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CLIMATE CHANGE AND ECONOMY: TOURISM ASPECTS FOR GREECE

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Climate Change…

"We, the human species, are confronting a planetary emergency – a threat to the survival of our civilization that is gathering ominous and destructive potential even as we gather here. But there is hopeful news as well: we have the ability to solve this crisis and avoid the worst – though not all – of its consequences, if we act boldly, decisively and quickly."

AL GORE, NOBEL PEACE PRIZE LECTURE, 10 DECEMBER 2007

- **Climate is critical to the world as we know it.**
- **In broad terms, "climate" is the typical range of weather, including its variability, experienced at a particular place.**
- **What is of immediate concern is that climate has shown an almost unprecedented rapid global warming trend in the last few decades.**

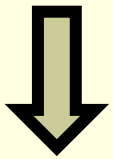
Introduction

- Tourism is a climate-sensitive economic sector.
- Climate change affects a number of key factors of tourism.
- Tourism contributes to climate change since it is responsible for about 5% of global CO_2 emissions.
- Urgency of tourism sector: respond to climate change, via mitigating its GHGs emissions and adapting businesses and destinations to the dynamically changing climate conditions.

Introduction

- **Confronting climate change requires governance based on the formation of robust policies.**

- **Realistic strategies for mitigation and adaptation measures need:**
  - **to be based on a destination-level approach (specific characteristics of the area under study)**
  - **involve a wide range of scientists and stakeholders with different expertise and interests.**

