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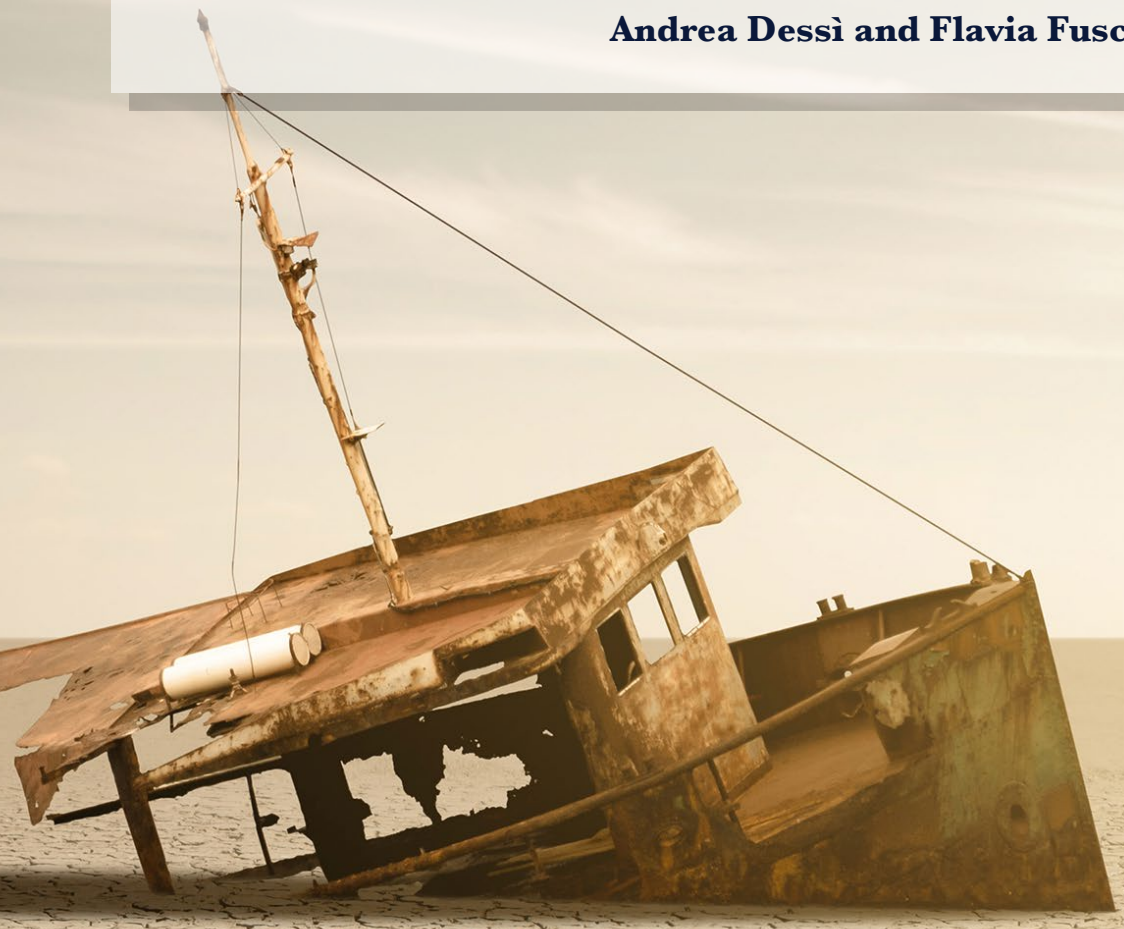
Climate Change and Security in the Mediterranean: Exploring the Nexus, Unpacking International Policy Responses

edited by
Andrea Dessì and Flavia Fusco



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CLIMATE CHANGE AND SECURITY IN THE MEDITERRANEAN: EXPLORING THE NEXUS, UNPACKING INTERNATIONAL POLICY RESPONSES

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Andrea Dessì and Flavia Fusco

Istituto Affari Internazionali

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List of abbreviations

ACER	European Union Agency for the Cooperation of Energy Regulators
AFID	Alternative Fuels Infrastructure Directive
ALG	Autorité du Liptako-Gourma
AP	Agency for Peacebuilding
AU	African Union
BTC	Bilateral Transfer Capacity
CBAM	Carbon Border Adjustment Mechanism
CEN-SAD	Community of Sahel-Saharan States
CILSS	Comité permanent inter-État de lutte contre la sécheresse au Sahel
CO2	Carbon dioxide
COMELEC	Comité Maghrébin de l'Electricité (Maghreb Electricity Committee)
COP26	2021 United Nations Climate Change Conference
CSP	Concentrated Solar Power
EEAS	European External Action Service
EED	Energy Efficiency Directive
EIP	Economic and Investment Plan
EMP	Euro-Mediterranean Partnership
ENP	European Neighbourhood Policy
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSO-G	European Network of Transmission System Operators for Gas
ESR	Effort Sharing Regulation
EU	European Union
EU ETS	European Union Emissions Trading System
GCF	Green Climate Fund
GDP	Gross Domestic Product

GHG	Greenhouse Gas
Ios	International organisations
IPCC	Intergovernmental Panel on Climate Change
kV	Kilovolt
LULUCF	Land Use, Land-Use Change and Forestry
MAP	Mediterranean Action Plan
MedECC	Mediterranean Experts on Climate and Environmental Change
MEDREG	Association of Mediterranean Energy Regulators
Med-TSO	Association of Mediterranean Transmission System Operators
MENA	Middle East and North Africa
MSP	Mediterranean Solar Plan
MW	Megawatt
NATO	North Atlantic Treaty Organization
NDC	Nationally Determined Contribution
NDICI	Neighbourhood, Development and International Cooperation Instrument
NGO	Non-governmental organisation
O3	Tropospheric ozone
OECD	Organization for Economic Cooperation and Development
OSCE	Organization for Security and Co-operation in Europe
PPRD	Prevention, Preparedness and Response to Natural and Man-made Disasters
PV	Photovoltaic
RCP	Representative Concentration Pathway
RED	Renewable Energy Directive
SEM	Southern and Eastern Mediterranean
SO2	Sulphur dioxide
UfM	Union for the Mediterranean
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme

Foreword

The current geological era is known to many as the Anthropocene. This concept aims to underline the way in which the terrestrial environment is shaped by the effects of human action. Yet, while the problem of human behaviour is no doubt present,[1] it is almost fully linked to certain societies and economies, located in particular in Northern Europe, on the Atlantic coast of the United States and in Eastern China. Most of the rest of the world and its inhabitants bear little responsibility for the causes and dynamics related to the Anthropocene, beyond sharing its dramatic effects.

