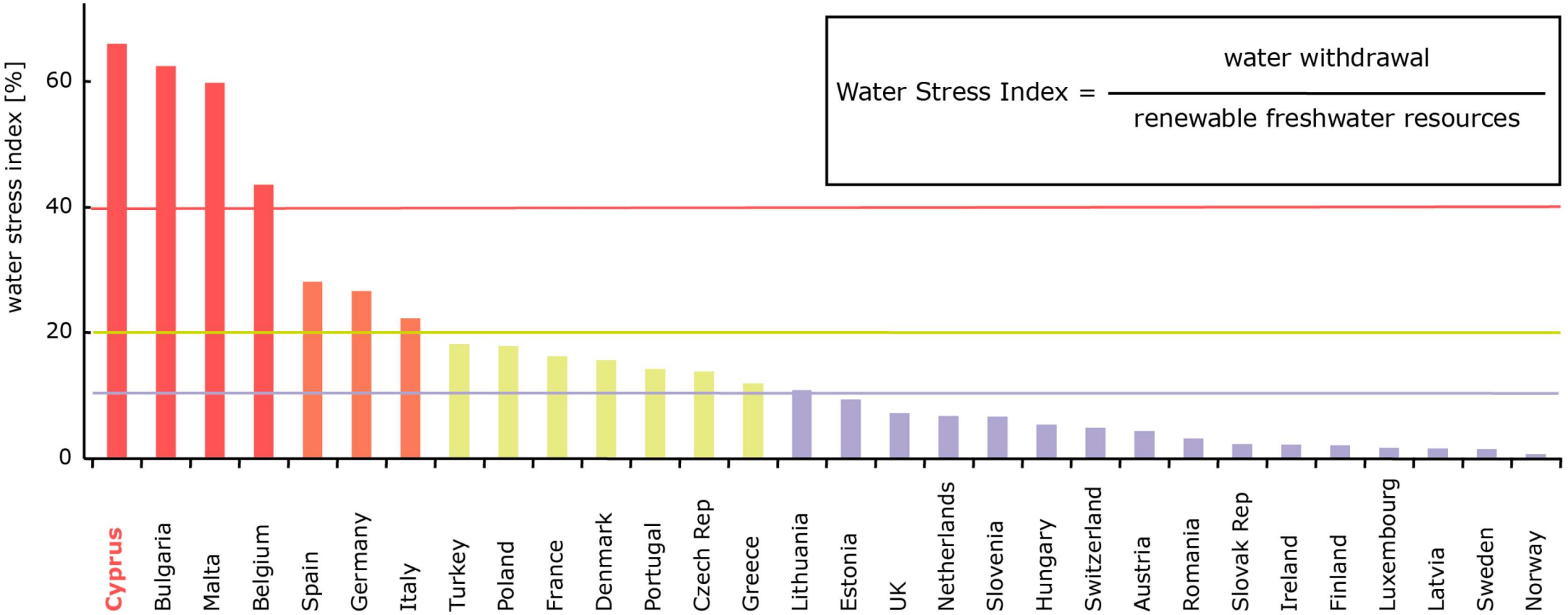
Water Stress of European Countries



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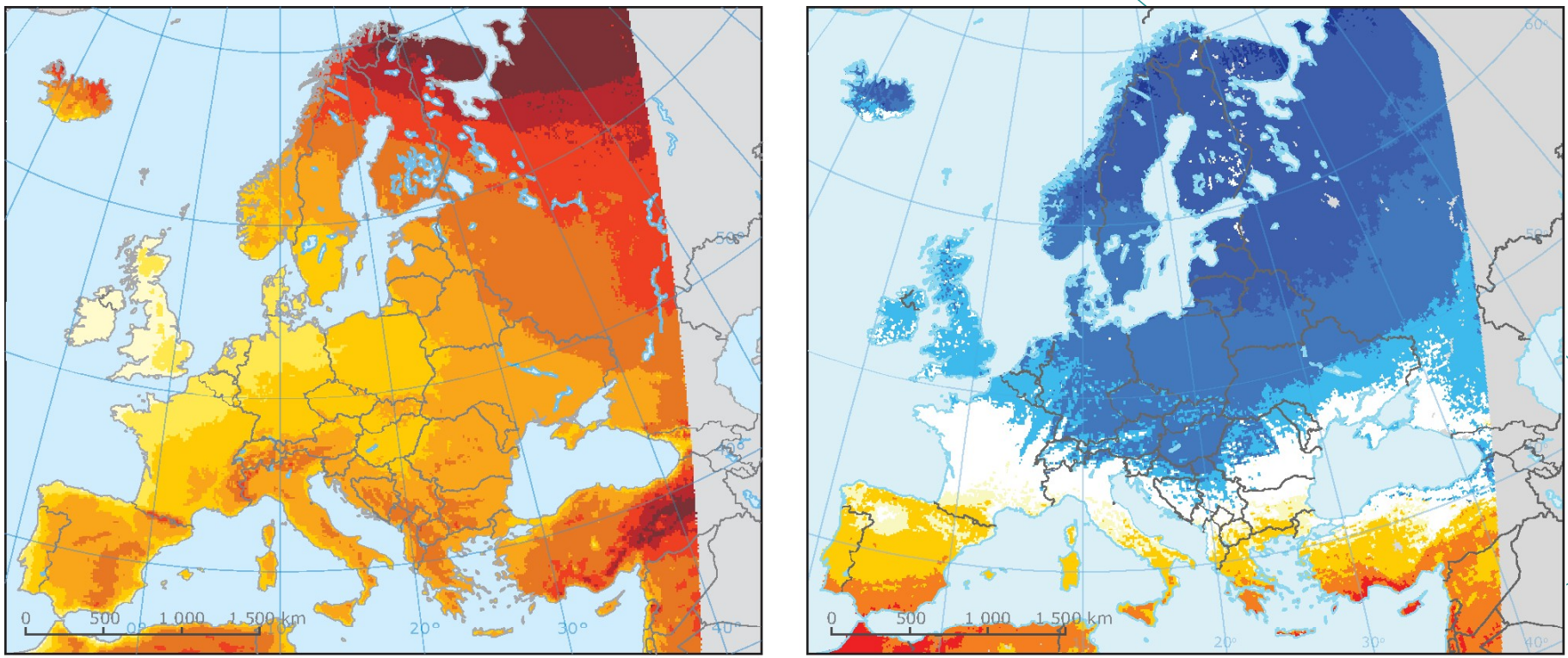
Projected changes in annual mean temperature and annual precipitation