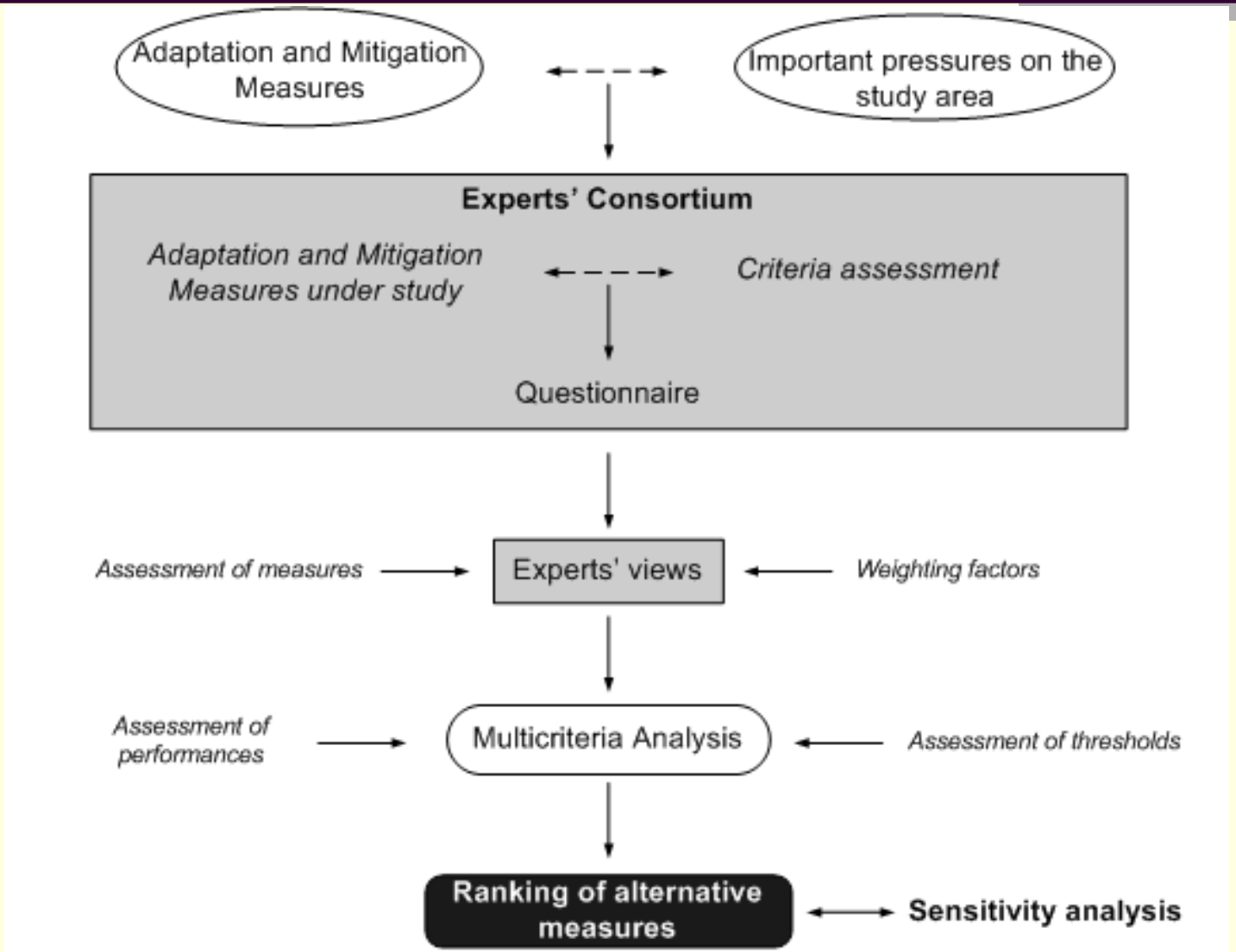


multi-criteria analyses and decision-making theories

Introduction

- The approach is based on Multi-Criteria Decision Analysis methodological framework.
- Interface environmental benefits, financial viability, applicability and local acceptance of the available policies for the final strategy adopted.
- Enables the synthesis of interdisciplinary knowledge so as to maximize local consensus and secure the adoption of the resulting optimal strategy.

Methodological insights



Case study - Selection of study area

- Mediterranean is considered climatically vulnerable, combining significant variations in precipitation, temperature, air humidity and cloud cover, affecting also Greece.
- Factors such as temperature increase, drought, extreme weather phenomena and rising sea levels will have an impact on tourism as well as other sectors.
- Capital loss and additional costs to repair the damage, especially if adverse health effects caused by climate change and corresponding externalities are also considered.

Case study - Selection of study area

- Greece has 13,600 km of coastline, 190,000 beaches, and 6,000 islands and islets.
- 33% of population inhabits coastal areas located at 1–2 km near the coast.
- In 2012, more than 9,500 hotels operated in Greece.
- Contribution to Greek GDP amounted to 16.4%, while total employment in tourism (688,800 jobs) corresponded to 18.3% of the workforce in 2012.

Case study - Selection of study area

- Greece is expected to experience an increase in maximum, minimum and average temperature, especially during summer periods (peak tourism activity).
- The mean air temperature countrywide in the decade 2091-2100 is projected to be 4.5ºC higher on an annual basis under the most extreme scenario and 2.4ºC under the modest scenario.
- The frequency of occurrence of heat waves will increase until the end of the 21st century.
- Annual precipitation levels countrywide are projected to decline during the period 2071-2100, relative to 1961-1990, by 17% to 19%.

Case study - Selection of study area

- Increase in the intensity of the extreme precipitation indices is expected, raising the possibility of floods and extreme events.
- The projected temperature rise should increase fuel dryness and reduce relative humidity.
- The increased frequency of extreme climate events is expected to have a significant impact on the fire vulnerability of forests.
- Greek coastal areas will be threatened from the risk of a rise in average sea level by an estimated 0.2 m to 2 m by the year 2100. 21% of Greece's total shoreline is going to present medium to high vulnerability, supposing a rise of sea level of 1 m.

Results and Discussion

- Review of the mitigation and adaptation alternatives already implemented in touristic areas worldwide.
- Synthesis of the available pool of policies/measures for the Greek case (inventory and a short description of the corresponding alternatives).
- Decision-making group: 17 experts origin from the scientific and stakeholders community, representing local authorities, organizations and chambers actively involved in the tourism sector in Greece.

Results and Discussion

- 18 mitigation and 16 adaptation alternatives from the policies' pool were characterized as most appropriate for the case under study.
- 4 criteria for their evaluation (C_1: environmental benefit, C_2: applicability, C_3: cost, C_4: social acceptance).
- A 10-point dichotomous-choice scale was used, with 1 being "poor", and 10 being "outstanding" for criteria C_1,C_2,C_4, with the exception of criterion C_3, where 1 represents "high" cost and 10 represents "low" cost.