Although the Anthropocene is a largely inaccurate concept – and despite being considered by a growing number of scholars as a "Eurocentric" and "unnecessary" intellectual posturing – ongoing debates surrounding this term are nonetheless igniting a few positive effects. The most important is reaffirmation of the salience of human beings and their actions. The marginal centrality of our planet and its inhabitants was reinforced by many discoveries made in modern times. Think about Copernicus (1473–1543), who confirmed that the Earth revolves around the Sun and that therefore the former is not positioned at the centre of our solar system; or Kepler (1571–1630), whose telescopes confirmed for the first time that the Earth is only one planet among billions of others. The same applies to dozens of others scholars and scientists, including Charles Darwin (1809–1882), who contended that monkeys, apes and humans must share a common ancestor and are therefore part of a broader and more complex process connected to life on Earth. After

[1] Jürgen Renn noted that "the present concentration of carbon dioxine has been reached at a rate at least ten, and possibly one hundred times faster than increases at any time during the previous 420,000 years". See Jürgen Renn, *The Evolution of Knowledge. Rethinking Science for the Anthropocene*, Princeton, Princeton University Press, 2020, p. 4.

many centuries, the concept of the Anthropocene is making a contribution towards tackling what has long appeared as an inherent "perception of marginality" of human beings, giving new strength to the positive and negative impact that we can all exert on our planet.

Climate Change and Security in the Mediterranean is a timely work which places human beings and their actions at centre stage. The editors and contributors to this volume analyse the relation between security and climate change, while also informing readers about innovative ideas and practical strategies that human beings can adopt to tackle climate-related dynamics in the Mediterranean space and beyond.

Last but not least, the volume provides inputs that pertain to both state and societal levels, and shed further light on the Sahel and other areas deeply affected by conflict and what some call "climate-induced migration", with all the repercussions that this issue has on African countries and, to a much lesser extent, on Europe. The latter, for many centuries, contributed to intercontinental migration more than any other continent: between 1820 and 1930 more than 60 million Europeans emigrated toward Australia, New Zealand, North America and a number of other areas defined by Alfred W. Crosby as "Neo-Europes". On the other hand, migrants from other continents rarely chose Europe as a destination. Humanising the ongoing "othering" process – increasingly common in our times – should indeed be considered as a key component of climate-related solutions.

Lorenzo Kamel
May 2022

Introduction: Framing the Climate Emergency in the Mediterranean

Andrea Dessì and Flavia Fusco

A conveyer belt of knowledge, traditions and heritages, the Mediterranean has historically acted as a connector between different regions and continents. Stretching from the Atlantic Ocean to the Red Sea and the Bosporus, the Mediterranean is the world's largest inland sea, connecting the African, European and Asian continents and witnessing a significant cross-fertilisation of people, ideas and goods. Host to a broad diversity of states and societies, elements of a shared historical heritage continue to define the contemporary *mediterraneus*, beyond the clear political, economic and social diversity that inherently characterise this common space. Rather than a simple geographic backdrop, the Mediterranean has represented a fundamental constitutive element for the flourishing of societies, expansive empires and technological advancements, elements that have propelled human development but also produced conflict, colonial oppression, uneven development and unjust exploitation. In this regard, the Mediterranean maintains its characteristic of literally – albeit not unproblematically – being a "sea in the middle", caught between elements of a shared past and an increasingly divergent present but in which geography continues to shape forms of interaction and coexistence, both in terms of perceived threats and opportunities.

The ties that bind Mediterranean societies have survived the appearance and disappearance of empires, world wars and global ideational conflicts, the advent of industrialisation and information technologies as well as the diverging trajectories of growth and political develop-

ment. Yet, with the beginning of the European integration process, first through the establishment of the European Economic Community and then via the creation of the European Union, trends of divergence have increased. One by product of these processes was that the Mediterranean gradually moved from a bridge into a boundary and eventually a socio-political and economic border separating Europe in the north from the Middle East and North Africa (MENA) in the south and eastern Mediterranean. While examples of conviviality and shared praxis or traditions have survived and do exist especially at the societal level, the European integration process has accelerated alternate trajectories across the Mediterranean Basin, itself becoming a constitutive element for the development of a new political identity across Europe that was increasingly separate from other Mediterranean Basin states to the south and the east. As Europe's southern Mediterranean states re-oriented their priorities northwards, the ties that bind the Mediterranean Basin were increasingly overshadowed by new political and socio-economic boundaries separating Europe from its co-called "southern neighbourhood", where priorities were different and efforts to promote genuine integration and inclusive cooperation have struggled to materialise.

Some have framed the Mediterranean's unity in diversity as a by-product of the particular geography of the region in which a peculiar *complicity* between land and sea, symbolising rootedness and emancipation has materialised. In this understanding, multiplicity and diversity emerge as values in and of themselves allowing for the production of a shared identity rooted in the "accidental historical coexistence of multiple ways of living in a single basin".[1] Inherent to this land-sea relationship is the Mediterranean's traditionally mild and hospitable climate, the harbinger for human development and a key constitutive element of this shared diversity that has become stratified in the historical experiences of Mediterranean states and societies. It was this "Mediterranean climate" that brought about the agricultural revolution roughly 10,000 years ago and it was thanks to this element that the Mediterranean would not only be host to some of the most expansive

[1] Onofrio Romano, "Mediterraneanism", in Ashish Kothari et al. (eds), *Pluriverse. A Post-Development Dictionary*, New Delhi, Tulika Books, 2019, p. 237-240 at p. 238.

empires, but also the harbinger of ground breaking architectural and technological innovations, many of which sought to harness the environment and climatic specificities of the Mediterranean, both on land and sea. These would propel constant interactions between and across the Mediterranean Basin, making the environment and specific geography of the region a fundamental constituent element for the political, economic and socio-cultural development of Mediterranean societies.

Today, the changing Mediterranean climate is again defining and re-defining this region, replicating this relationship of unity in diversity across its lands and waters. Rising temperatures and sea levels, stronger and reoccurring heat waves, declining precipitation, droughts and other extreme weather events have turned the Mediterranean into a climate change hotspot, meaning that climate has become even more crucial in shaping the present and future trajectories of the countries and populations that inhabit this space. Whether this new, common and even existential threat will produce convergence or divergence across the Mediterranean Basin remains to be seen. What is clear is that the climate emergency will be far reaching, exacerbating pre-existing challenges across Mediterranean states and making the need for genuine north-south and south-south cooperation ever more urgent if mitigating and adaptation strategies are to be pursued in an inclusive manner.