Projected changes in annual mean temperature (left) and annual precipitation (right)

°C: < 3 | 3 to 3.5 | 3.5 to 4 | 4 to 4.5 | 4.5 to 5 | 5 to 5.5 | 5.5 to 6 | > 6

Outside coverage

%: < -40 | -40 to -30 | -30 to -20 | -20 to -10 | -10 to -5 | -5 to 5 | 5 to 10 | 10 to 20 | 20 to 30 | > 30

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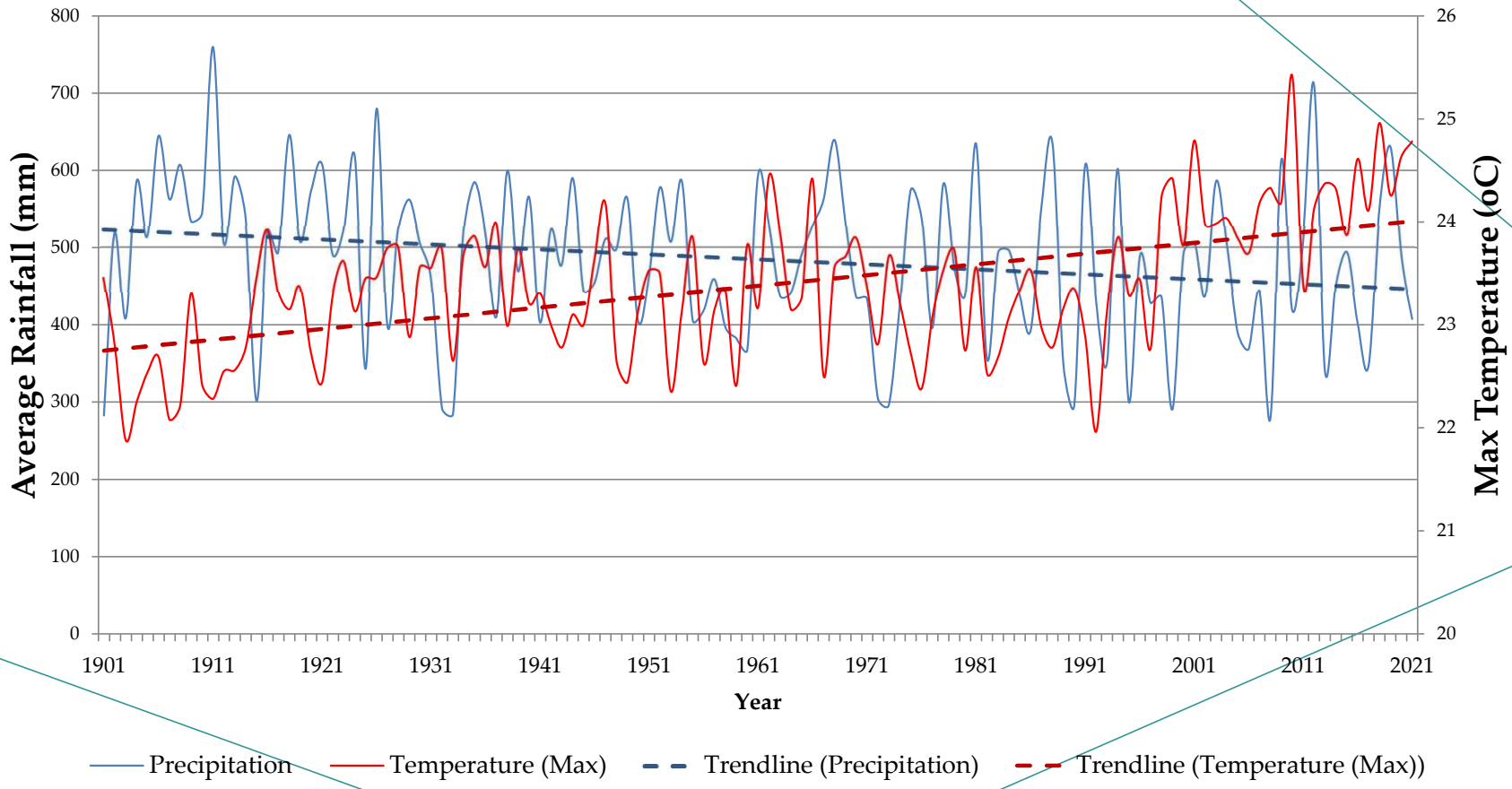
Temperature & Rainfall in Cyprus