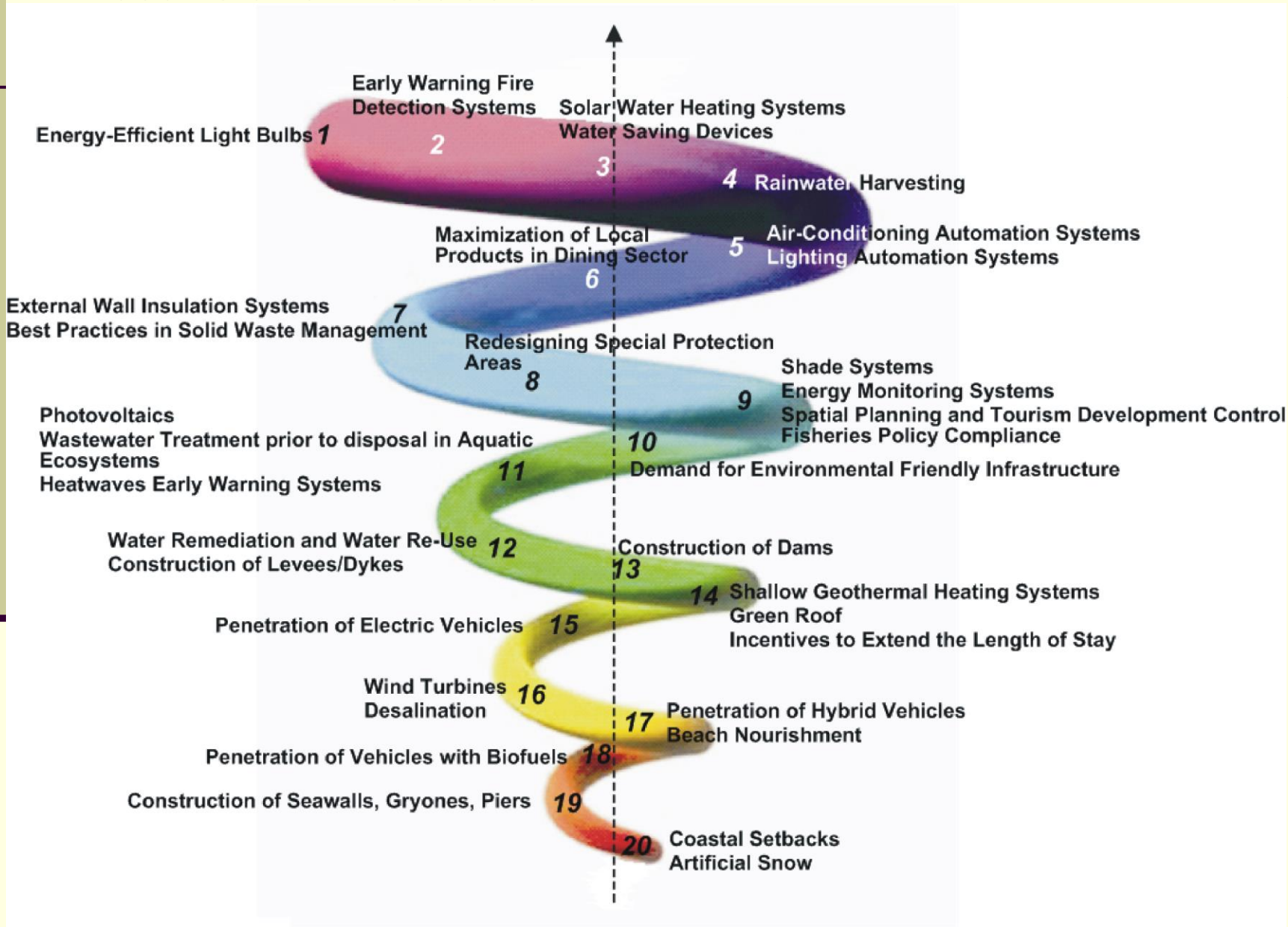
Results and Discussion

Mitigation Measures	C_1	C_2	C_3	C_4
M1. Photovoltaics	7.5	8.06	5.94	8.13
M2. Shallow Geothermal Heating Systems	8.69	5.25	4.94	7.93
M3. Wind Turbines	7.5	6.63	5.25	5.88
M4. Solar Water Heating Systems	8.56	9.13	7.88	9
M5. External Wall Insulation Systems	8.56	7.81	6.69	9.13
M6. Shade Systems	7.56	8.06	7.31	8.13
M7. Air-Conditioning Automation Systems	8.38	8.75	8.06	8.63
M8. Lighting Automation Systems	8.06	8.63	8.13	8.94
M9. Energy Monitoring Systems	7.88	7.75	7.19	7.81
M10. Energy-Efficient Light Bulbs	8.25	9.63	9.19	9.5
M11. Green Roof	7.88	5.94	5.81	8.38
M12. Maximization of Local Products in Dining Sector	7.88	7.63	8.06	8.94
M13. Incentives to Extend the Length of Stay	5.94	5.75	6.75	8.75
M14. Penetration of Electric Vehicles	6.88	6.63	5.25	8.33
M15. Penetration of Hybrid Vehicles	7.31	6.13	4.63	8.07
M16. Penetration of Vehicles with Biofuels	6.69	5.5	5.5	7
M17. Demand for Environmental Friendly Infrastructure	8.31	6.75	7.25	7.94
M18. Best Practices in Solid Waste Management	8.88	7.06	6.81	8.38

Results and Discussion

Adaptation Measures	C_1	C_2	C_3	C_4
A1. Desalination	7.19	6	5.25	7.06
A2. Rainwater Harvesting	8.75	8.13	7.81	8.69
A3. Water Remediation and Water Re-Use	8.31	7.38	6.19	7.81
A4. Water Saving Devices	8.44	8.88	8.13	8.88
A5. Coastal Setbacks	6.94	4.31	5.94	4.81
A6. Construction of Seawalls, Groynes, Piers	6.94	6.19	4.94	6.44
A7. Beach Nourishment	6.81	6	5.25	7.38
A8. Spatial Planning and Tourism Development Control	8.69	6.75	8.19	7
A9. Fisheries Policy Compliance	8.5	6.69	7.81	7.13
A10. Wastewater Treatment prior to disposal in Aquatic Ecosystems	8.81	7.06	6	8.25
A11. Redesigning Special Protection Areas and Special Areas of Conservation	8.44	7.44	7.56	7.38
A12. Heatwaves Early Warning Systems	6	7.69	7.63	8.81
A13. Early Warning Fire Detection Systems	9.31	8.63	7.5	9.63
A14. Construction of Dams	7.75	7	5.88	7.31
A15. Construction of Levees/Dykes	7.5	7.38	6.69	7.88
A16. Artificial Snow	4	6.31	5.63	7.19
Weighting factors (%)	29.06	25.94	29.69	15.31

Results and Discussion



Results and Discussion

- Energy-efficient lights to tourist lodgings is the best alternative measure due to its very good performance in all criteria.