The Mediterranean hotspot

In August 2021, a monitoring station on the Italian island of Sicily deep in the Mediterranean set a new record for the highest temperature ever recorded in Europe. Measuring 48.8 degrees Celsius (119.84 Fahrenheit), this replaced a previous record of 48°C set by the Greek capital Athens back in July 1977.[2] At the same time, across the Strait of Sicily, in Tunisia, an even greater measurement – 49°C – was recorded in the capital Tunis, far outstripping the previous record of 46.8°C set in 1982 by

[2] Gaia Pianigiani, "Sicily Registers Record-High Temperature as Heat Wave Sweeps Italian Island", in *The New York Times*, 12 August 2021, https://www.nytimes.com/2021/08/12/world/europe/sicily-record-high-temperature-119-degrees.html.

Tunisia's Meteorological Institute.[3] The unprecedented heat wave – with 2021 being the fifth warmest year on record since 1850 according to the EU Copernicus Climate Change Service[4] – would coincide with massive wildfires in various localities across the globe, including Turkey, Greece, Algeria, Italy and France, causing deaths and widespread damage to livelihoods, infrastructure and the economy.[5]

Far from being restricted to the Mediterranean, the climate emergency has made itself evident in every corner of the globe. The direct, climate-related effects of a warming climate are caused by carbon and methane emissions linked to unsustainable growth and consumption models born in Europe and the US and subsequently exported to much of the rest of the world. A vast body of scientific research has long demonstrated the causal link between highly polluting human activities and the worsening global climate emergency, demonstrating in concrete terms how no dimension of human and planetary health is spared from the direct and indirect effects of a warming climate.[6] Widely recognised as a threat multiplier, climate change will (and already is) having cascading effects on the full spectrum of human livelihoods, severely impacting the sustainability of living eco-

[3] "Tunis Hit Record 49C in Heat Wave on Tuesday", in *Reuters*, 11 August 2021, https://www.reuters.com/article/climate-change-tunisia-idAFL1N2PI0JP.

[4] The hottest years on record were 2020 and 2016. See, "2021 Was the Fifth-Hottest Year on Record as Emissions Surge", in *Al Jazeera*, 10 January 2021, https://aje.io/33zx6k.

[5] During the same month, major flooding in Turkey, China and the US, combined with a hurricane in Mexico, only added to a growing global awareness about the visible effects of the climate emergency, and this after major flooding ravaged northern Europe in July 2021, causing over 200 deaths in Germany, Belgium and the Netherlands in what was the continent's deadliest flood since 1985. See, UN Regional Information Centre, *2021 Floods: UN Researchers Aim to Better Prepare for Climate Risks*, 24 January 2022, https://unric.org/en/2021-floods-un-researchers-aim-to-better-prepare-for-climate-risks; Bob Henson and Jeff Masters, "Central Europe Staggers toward Recovery from Catastrophic Flooding: More than 200 Killed", in *Yale Climate Connections*, 21 July 2021, https://yaleclimateconnections.org/?p=77745.

[6] See for instance, Benjamin Franta, "Shell and Exxon's Secret 1980s Climate Change Warnings", in *The Guardian*, 19 September 2018, https://www.theguardian.com/p/9d8z4; Intergovernmental Panel on Climate Change (IPCC), *Climate Change Widespread, Rapid, and Intensifying – IPCC*, 9 August 2021, https://www.ipcc.ch/?p=38565.

systems and species diversity as well as the upholding of social contracts, given its effects on food and water security, public health, state budgets, social justice and inequality.[7]

Growing evidence about the multidimensional effects of climate change on both the environment *and* human health and socio-political security has spurred efforts to develop mitigating and adaptation strategies at the international, regional and nation-state levels. In this context, while the United States and even more so the European Union have both adopted ambitious blueprints for a green energy transition to net-zero emissions by 2050, other states and regions are struggling to reorganise their economies to limit pollution and waste while increasing the use of renewables. At the international level, world states remain committed to limiting global temperature increases to 1.5–2°C compared to preindustrial times, a target first set during the 2015 UN Climate Summit in Paris. Yet, the pace of international efforts to tackle pollution levels and empower renewables and the green energy transition are far from sufficient to meet such an objective, as demonstrated by the repeated warnings issued by the UN Intergovernmental Panel on Climate Change (IPCC).[8] These have illustrated, in minute detail, the real-world implications of the climate emergency, producing modelling and simulations that demonstrate the ramifications of temperatures rising beyond the 1.5°C target and reaching as far as a 3°C and even 4°C compared to pre-industrial levels, a scenario that would imply existential disruptions for all living ecosystems, particularly in the developing world and in regions already suffering from significant socio-economic and political crises and where weak social contracts could well be pushed over the brink by such developments.

While many states beyond Europe and the US have similarly pledged

[7] See for instance, IPCC, *Climate Change: A Threat to Human Wellbeing and Health of the Planet. Taking Action Now Can Secure Our Future*, 28 February 2022, https://www.ipcc.ch/?p=40120.

[8] See for instance, Valérie Masson-Delmotte et al. (eds), *Global Warming of 1.5 C. An IPCC Special Report on the Impacts of Global Warming…*, 2019, https://www.ipcc.ch/sr15; Zeke Hausfather, "UNEP: 1.5C Climate Target 'Slipping Out of Reach'", in *Carbon Brief*, 26 November 2019, https://www.carbonbrief.org/unep-1-5c-climate-target-slipping-out-of-reach.

to phase-out highly polluting activities and align with international targets on the green transition, this process is fraught with challenges. Many states, particularly in the Global South, are significantly exposed to the adverse effects of climate change and yet do not have access to similar funds and technologies needed to implement adaptation and mitigating strategies. Trends are slightly different in the Mediterranean Basin and broader Middle East and North Africa, but weak social contracts and the consequent lack of legitimacy of many ruling elites do complicate the process, given the nature of these transformations which require a high degree of buy-in from the population and the fact that many of these states rely on energy and hydrocarbon exports to service their state budgets and promote social peace, including through heavily subsidised energy goods and services. This has given rise to significant grievances and calls for reparations and assistance by struggling states and harmed societies. Calls for burden sharing and financial assistance to help partner states implement the necessary reforms while mitigating its possible effects on internal stability have therefore increased. While funding and assistance have been made available by the UN and individual states, including the European Union via its New Agenda for the Mediterranean, these tend to prioritise certain areas and regions rather than a broader multilateral and collective effort to preserve planetary health and security.