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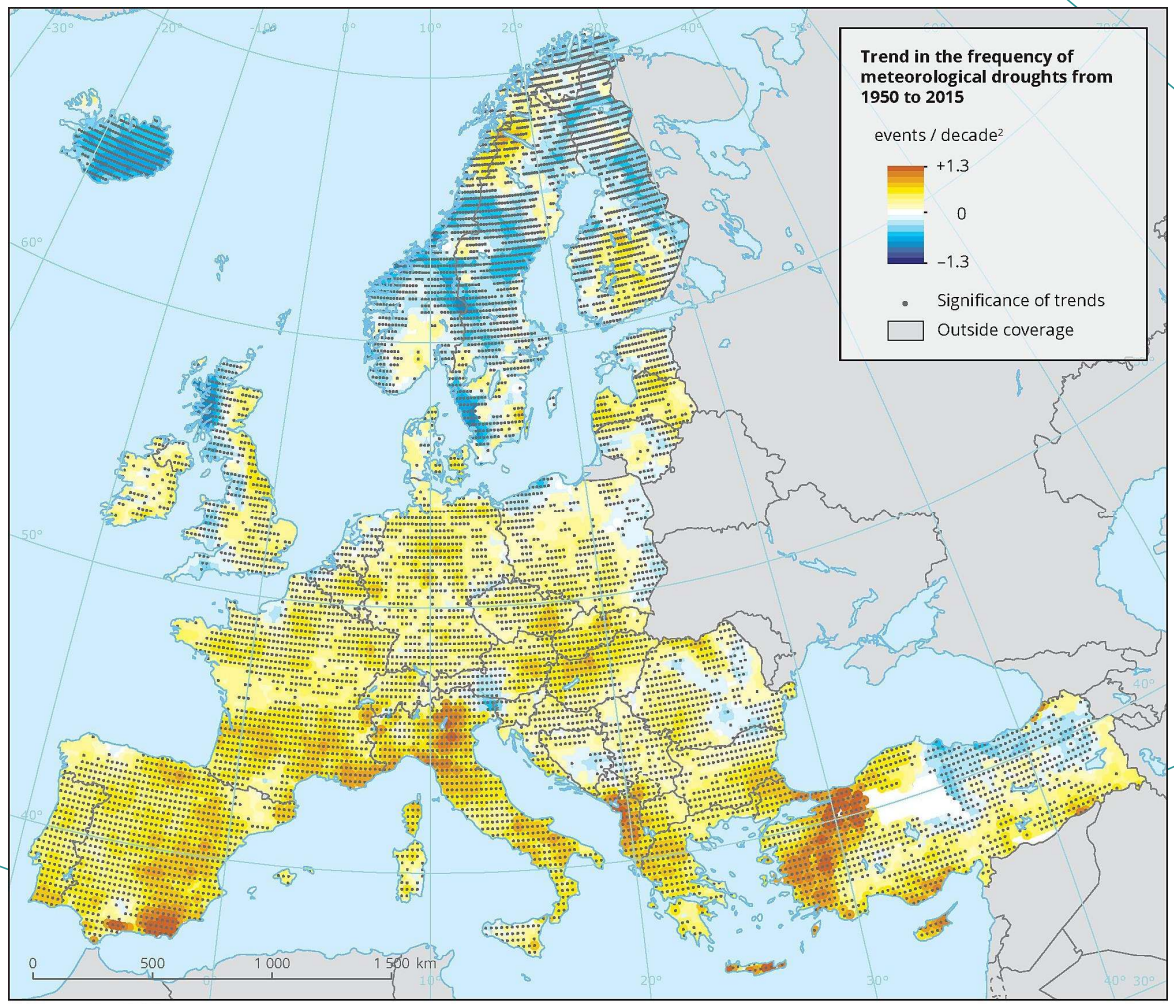
Cumulative effect of increasing temperature and decreasing precipitation (frequency of droughts)



Reference data: ©ESRI

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- **Flood Risks**

Water-Related Risks

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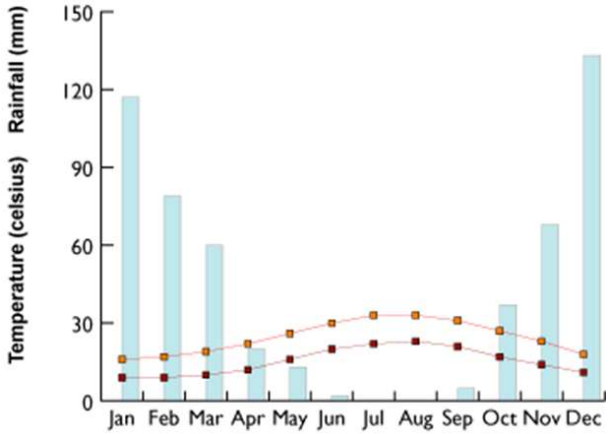
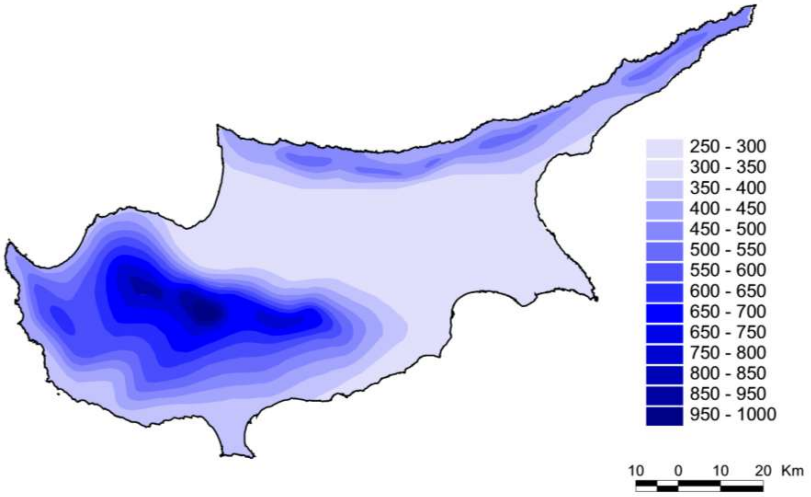
Cyprus: Temporal and Spatial Distribution of Water





