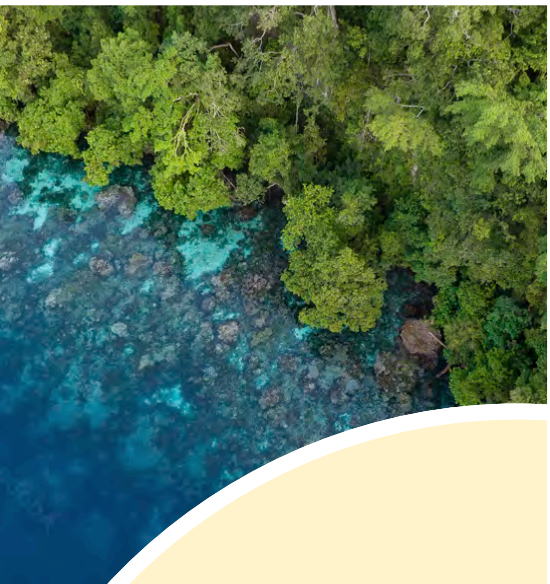

Interlinking climate change with the Water - Energy - Food - Ecosystems (WEFE) nexus in the Mediterranean Basin

by MedECC

Mediterranean Experts on Climate and environmental Change

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

UN environment programme

Mediterranean Action Plan
Barcelona Convention

Plan Bleu

MEDITERRANEAN EXPERTS ON CLIMATE AND ENVIRONMENTAL CHANGE

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Special Report

Interlinking climate change with the Water - Energy - Food - Ecosystems (WEFE)

nexus in the Mediterranean Basin

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Foreword

The Mediterranean region is currently dealing with critical global challenges, including water scarcity, food and energy insecurity, and ecosystem degradation. These challenges are interconnected and are collectively referred to as the Water-Energy-Food-Ecosystems (WEFE) nexus. Climate change further exacerbates these challenges, making it necessary to take a comprehensive and integrated approach to achieve sustainable development and resilience in the face of evolving environmental and socio-economic dynamics.

This Special Report on the WEFE nexus is essential. It represents a significant step in understanding the complex relationships between water, energy, food, and ecosystems in the Mediterranean. The report is based on assessment frameworks developed by the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). It offers a comprehensive assessment of the available scientific knowledge on these issues, covering the drivers of change, cascading impacts, and response options for addressing the multiple challenges in the region. The report emphasises the need for cross-sectoral coordination, technological and social innovation, ecosystem-based solutions, including nature-based, and transformative governance to mitigate risks and maximise synergies across the WEFE components.

This report aligns with the most recent IPCC findings on climate impacts, focusing on the Mediterranean region, and adapts the IPBES context to emphasise the crucial role of ecosystems in ensuring water, food, and energy security. It stresses the importance of employing a nexus approach at various scales – from local to regional – to build resilience, promote peace, and support the achievement of the Sustainable Development Goals (SDGs).

The findings in this Special Report are the result of collaborative efforts by scientists, policymakers, and stakeholders across the Mediterranean. It builds on the First Mediterranean Assessment Report (MAR1) released in 2020 by MedECC, advancing the discussion by focusing on the interconnections and trade-offs between water, energy, food, and ecosystems. This report provides decision-makers with data-driven insights, along with evaluations relevant for policy-making needed for mitigating climate impacts and ensuring the sustainable management of natural resources.

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Wolfgang CRAMER
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Joël GUIOT

Report Coordinators:
Philippe DROBINSKI
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Mohamed ABDEL MONEM

Statements from Key Partners

This new MedeCC special report on the nexus or interaction between water, environment, food and energy (WEFE) sheds light on a vital aspect of Mediterranean life. The growing water shortage in the Basin is threatening the survival of the environment and agriculture around the Big Blue. It is the very life of the Mediterranean people that is at stake, their ability to ensure their food security. The countries on the southern shores of the Mediterranean are already bearing the full brunt of repeated spring and summer droughts, with torrential rains following in the autumn. The threat is rising in latitude, and Europe is now under the spotlight.

Technology, and in particular the desalination of seawater using renewable energy sources, may offer ways of adapting, but let's make no mistake: we need to rethink the management of the great water cycle, questioning not only supply but also uses.
It is fundamental.