Against this backdrop, growing emphasis has been placed on the security dimension(s) of the climate emergency, with policy, academic and media analyses increasingly framing the debate in terms of real-world security implications of a changing climate. Resource scarcity and abundance have been widely discussed in their complex relationship with conflict in the literature.[9] Yet, findings remain inconclusive and despite the many theoretical arguments on how the occurrence of violent conflict relates to the availability and access to natural resources, the lack of clear evidence has led many to question a direct correlation. Acknowl-

[9] Stormy-Annika Mildner, Gitta Lauster and Wiebke Wodni, "Scarcity and Abundance Revisited: A Literature Review on Natural Resources and Conflict", in *International Journal of Conflict and Violence*, Vol. 5, No. 1 (2011), p. 155-172, https://doi.org/10.4119/ijcv-2852.

edging the security implications of the climate emergency extends well beyond the domain of hard security, war and military conflict, however. A more encompassing methodology is required, one centred around human security or, to adopt a different terminology that has been promoted over the decades by the Organization for Security and Co-operation in Europe (OSCE), "comprehensive security", an approach that considers a broad spectrum of military, governance and socio-economic dimensions, all of which also maintain security dimensions.[10] In this regard, deeper understandings of security allow for environmental, social, economic and political aspects to be prioritised in policy agendas and for individuals and communities as opposed to only states, governments and the private sector to be factored into such approaches.

The multifaceted and multidimensional impact of the climate emergency on human security and development has spurred rich debates that resonate well beyond academia, reaching both the decision-making *loci* and environmentalist circles. While some maintain that talking of "climate migrants", "weak and failing states", "resource conflicts" and "food and water scarcity and security" has helped raise political awareness and funding to tackle these emergencies – and simultaneously underscore the shared, globalised nature of these threats,[11] – others argue that the securitisation of climate change carries a number of risks. If it is true that talking about climate change in terms of security provides a sense of urgency, it is also true that such approaches tend to shift the issue "out of the realm of 'normal' political debate", allowing for extraordinary measures in the shadow of an emergency logic.[12] While no one debates the urgent need for extraordinary measures to tackle the climate emergency, the risk is that of an excessive prioritisation of climate-related effects over other, deeper, political, governance and security challenges

[10] See for instance, OSCE, *The OSCE Concept of Comprehensive and Co-operative Security. An Overview of Major Milestones* (SEC.GAL/100/09), 17 June 2009, https://www.osce.org/node/37592.

[11] Matt McDonald, "Climate Change and Security: Towards Ecological Security?", in *International Theory*, Vol. 10, No. 2 (July 2018), p. 153-180.

[12] Columba Peoples and Nick Vaughan-Williams, *Critical Security Studies. An Introduction*, 2nd ed., Routledge, 2015, p. 94.

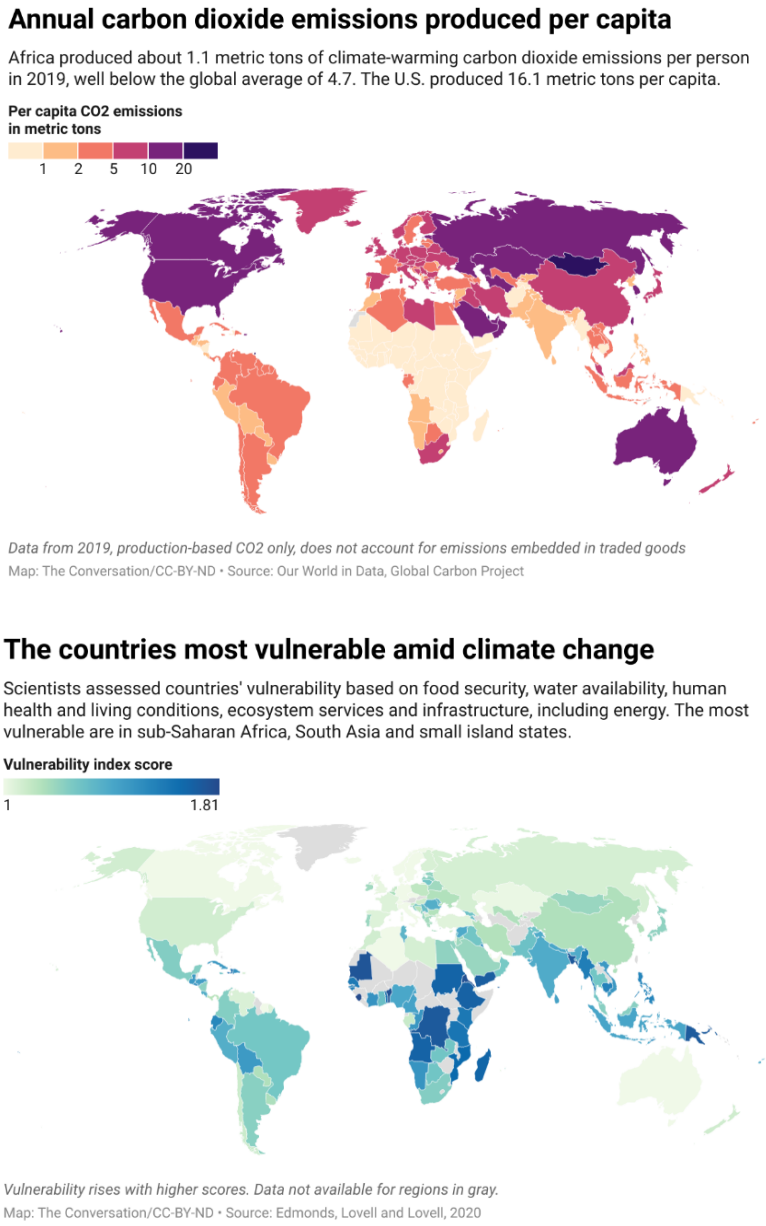
that pre-date and overlap with the climate emergency. While these pre-existing challenges will be further aggravated by the changing climate, addressing their causes requires a different policy toolkit, one that remains grounded in a genuinely political engagement with partner states that similarly requires long-term commitments, funding and political backing and yet risks being diluted or overshadowed by more "technical" approaches cantered on emission reductions or mitigating strategies that necessarily rely on close cooperation with governing authorities and an often corrupt or co-opted private sector. In this domain, the prioritisation of security related effects and government-to-government engagements without a similarly sustained focus on human rights, socio-economic exclusion, authoritarian governance and the role of civil society risks undermining the reach and effectiveness of mitigating and adaptation measures due to a lack of popular buy-in and the weak legitimacy of ruling elites, while also possibly serving to further entrench authoritarianism, corruption and top-down co-optation.