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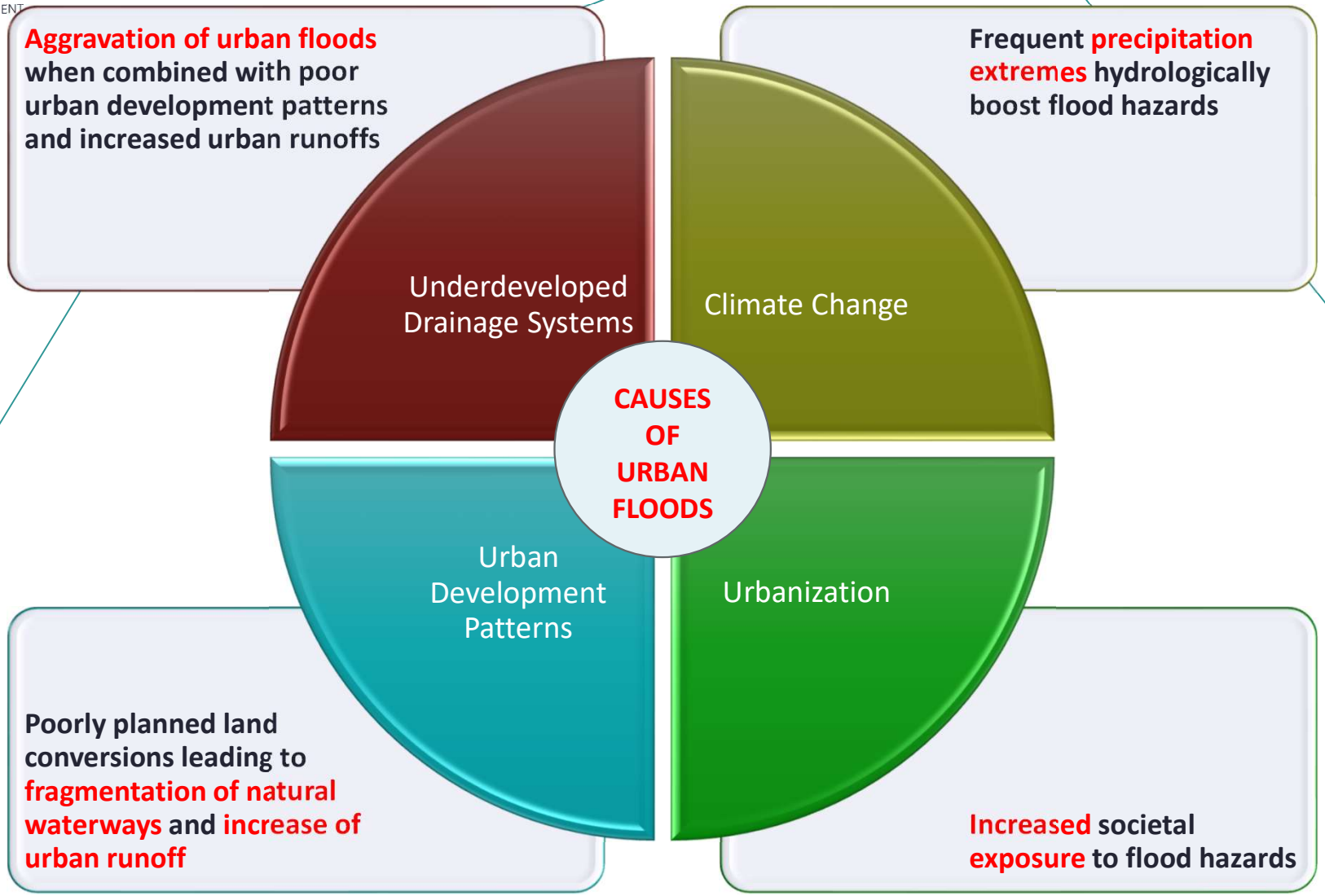

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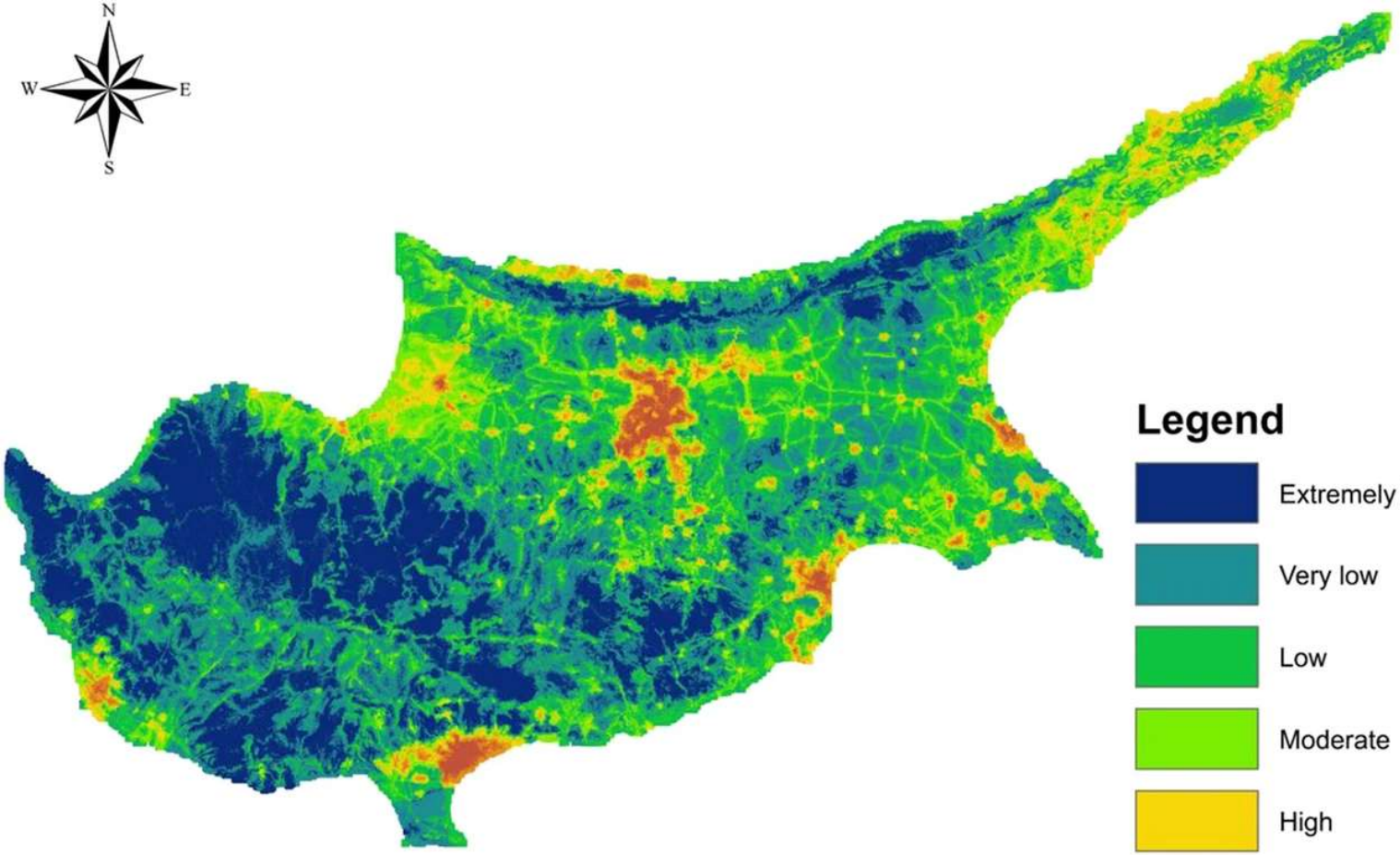
Cyprus Flood Risk Map