Mr Robin Degron
Director of Plan Bleu (UNEP/MAP)

Climate change presents multiple challenges to the water, energy, food, and ecosystems (WEFE) nexus in the Mediterranean region. Rising temperatures, evolving precipitation patterns, and more frequent extreme weather events threaten water availability, agricultural productivity, energy security, and ecosystem health across the region. This new report addresses the critical need to understand and manage the intricate links between climate change and the WEFE nexus in the Mediterranean. By examining how climate stressors impact each component of this nexus and how they interrelate, it offers a comprehensive overview of the current challenges while highlighting solutions to enhance resilience and sustainability, thus contributing to the objectives of the UNEP/MAP Mediterranean Strategy for Sustainable Development.

It emphasizes the importance of integrated management approaches that account for the interdependencies within the WEFE nexus to develop adaptive strategies for mitigating climate impacts. The report, compiled by voluntary scientists within the network of Mediterranean Experts on Climate and environmental Change (MedECC), and engaging policymakers, represents an invaluable contribution to the science-policy dialogue in the Mediterranean and to support evidence-based decision-making. The UNEP/MAP is pleased to renew its support for MedECC, with activities included in the UNEP/MAP work programs for 2024-2025."

Ms Tatjana Hema
UNEP/MAP Coordinator

As we confront the interconnected challenges of climate change, this report on the Water-Energy-Food-Ecosystems (WEFE) nexus sends the clear and urgent message: the time for action is now. The Mediterranean, a high-risk region, faces severe pressures. Water scarcity is deepening, energy demand is mounting, food security is under threat, and ecosystems are being pushed to the brink of collapse. The consequences of inaction will profoundly impact millions of lives and destabilise our economies. This report serves as a strong call for action for political leaders and stakeholders throughout the region. It emphasises the need for innovative and integrated solutions, including renewable energy technologies, ecosystem-based approaches, and social strategies to promote sustainable practices. It also advocates for enhanced institutional capacities and improved science-policy interface to ensure coordinated actions across sectors. The Union for the Mediterranean is committed to leading this change and facilitating regional cooperation to address these pressing challenges. However, this can only be achieved with firm commitment from all parties involved. The Mediterranean must transform from a "hot spot" of climate troubles to a "hope spot" for sustainable development, a shift that requires decisive leadership and immediate action. We must unite and tackle these interconnected challenges with ambition and determination to enhance resilience, safeguard resources and work towards a sustainable future for the Mediterranean.

Mr Nasser Kamel
Secretary General of the Union for the Mediterranean (UfM)

Acknowledgements

The MedECC report is the result of extensive efforts by numerous individuals, supported by esteemed institutions. We express our deepest appreciation to the Coordinating Lead Authors and Lead Author for their invaluable expertise and dedication throughout the process. Their work was facilitated by the many Contributing Authors, who assisted in drafting the report. We are grateful to the experts and government reviewers whose insightful feedback on the drafts significantly enhanced the report's quality.

We sincerely acknowledge the support from the contributing institutions, particularly Plan Bleu, which hosts the MedECC Secretariat, the Union for the Mediterranean (UfM) (with funding from the Swedish International Development Cooperation Agency (SIDA)), and the United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP). The MedECC also benefits from the funding from the French Agency for Ecological Transition (ADEME), the French Ministry of Ecological Transition and Territorial Cohesion, the French Ministry for Europe and Foreign Affairs (MEAE), the Italian Ministry of Environment and Energy Security (MASE), the Principality of Monaco, the French Rhone Mediterranean Corsica water agency, and the Mediterranean Trust Fund (MTF). MedECC is also supported by the Advisory Council for the Sustainable Development of Catalonia (Government of Catalonia, Spain), the Association pour l'innovation et la recherche au service du climat (AIR Climat) and IT Department of OSU Pythéas (France).