- Early fire detection systems, solar water heating systems, rainwater harvesting, air-conditioning and lighting automation systems occupy the first five positions in the optimal ranking (easy to implement, significant environmental benefit in relation to their cost, and high levels of social acceptability).

- Penetration of vehicles with biofuels and the construction of seawalls, gryones and piers, coastal setbacks and artificial snow come last in the ranking due to their low performance under all criteria.

Results and Discussion

- Weighting factors and thresholds are most often based on personal views and opinions of the experts involved.
- What-if analysis on critical values of parameters is performed.
- The mathematical problem is resettled with differentiating preference and indifference thresholds by 30% (increasing and decreasing) and examined in parallel to the “basic” scenario. The percentage (%) increase/decrease amount was applied equally all across the control options.
- No significant variations in the optimal strategy results.

Conclusions

- The optimal governance strategy reveals that rational energy use / energy efficiency oriented policies and measures are of crucial importance to be implemented in Greece (buildings in Greece is an energy intensive sector and accounts for approximately 40% of the total energy consumption).

- Alternatives in the last positions concern measures against sea level rise and ski industry and resorts, which do not present high vulnerability in Greece for the time being.

Conclusions

- The Greek case study depicts that the MCDA methodological framework could be a useful, tool for decision makers in order to plan and implement a bottom-up (from citizen to governance) strategy for sustainable tourism areas.

- It assists on maximizing consensus, crucial in real life decision making problems, and scientifically (and not politically) provides governance priorities regarding the optimal planning towards addressing climate change.

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Thank you for your attention!

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