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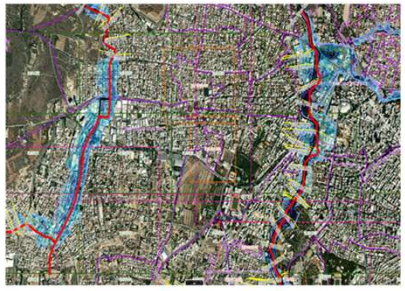
Flood Risk Plan

(Σχέδιο Διαχείρισης Κινδύνων Πλημμύρας - 2022-27)
(εφαρμογή Οδηγίας 2007/60/ΕΚ)

Ονομασία ΠΔΣΚΠ	Θιγόμενος Πληθυσμός	Ανθρώπινη υγεία	Κοινωνικές Υποδομές	Ιδιοκτησία	Τεχνικές Υποδομές	Οικονομικές δραστηριότητες	Αγροτικές δραστηριότητες	Πολιτιστική κληρονομιά	Περιβάλλον
ΕΠΑΡΧΙΑ ΛΕΥΚΩΣΙΑΣ									
Πεδιαίος	ΥΨΗΛΗ	ΜΗΔΕΝΙΚΗ	ΥΨΗΛΗ	ΥΨΗΛΗ	ΜΕΤΡΙΑ	ΥΨΗΛΗ	ΧΑΜΗΛΗ	ΜΕΤΡΙΑ	ΜΕΤΡΙΑ
Κλήμος	ΥΨΗΛΗ	ΜΗΔΕΝΙΚΗ	ΥΨΗΛΗ	ΥΨΗΛΗ	ΥΨΗΛΗ	ΥΨΗΛΗ	ΜΗΔΕΝΙΚΗ	ΜΗΔΕΝΙΚΗ	ΜΗΔΕΝΙΚΗ

Flooding hazard Map with a high probability (1/20)



Flooding hazard Map with an average probability (1/100)

Flooding hazard Map with low probability (1/500)

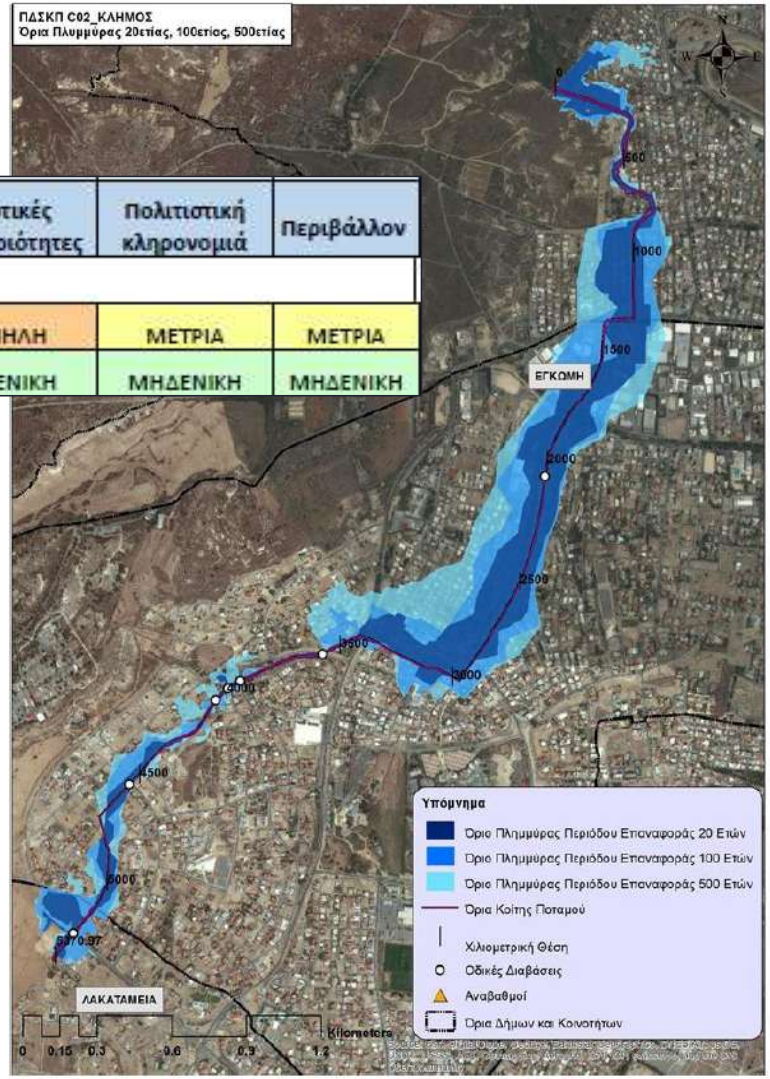


Figure 8. Interactive Flood Hazard Maps (source, http://www.moa.gov.cy/moa/WDD/wfdf.nsf/page08_gr/page08_gr?opendocument)