We would like to extend our special recognition to individuals who provided invaluable help in advancing MedECC and its science-policy interface, especially Robin Degron and François Guerquin, current and former Director of Plan Bleu, Lina Tode, former Deputy Director of Plan Bleu and Antoine Lafitte, Director of the Observatory and Relations with UNEP/MAP at Plan Bleu; Grammenos Mastrojeni, Deputy Secretary General for Energy and Climate Action (UfM Secretariat); Marie-Claire Boillot, Senior Expert on Energy and Climate Action (UfM Secretariat); Arnault Graves, former Senior Climate Adviser (UfM Secretariat). We also acknowledge the UNEP/MAP Coordinating Unit, especially Coordinator Tatjana Hema, as well as Ilias Mavroeidis and Julien le Tellier, current and former Programme Management Officer respectively.

We gratefully thank the following individuals who provided their invaluable help and assistance for the Coordinating Lead Authors in person meeting, held in Barcelona (Spain) in June 2022: Arnau Queralt Bassat (Advisory Council for the Sustainable Development of Catalonia, Government of Catalonia, Spain) and Maria Carmen Llasat (University of Barcelona, Spain), Sandra Dubelcco and Yasmine Hadj Larbi (Plan Bleu).

The refinement of the Summary for Policymakers (SPM) was further enhanced by a day-long discussion with stakeholders, including governmental Focal Points, chaired by Marie-Claire Boillot (UfM) and Antoine Lafitte (Plan Bleu).

We are grateful to those involved in communicating about MedECC and its reports, including the Plan Bleu communication team, especially Pauline Simon, Christelle El Selfani, and Chloé Gaillard, as well as the UfM communication team, especially Isabel Pardillos.

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Preface

MedECC

The Mediterranean Experts on Climate and environmental Change (MedECC) is an open and independent network of scientists founded in 2015, that specifically focuses on climate and environmental changes within the Mediterranean region. The objective of MedECC is to provide decision-makers, stakeholders, and citizens with scientific assessments of scientific knowledge on climate and environmental changes including associated risks and social aspects.

To date (October 2024) more than 300 authors contributed to MedECC reports in an individual capacity and without financial compensation. MedECC scientists are located in 35 countries, including 19 registered as Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and 23 members of the Union for the Mediterranean (UfM).

The network is governed by Co-Coordinators, a Steering Committee, and an Advisory Board. The operations are managed by the MedECC Secretariat, which is officially hosted by Plan Bleu, a UNEP/MAP Regional Activity Centre in Marseille, France, as part of a partnership with the Secretariat of the Union for the Mediterranean (UfM). The Mediterranean Action Plan of the United Nations Environment Program (UNEP/MAP) has also provided support since 2022, with MedECC activities integrated into the UNEP/MAP Work Programmes for 2022-2023 and 2024-2025, approved during COP 22 (Antalya, Türkiye, December 2021) and COP 23 (Portorož, December 2023). The UfM supports MedECC through technical assistance contracts for the MedECC via the AIR Climat association (2018-2020, 2021-2023 and 2024-2026) thanks to the funding from the Swedish International Development Cooperation Agency (SIDA).

The MedECC published the First Mediterranean Assessment Report (MAR1) in November 2020, which includes a Summary for Policymakers (SPM) that has been approved line by line during a plenary session attended by government representatives from Mediterranean countries in September 2020. The SPM was recognised as an important contribution of the scientific community to future climate and environmental action in the Mediterranean region in the Declaration adopted during the 2nd Union for the Mediterranean Ministerial Meeting on Climate and Environmental Action (October 4, 2021, Cairo, Egypt), and was endorsed by the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its Protocols at their 22nd meeting (COP 22, December 2021, Antalya, Türkiye). MedECC was awarded the prestigious North-South Prize 2020 of the Council of Europe for their efforts for peace and democracy. The MAR1 report has significantly laid the groundwork for the first ever chapter on the Mediterranean Basin in an IPCC report, published as a cross-chapter paper in the IPCC 6th Assessment Report in 2022. The findings of MAR1 have been recognised in several key strategic documents aimed at mitigating climate impacts and informed by scientific knowledge from MAR1. The Portorož Ministerial Declaration, signed by the Ministers of the Environment and Heads of Delegation of the Contracting Parties to the Barcelona Convention during COP 23, held from December 5-8, 2023, in Portorož, Slovenia (Decision UNEP/MED IG.26), emphasises the need to enhance actions against climate change in the Mediterranean and to protect marine ecosystems from its harmful impacts. It calls for strengthening scientific knowledge and expertise in this area, highlighting initiatives like MedECC.