Against this backdrop, many civil society organisations, international NGOs, scholars and individual activists have come to frame the issue as one of "climate justice".[13] Such a framing highlights the shared nature of the threat but places more emphasis on its unequal impacts, with struggling and underprivileged states and societies, mostly located in the Global South, facing the most adverse repercussions even though they are by far the least responsible for the climate emergency (Figure 1). Climate justice, moreover, seeks to move beyond the technical realm of emission reductions and new mitigating or adaptation technologies to focus on social justice and how the implications of the climate emergency will further increase socio-political and economic inequalities as well as systemic marginalisation, both across and within regions and states.[14]

[13] See for instance, Josh Gabbatiss and Ayesha Tandon, "In-depth Q&A: What Is 'Climate Justice'?", in *Carbon Brief*, 4 October 2021, https://www.carbonbrief.org/science/in-depth-qa-what-is-climate-justice; Daisy Simmons, "What Is 'Climate Justice'?", in *Yale Climate Connections*, 29 July 2020, https://yaleclimateconnections.org/?p=63960.

[14] Ibid. Also see, Farhana Sultana, "Climate Change, COVID-19, and the Co-Production of Injustices: A Feminist Reading of Overlapping Crises", in *Social & Cultural Geography*, Vol. 22, No. 4 (2021), p. 447-460.

Figure 1 | Climate justice



Source: Sonja Klinsky, "Climate Change Is a Justice Issue - These 6 Charts Show Why", in *The Conversation*, 3 November 2021, https://theconversation.com/climate-change-is-a-justice-issue-these-6-charts-show-why-170072.

The climate emergency is indeed deeply intertwined with pre-existing political, security and socio-economic challenges. More comprehensive and encompassing policy approaches to tackle it are therefore needed. These go beyond mitigating and adaptation strategies or support for the green transition and instead revolve around more traditional modalities of support for political reforms, including the strengthening of the rule of law and human rights, as well as the fight against inequalities and corruption through enhanced engagement with civil society and other relevant stakeholders. From the perspective of international cooperation, the growing emphasis on the security implications of climate change should therefore progress in parallel with these more traditional elements of political engagement with partner states, which require equal focus by policymakers and international organisations, not least given that effective implementation of any climate change reforms will undoubtedly also depend on the support of local populations and thereby on the sustainability of social contracts and the legitimacy of ruling elites.

While sections of the industrialised world may hope to be spared from some of the most existential implications of the climate emergency, thanks to geography and the availability of resources to implement some mitigation and adaptation strategies, states in the Global North are by no means immune to such developments. They will not be able to shield themselves from broader global disruptions tied to climate change, including in the domain of trade and supply chains, the spectre of state collapse or violent conflict and mass population movements that would follow in their wake.[15] Moreover, the climate emergency is already having a dramatic impact on societies *within* developed states and regions, straining state budgets and increasing inequality, as the most vulnerable sections of the population – like the more disadvantaged states internationally – are facing and will increasingly face the greatest burden from

[15] A September 2021 World Bank report predicted that climate change may displace as many as 216 million people across the globe by 2050. See, Viviane Clement et al., *Groundswell Part 2. Acting on Internal Climate Migration*, Washington, World Bank, 2021, http://hdl.handle.net/10986/36248.

these transformations in terms of unemployment and poor working conditions, dwindling social safety nets, rising prices and limited access to housing, food and other resources. It is also in this context that the European Union has unveiled its "Just Transition Mechanism", which will provide funding for more disadvantaged regions and states within the Union to ensure that "no one is left behind".[16]

All of this translates into extremely concerning trends when it comes to the Mediterranean. With its air, land and sea warming 20 per cent faster than the global average,[17] the Mediterranean Basin is also growing more polluted, water scarce and food insecure, with dramatic consequences for the health of its ecosystems and populations, not least in light of its growing energy demands.[18] The unsustainable and extractive use of land and sea resources has damaged and impoverished ecosystems in dramatic ways, with unequal and uneven consequences for vulnerable social groups and already fragile areas. Recent research has demonstrated how the ecological footprint of Mediterranean Basin states is higher than the global average, and its ecological deficit is twice as high, meaning that Mediterranean countries consume approximately 2.5 times more natural resources and ecological services than the region's ecosystems can provide.[19] Water is a particularly worrying dynamic, as the Mediterranean's

[16] For more on the Just Transition Mechanism see the European Commission website: *The Just Transition Mechanism: Making Sure No One Is Left Behind*, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en.

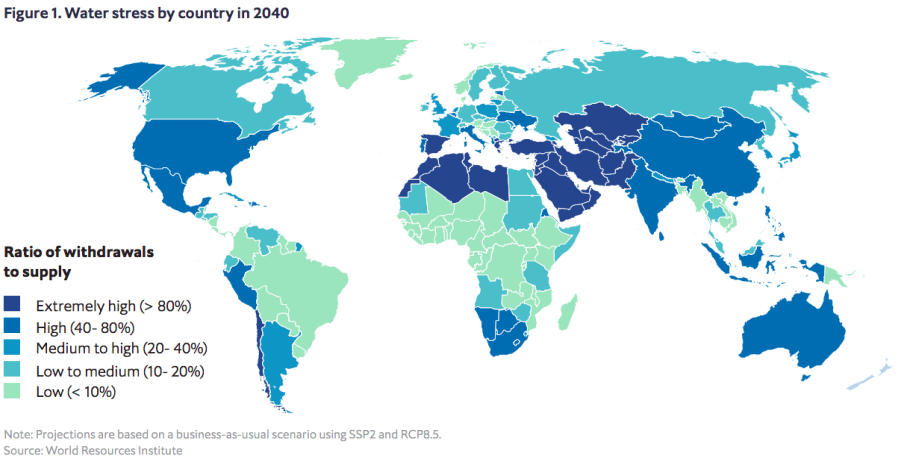
[17] UNEP/MAP website: *Climate Change in the Mediterranean*, https://www.unep.org/unepmap/node/20387.

[18] See for instance, Andrea Dessì, Daniele Fattibene and Flavia Fusco (eds), *Climate Change and Sustainability: Mediterranean Perspectives*, Rome, Nuova Cultura, 2021, https://www.iai.it/en/node/13843. On the rising energy demand of Mediterranean Basin states see, Observatoire Méditerranéen de l'Energie (OME), *Mediterranean Energy Perspectives to 2050. 2021 Edition. Executive Summary*, September 2021, https://www.ome.org/wp-content/uploads/2021/09/MEPto2050-2021-ed-Executive-Summary.pdf.