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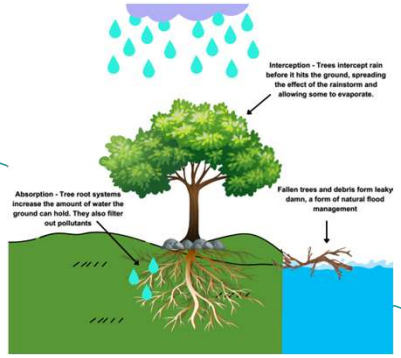
Flood Mitigation Approaches

Permeable surfaces

Significantly reduce flooding potential by absorbing 80-100% of water during intense rainfall.

Vegetated Filter Strips

Mitigate flooding from excessive rainfall and retain pollutants. Control the urban heat island effect.



Tree planting

Promote water retention and filtration. Aid in soil retention.

Rainwater Harvesting

Also helps to reduce municipal water consumption

Green Roofs

Achieves a 40-80% decrease in rainwater runoff into sewers.

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Sectoral Impacts

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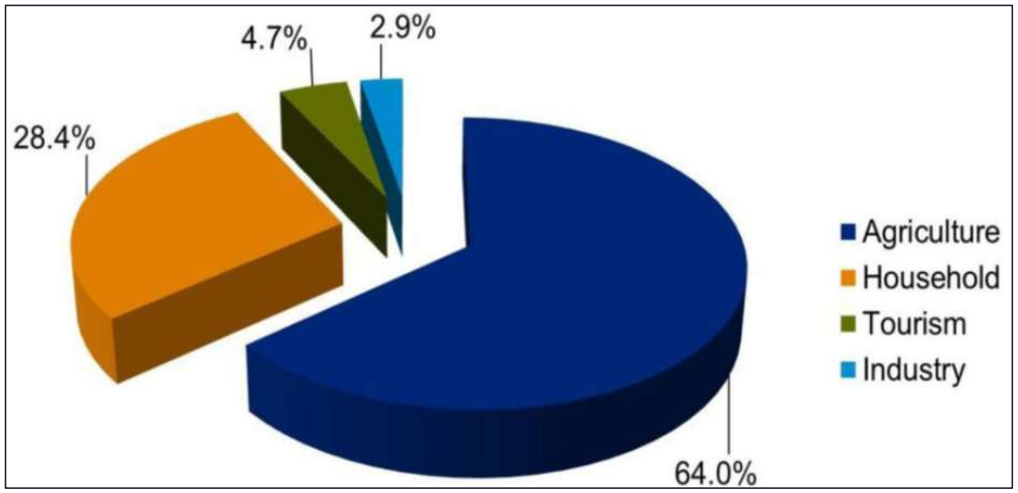
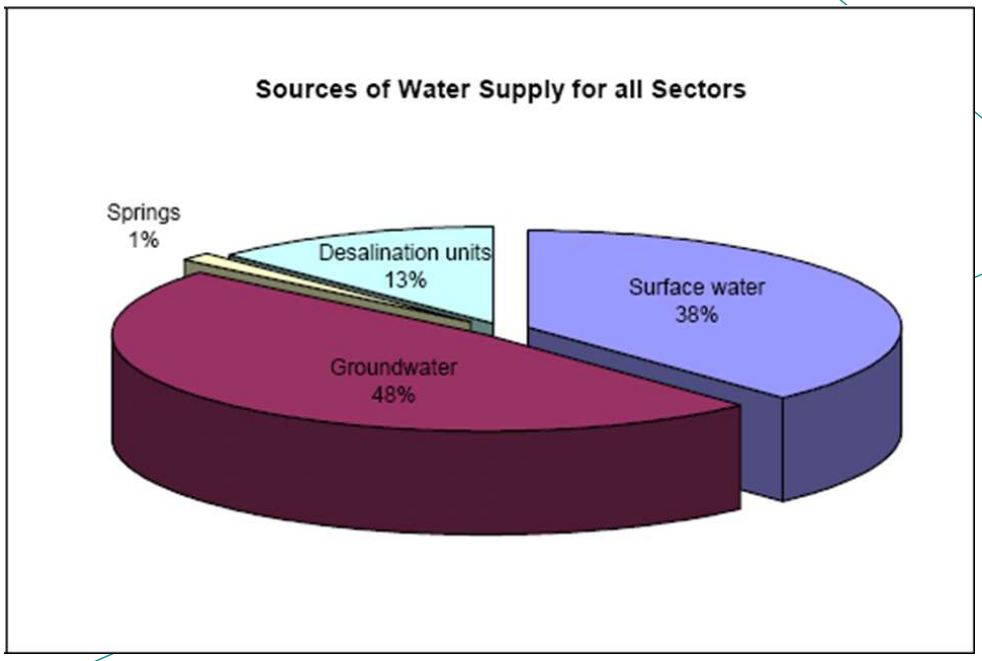
Cyprus: Water Demand and Supply