This Special Report

The Special Report "Interlinking climate change with water - energy - food - ecosystems nexus in the Mediterranean Basin" responds to the MedECC Steering Committee's decision to produce three Special Reports as part of the 2021-2023 MedECC work programme. These reports focus on specific issues identified after the publication of the First Mediterranean Assessment Report (MAR1) in November 2020, including considering suggestions from government representatives and stakeholders. As all MedECC reports, this report is produced for use by policymakers and a broader audience. It is developed on the basis of scientific criteria only. The Special Report provides a comprehensive assessment of the scientific and technical literature. It builds upon the MedECC MAR1 Assessment Report, previous report by Intergovernmental Panel on Climate Change (IPCC) and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem

Services (IPBES) reports, as well as other relevant regional, national and local assessments, and is drawing on evidence from over 1000 scientific publications. The available knowledge concerning the risks studied by MedECC has significant gaps, often due to limited monitoring systems or scientific research capacity – these gaps have been communicated as clearly as possible. Despite best efforts, errors and omissions are nevertheless not unlikely.

Scope of the Report

This Special Report identifies and assesses the impact of environmental and climate change on the Water-Energy-Food-Ecosystems (WEFE) nexus in the Mediterranean Basin, related risks, adaptation options and solutions along five chapters. In this report, the WEFE nexus is addressed as a key concept for a more resilient adaptation to the climate crisis in the Mediterranean region. It addresses the interlinked water, energy and food security – and their connection with the surrounding ecosystems. Thus, security issues, and therefore adaptation actions, are the key focus of this report, leaving the mitigation consequences of the nexus approach as potential synergies and trade-offs derived from the interconnections among WEFE components. The focus is on the nexus between water, energy and food security and ecosystems' health, extending to the coasts of the Mediterranean Sea, and the report does not address the details of marine environment.

Structure of the Report

This report consists of five Chapters, four Annexes, and includes a Summary for Policymakers (SPM) composed of headline statements, a high-level summary and narrative of the key messages from the longer report. Chapter 1 provides the context, background and key dimensions of this assessment, Chapter 2 assesses the drivers of change impacting on the WEFE nexus and the cascading effects associated to these impacts, Chapter 3 assesses the existing and prospective responses and management options to implement the WEFE nexus approach in the context of climate change. Chapter 4 addresses the link between the WEFE approach and the Sustainable Development Goals (SDG). Finally, Chapter 5 reviews governance, policies and research options for the WEFE nexus implementation in the Mediterranean Basin.

The Process

The Special Report represents the collaborative efforts of a team of volunteer leading experts and scientists in the various related fields of research. Its preparation followed the established principles of scientific assessments, similar to those applied for MAR1 and the IPCC, involving an open and rigorous process of author selection, external peer-review, and stakeholder consultation.

The preparation of this report was launched in April 2021 through an open call for self-nominations of authors. The outline was developed during a Scoping Meeting where experts and scientists were consulted alongside governmental representatives and stakeholders. The framework and outline were reviewed and approved by the MedECC Steering Committee. The authors were selected and approved by the MedECC Steering Committee based on their expertise, country and gender balance (60 authors from 15 countries). The Zero Order Draft (ZOD) of the report underwent internal review in March and April 2023. The MedECC Secretariat received 479 comments from 15 reviewers. The First Order Draft (FOD) of the report and draft SPM underwent external peer-review and broad consultation with governments, decision-makers and stakeholders in July-September 2023. As a result, 820 and 247 comments for the longer report and SPM were received respectively by 64 reviewers. The authors revised the draft SPM between October 2023 and March 2024, addressing all comments. The stakeholder consultation on the SPM was concluded through the online plenary consultation on April 29, 2024 during which the SPM was approved line by line. These included MAP Focal Points, Plan Bleu Focal Points, members of the Mediterranean Commission on Sustainable Development (MCSD), MAP Partners, as well as members, observers, and partners of the UfM Climate Change Expert Group (UfM CCEG) and the UfM Working Group on Environment and Climate Change (WG ENV-CC), among other MedECC partners.

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