[19] Emel Akçalı, Evrim Görmüş and Soli Özel, "Energy Transitions and Environmental Geopolitics in the Southern Mediterranean", in *IAI Commentaries*, No. 22|17 (April 2021), https://www.iai.it/en/node/15057. Also see, Global Footprint Network, *Ecological Footprint Explorer*, https://data.footprintnetwork.org.

water resources are already unevenly distributed across the basin (73 per cent of resources in the North, 23 per cent in the East and only 5 per cent in the South[20]), while modelling and predictions have demonstrated how most countries in the basin are set to experience "extremely high" to "high" water stress by 2040 (Figure 2). This also implies significant challenges in the domain of food, given the growing relevance of the water-energy-food nexus in the Mediterranean region.[21]

Figure 2 | Water stress by country in 2040



Source: Economist Intelligence Unit, *Reimagining Urban Water Systems. The City Water Optimization Framework*, 2021, p. 6, https://impact.economist.com/sustainability/project/water-optimisation/download/water-opt-report-EIU-version.pdf.

Cooperative solutions to tackle the multidimensional impact of the climate emergency in the Mediterranean are therefore more urgent than

[20] Emel Akçalı, Evrim Görmüş and Soli Özel, "Energy Transitions and Environmental Geopolitics in the Southern Mediterranean", cit.; Maria Serena Mancini and Alessandro Galli, "Measuring and Monitoring Sustainability Trends in the Mediterranean: The Ecological Footprint Viewpoint", in *Quaderns de la Mediterrània*, No. 25 (2018), p. 119-126 at p. 121, https://www.iemed.org/?p=42280.

[21] See for instance, Vasileios Markantonis et al., "Can the Implementation of the Water-Energy-Food Nexus Support Economic Growth in the Mediterranean Region? The Current Status and the Way Forward", in *Frontiers in Environmental Science*, 2 July 2019, https://doi.org/10.3389/fenvs.2019.00084.

ever. Yet, such efforts also face a number of challenges. The uneven power relations embedded in the region have so far hindered genuine cooperation. While formal institutional frameworks have been established, these have generally failed to promote more balanced north-south cooperation beyond the remit of governing elites. Indeed, with the passage of time, many of these frameworks – from the Barcelona Process in the 1990s to the European Neighbourhood Policy and the Union for the Mediterranean in the mid-2000s – have shed much of their normative or political ambition, increasingly becoming vehicles for the promotion of economic interests via the standardisation of trade barriers, rules and regulations that are important for commercial exchanges but have also ultimately benefitted large multinational companies while creating a conducive environment for the further consolidation of authoritarian rule in much of the MENA region. Indeed, and differently from Europe's approach to the "eastern neighbourhood", where the prospect of EU membership has helped promote reforms and integration, the absence of such prospects for southern and south-eastern Mediterranean states has weakened the reach – or "normative appeal" – of the EU, further increasing trends of division between the two shores of the Mediterranean.

As an example of this, the Mediterranean region faces significant opportunities but also huge challenges in developing its renewable energy potential, in the realm of which fragmentation and lack of coordination remains prevalent despite the theoretical complementarity between northern and southern and south-eastern shores. As new efforts are directed at unleashing the complementary potential of air, wind, solar and hydro power across Mediterranean Basin states, the lack of south-south trade and infrastructure integration and uneven north-south relations are hindering collaborative frameworks to promote genuine Mediterranean integration in the realm of renewable energy, an indispensable component for the sustainability of states, societies and living ecosystems in this shared Mediterranean space.

Division of the volume

How to make sense of the many security implications of the present climate emergency and promote more balanced and genuine north-south and

south-south engagements across Mediterranean Basin states represents the underlining objective of this collective volume. Born out of an ongoing research effort directed by the Rome-based Istituto Affari Internazionali (IAI) under the rubric of the New-Med Research Network, individual chapters delve into different dimensions of the Mediterranean climate hotspot while also addressing past and current international efforts to promote adequate mitigating and adaptation strategies to limit its most adverse effects.[22] Supported by the Italian Ministry of Foreign Affairs and International Cooperation, the OSCE Secretariat in Vienna and the Compagnia di San Paolo Foundation, the New-Med Research Network has since 2014 worked on a broad diversity of security and political themes impacting the Mediterranean Basin, adopting a "comprehensive security" approach to analyse the multiple overlapping drivers of insecurity and societal grievances that continue to characterise this common space.

Between 2020–2022, the New-Med Research Network specifically tackled environmental and climate aspects in the contemporary Mediterranean, publishing reports[23] and organising conferences in partnership with other international organisations – the Agency for Peacebuilding (AP)[24] and the Union for the Mediterranean (UfM)[25] – to strengthen

[22] For more information on the New-Med Research Network see the dedicated website: https://www.new-med.net.

[23] See for instance, Anis Germani and Rania Masri, "The Covid-19 Crisis and the Mediterranean Basin: Overcoming Disparities, Promoting Genuine Cooperation", in *IAI Papers*, No. 21|41 (September 2021), https://www.iai.it/en/node/14053; Andrea Dessì, Daniele Fattibene and Flavia Fusco (eds), *Climate Change and Sustainability: Mediterranean Perspectives*, cit.; Michaël Tanchum, "Europe–Africa Connectivity Outlook 2021: Post-Covid-19 Challenges and Strategic Opportunities", in *IAI Papers*, No. 21|20 (May 2021), https://www.iai.it/en/node/13326.

[24] On 18–19 May 2021, New-Med partnered with the AP in co-organising the second day of the annual Bologna Peacebuilding Forum, focused on climate change and peacebuilding. A New-Med/AP co-edited volume was published following the forum. See, Bernardo Venturi and Andrea Dessì (eds), *Bologna Peacebuilding Forum 2021. Peacebuilding and Climate Change*, Bologna, Agency for Peacebuilding, October 2021, https://www.iai.it/en/node/14256.

[25] On 17 December 2021, New-Med partnered with the UfM and other partners to co-organise an international conference on the climate change-security nexus in the Mediterranean. The full conference report and agenda is available here: Flavia Fusco,

outreach and engagement efforts with key stakeholders across the southern, eastern and northern shores of the Mediterranean. This volume therefore fits into a broader research and outreach effort which aims at one and the same time to further raise awareness about the multidimensional impacts of the climate emergency on Mediterranean states and societies and to explore potential avenues for improved cooperative action across basin states.