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- **Agriculture**

Sectoral Impacts

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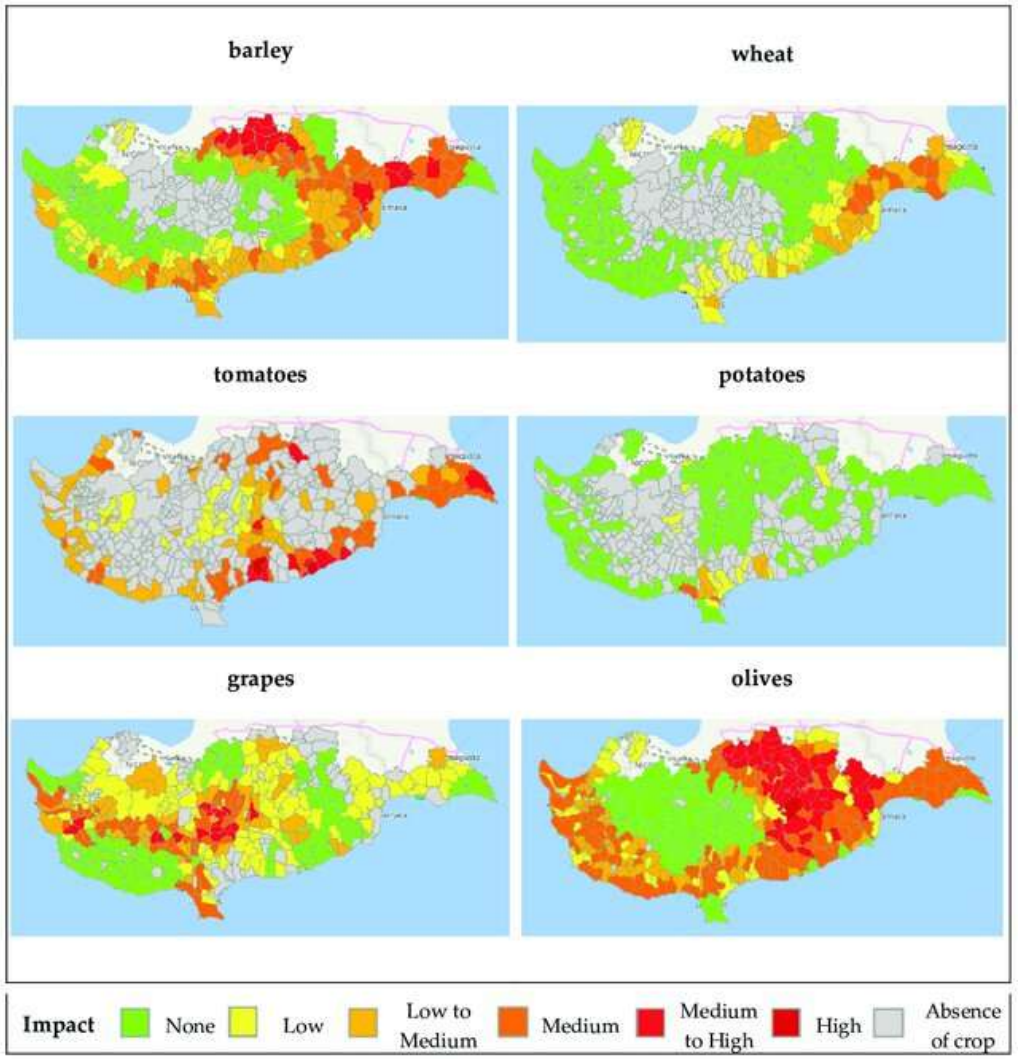
Climate Change Impacts on the Agricultural Sector of Cyprus



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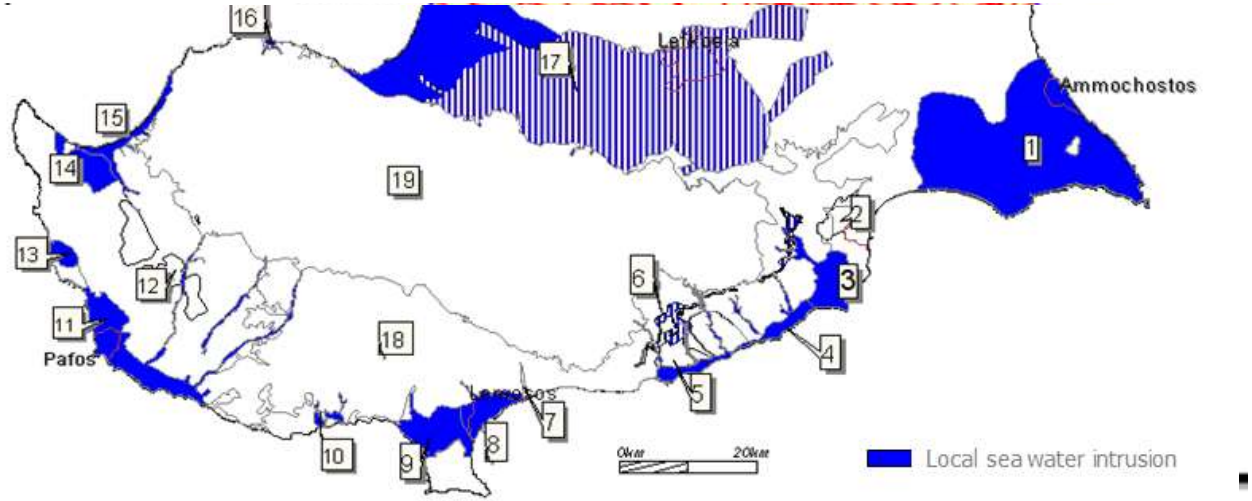
Climate Change Impacts of the Agricultural Sector in Cyprus