Structured around four chapters, the volume begins with a comprehensive overview of climate related regional cooperation initiatives in the Mediterranean. Authored by Niklas Bremberg, Associated Senior Researcher at the Stockholm International Peace Research Institute (SIPRI) and Associate Professor of Political Science at Stockholm University, the chapter outlines how regional and global cooperation remains indispensable to respond to climate-related security risks in the Mediterranean and strengthen state and societal resilience to withstand its many implications. The analysis addresses the clear links between global and regional efforts to tackle the climate emergency, as well as the need to promote enhanced knowledge exchanges across regions and local contexts, to develop the most effective mitigating and adaptation strategies. In mapping the key international organisations that are increasingly shaping cooperation on climate-related security risks, the analysis addresses the UN, OSCE, EU and other regional, Mediterranean frameworks involved in promoting policy proposals for prevention and preparedness, as well as early warning and information sharing, taking stock of the lessons learned that could help spur enhanced Mediterranean cooperation in the field of climate security.

In chapter two, Wolfgang Cramer and Joël Guiot,[26] lead authors of the international network of Mediterranean Experts on Climate and Envi-

"Climate Change and Security in the Mediterranean", in *Documenti IAI*, No. 22|04 (March 2021), https://www.iai.it/en/node/14917.

[26] Wolfgang Cramer is Director of Research within the Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale (IMBE) at the French Centre national de la recherche scientifique (CNRS) and member of the Académie d'Agriculture de France. Joël Guiot is Emeritus scientist in the Centre de Recherche et d'Enseignement de Géosciences de l'Environnement (CEREGE), Aix-Marseille University.

ronmental Change (MedECC), delve into the various dimensions of the Mediterranean as a climate change hotspot, outlining the concrete, real-world implications the warming climate will have on state, societal and ecosystem resilience in the area. By drawing on recent scientific research and modelling simulations, the authors note that current climatic disruptions are expected to be exacerbated in the coming decades, especially if international action to meet the 2015 Paris Commitment falls short and temperature increases exceed 1.5°C compared to pre-industrial times. In outlining both climate and non-climatic drivers of change, the authors underscore that significantly enhanced efforts are needed to tackle the implications of the climate emergency. In this regard, achieving the UN Sustainable Development Goals in the Mediterranean remains unlikely within current economic and environmental policy frameworks, calling for alternative models for equitable and sustainable development within and among Mediterranean Basin states.

Having covered prevalent policy frameworks to tackle the climate emergency and improved our understandings of the Mediterranean as a climate change hotspot, chapter three moves beyond the traditional boundaries of the Mediterranean region, re-thinking regionalisation processes and broadening its conceptualisation to address an increasingly salient feature of current policy debates on the security implications of the climate emergency: conflict and displacement in the Sahel region. In this chapter, Luca Raineri, Assistant Professor in the Institute of Law, Politics and Development at the Sant'Anna School of Advanced Studies in Pisa, Italy, dissects policy and media discourses promoting the existence of a direct, causal relationship between climate change and conflict, using the Sahel region as a case study. By drawing on the examples of the Sahelian droughts in the 1970s–80s and the ongoing (alleged) desertification of the central Sahel, the author notes that while climatic factors *per se* are neither sufficient nor necessary to trigger armed violence, climatic changes may fuel violent conflicts because they contribute to an erosion of fragile socio-economic systems and the relative mechanisms of conflict regulation. By adopting a political ecology framework, the analysis places emphasis on the crucial "weight" of governance schemes in making conflicts over natural resources veer towards either violent escalation or peaceful management. That said, the author also notes that

in the long-run governance mechanisms themselves can be affected or disrupted by changing climatic conditions, thereby stressing the importance of re-politicising the climate-conflict nexus in present policy and academic debates on the implications of the climate emergency in the Sahel and broader Mediterranean.

In the final chapter of the volume, Silvia Pariente-David and Philippe Drobinski, climate experts from the MedECC network with years of high-level experience in policy research and outreach with international organisations and policymaking communities on climate change, tackle the issue of renewable energy resources as an avenue that requires enhanced regional cooperation and integration across the Mediterranean Basin. Stressing how the Mediterranean is among the world's richest regions in renewable energy resources, the authors underscore how their development can assist the objective of achieving the Paris Agreement targets while enhancing beneficial forms of regional north-south and south-south integration. While multiple challenges remain, the authors argue that these resources can promote European efforts to achieve carbon neutrality by 2050 and at the same time improve the economic and social welfare of southern and eastern Mediterranean states. Enhancing regional energy market integration remains a fundamental objective, however, necessitating coordinated approaches across markets and power systems as well as enhanced cooperation between stakeholders involved at various levels, including governments, system operators, market operators and regulators as well as regional and international organisations. Success in this domain, argue the authors, can contribute to the creation of a genuine Mediterranean Union, thus restoring the Mediterranean to its historical position as a central hub for cultural and commercial exchanges across its multiple shores.

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1.

Climate Security in the Mediterranean: What Prospects for Regional Cooperation?

Niklas Bremberg[1]

The adverse effects of climate change are increasingly being acknowledged by political actors across the world. UN Secretary-General António Guterres described climate change as "a direct existential threat [with] disastrous consequences for people and all the natural systems that sustain us".[2] Recently, the sixth assessment report from the Intergovernmental Panel on Climate Change concluded that "human-induced climate change is already affecting many weather and climate extremes in every region across the globe" and that the scientific evidence of observed changes in extremes such as for example heatwaves, heavy precipitation and droughts, as well as their attribution to human influence, has strengthened since its previous analysis.[3] Reports in international media about weather-related events registered in summer 2021, such as extreme temperatures and uncontrolled wildfires in many Mediter-

[1] The author would like to thank Dr Johan Schaar for his valuable comments on climate-related security risks in the MENA region and Ms Ebba Behre for her excellent work as research assistant as well as the editors of this volume for helpful comments on earlier drafts of this chapter.

[2] United Nations, *Secretary-General's Remarks on Climate Change, Delivered on 10 September 2018*, https://www.un.org/sg/en/content/sg/statement/2018-09-10/secretary-generals-remarks-climate-change-delivered.