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- **Tourism**

Sectoral Impacts

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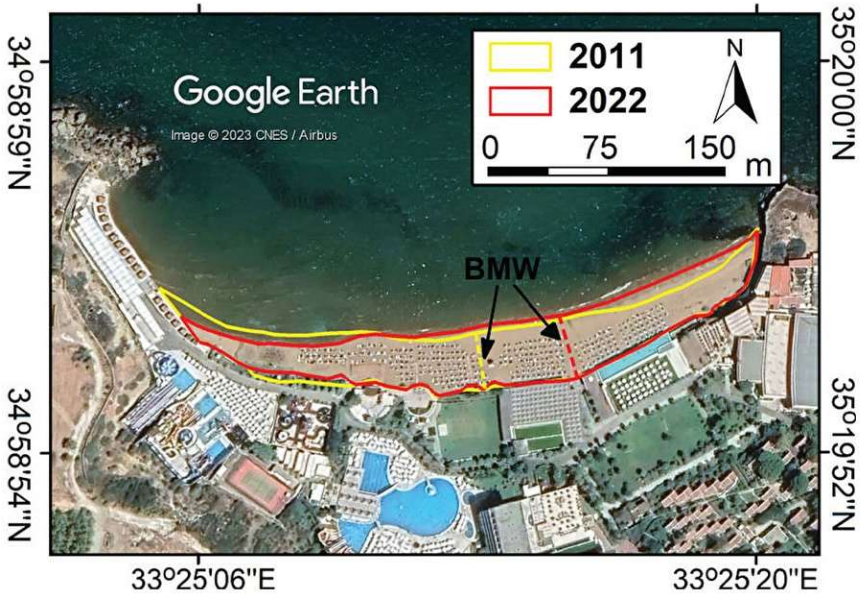
Climate Change – Coastal Erosion



Extreme sea level rise is projected to increase 60% by 2100 (up to 1.29 m above mean sea level) compared to the baseline level in 2000, with the greatest resulting erosive action occurring on the southern and western coastlines. However, it is the narrow beaches of less the 50 m width that are potentially most susceptible to erosion, with up to 72% modelled to permanently reduce their width by at least half at the end of the century.

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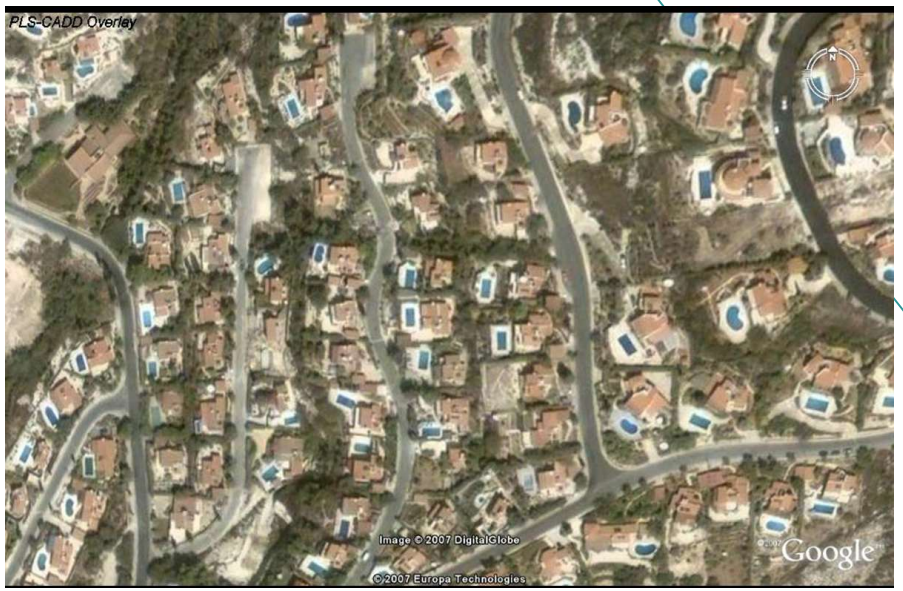
Reduced water availability for hotels, pools, and tourist activities



The water lost due to evaporation from a regular size swimming pool in Cyprus exceeds 250 L/day

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- **Municipalities**

Sectoral Impacts

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Water-Related Impacts on Municipalities

- **Urban Flooding**
  - Increasing intensity of short-duration rainfall events exacerbates **flash flooding** in urban areas.
  - Inadequate drainage infrastructure in many municipalities contributes to **localized flooding**.
  - **Economic and infrastructure damages**: Roads, bridges, and properties in flood-prone areas.
  - **Disruptions to** municipal **services**, such as public transportation and waste management.
- **Water Supply and Scarcity**
  - Declining freshwater availability and Increased dependency on desalination plants **raises operational costs**.
  - Impacts on residents and businesses due to **water rationing** during droughts.
  - Reduced water availability for municipal green spaces (parks, urban forests) affects **biodiversity**.
- **Economic Implications**
  - Higher **municipal costs** for flood defence infrastructure and maintenance.
  - Potential **losses in tourism revenue** in urban historical sites and coastal areas.
  - **Rising water tariffs** to fund water management projects.

https://www.youtube.com/watch?v=7t-GtkpqdZY

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Business Risks

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Water-Related Risks to Businesses

- **Operational Risks**
  - Disruptions in water supply for manufacturing, hospitality, and energy sectors.
  - Cost increases due to water scarcity or desalination.
- **Reputational Risks**
  - Negative perception of businesses that fail to manage water sustainably.
- **Regulatory Risks**
  - Stricter water management policies or penalties for overuse.

- It is necessary to understand 1) the **vulnerability** of supply chains to water risk, 2) the **economic impact** and 3) response or **mitigation** activities.
  - **Water footprints** are a good starting point to understand use per unit product of economic output, and the distribution of water consumption across the value chain of impacted industry sectors

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Water risk-response decision framework for businesses

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Conclusions

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Strategies for Mitigation

- **Government Initiatives:**
  - Adoption of **Integrated Water Resources Management**.
  - **Investments** in desalination plants and water recycling.
  - **Incentivize** water conservation technologies.
- **Business Actions:**
  - Implementing **water efficiency measures** (e.g. invest in water reuse systems and reduce water footprints).
  - Develop long-term climate resilience strategies (start by conducting **water risk assessments,** or consider Green Certifications**)**
  - **Educating** management and personnel.
  - Partnering with government agencies for **resource planning**.

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- **Recap Key Messages:**
  - **Climate change significantly exacerbates water-related risks in Cyprus.**
  - **Proactive planning and collaboration are essential to mitigate impacts.**

- **Final Thought:**
  - **Climate resilience (especially in relation to water) is not just an environmental goal; it is a critical business imperative.**

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- **Questions?**
- **Comments?**
- **Insults?**