[3] Richard P. Allan et al., "Summary for Policymakers", in International Panel on Climate Change, *Climate Change 2021. The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge, Cambridge University Press, 2021, https://www.ipcc.ch/report/ar6/wg1.

ranean countries, including Algeria, Greece and Turkey, as well as devastating floods due to heavy precipitation in northern Europe, mainly Belgium and Germany, are examples of increased public attention to risks to humans and eco-systems attributed to climate change.[4]

A fundamental characteristic of climate-related security risks to states, societies and individuals is their transnational dimension. Droughts, wildfires, water shortages, floods and extreme weather events often affect several countries in a certain region more or less simultaneously. The transnational character is not just linked to geophysical exposure and connection through, for instance, shared water basins and coastlines. It also entails the transnational movements of goods, finance and people.[5] It might therefore seem self-evident that the better states and societies are at coping with and mitigating adverse climate impacts, the greater the chances that negative effects on human security and societal stability will be alleviated and contained. Global and regional cooperation among states is generally understood to be of fundamental importance for increasing the capacity to adequately respond to climate-related security risks as well as other transnational challenges.[6]

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[4] Angela Dewan, "This Summer Was Europe's Hottest on Record as Mediterranean Heat Soared", in *CNN*, 7 September 2021, https://edition.cnn.com/2021/09/07/europe/europe-hottest-summer-climate-intl/index.html; Loveday Morris, Jennifer Hassan and Emily Rauhala, "Death Toll from European Floods Climbs to More Than 150", in *The Washington Post*, 17 July 2021, https://www.washingtonpost.com/world/2021/07/16/europe-flooding-deaths-germany-belgium.

[5] Johanna Hedlund et al., "Quantifying Transnational Climate Impact Exposure: New Perspectives on the Global Distribution of Climate Risk", in *Global Environmental Change*, Vol. 52 (September 2018), p. 75-85; Bodil Elmhagen et al., "Interacting Effects of Change in Climate, Human Population, Land Use, and Water Use on Biodiversity and Ecosystem Services", in *Ecology and Society*, Vol. 20, No. 1 (2015), Article 23, https://doi.org/10.5751/ES-07145-200123; W. Neil Adger, Hallie Eakin and Alexandra Winkels, "Nested and Teleconnected Vulnerabilities to Environmental Change", in *Frontiers in Ecology and the Environment*, Vol. 7, No. 3 (April 2009), p. 150-157, https://doi.org/10.1890/070148; Robin Leichenko and Karen O'Brien, *Environmental Change and Globalization. Double Exposures*, Oxford, Oxford University Press, 2008.

[6] Jörn Birkmann and Korinna von Teichman, "Integrating Disaster Risk Reduction and Climate Change Adaptation: Key Challenges, Scales, Knowledge, and Norms", in *Sustainability Science*, Vol. 5, No. 2 (July 2010), p. 171-184; Mark Rhinard, "European Cooperation on Future Crises: Toward a Public Good?", in *Review of Policy Research*, Vol.

International organisations (IOs), at both the global and regional levels, are getting more involved in efforts to assist states and societies mitigate and adapt to climate-related security risks.[7] These efforts include policy development on prevention and preparedness; early warning systems and information sharing; as well as enhancing crisis management and relief capabilities, to name but a few.[8] Research has also highlighted that knowledge exchange between local, national and international actors on context-specific vulnerabilities in particular regions is key to developing adequate responses to climate-related security risks.[9]

That said, it cannot be assumed that a perceived need for increased international cooperation on climate-related security risks will necessarily lead to adequate global and regional responses to manage and reduce such risks. Diverging national interests, political conflicts or lack of resources are factors that might hamper efforts to develop global as well as regional responses to climate-related security risks.[10] From this

26, No. 4 (July 2009), p. 439-455.

[7] Niklas Bremberg, Malin Mobjörk and Florian Krampe, "Global Responses to Climate Security: Towards a Framework for Analysis", manuscript under review; Lisa M. Dellmuth et al., "Intergovernmental Organizations and Climate Security: Advancing the Research Agenda", in *WIREs Climate Change*, Vol. 9 (January/February 2018), Article e496, https://doi.org/10.1002/wcc.496; Judith Nora Hardt, *Environmental Security in the Anthropocene. Assessing Theory and Practice*, London/New York, Routledge, 2017; Ken Conca, *An Unfinished Foundation. The United Nations and Global Environmental Governance*, Oxford, Oxford University Press, 2015; Shirley V. Scott, "Implications of Climate Change for the UN Security Council: Mapping the Range of Potential Policy Responses", in *International Affairs*, Vol. 91, No. 6 (November 2015), p. 1317-1333.

[8] Joshua W. Busby, "Beyond Internal Conflict: The Emergent Practice of Climate Security", in *Journal of Peace Research*, Vol. 58, No. 1 (January 2021), p. 186-194, https://doi.org/10.1177/0022343320971019.

[9] Camilla Born, Karolina Eklöw and Malin Mobjörk, "Advancing United Nations Responses to Climate-related Security Risks", in *SIPRI Policy Briefs* (September 2019), https://www.sipri.org/node/4907.

[10] See e.g., Niklas Bremberg, "Do Regional Organizations Contribute to Security? Perspectives on Euro-Mediterranean Cooperation", in Richard Gillespie and Frédéric Volpi (eds), *Routledge Handbook on Mediterranean Politics*, London/New York, Routledge, 2018, p. 194-206; Jonas Tallberg et al., "The Performance of International Organizations: A Policy Output Approach", in *Journal of European Public Policy*, Vol. 23, No. 7 (2016), p. 1077-1096; Michael Barnett and Martha Finnemore, *Rules for the World. Inter-*

perspective, it is worth stressing that the Mediterranean not only faces particular climate risks related to a rapidly warming climate in an already hot and dry region but also the huge challenge of long-standing conflicts and protracted tensions among and within countries in the region. These tensions might hinder regional cooperation to prevent and mitigate risks such as land degradation, desertification and coastal erosion and develop strategies to deal with the impacts on water, food and climate security.[11] Moreover, the southern and eastern parts of the Mediterranean are among the least integrated regions in the world, both politically and economically. While all countries in the region need to seriously step up efforts to accelerate the transition to low-carbon economies, this becomes a tougher challenge for some Mediterranean countries that are still heavily dependent on fossil fuel production to ensure state revenues.

Against this background, the analysis in this chapter draws on recent research on international cooperation in the field of climate security. It focuses on climate-related security risks in the Mediterranean and highlights recent developments within a set of IOs, particularly the European Union and the Union for the Mediterranean (UfM), that are relevant for states and societies in the region. The analysis ends with a discussion on lessons that might help spur enhanced Mediterranean cooperation to address climate-related security risks.

1.1 International cooperation on climate security: An overview

The notion that climate change threatens to cause catastrophic outcomes for living ecosystems at a scale "second only to nuclear war" was recognised already in the 1980s and paved the way for the establishment of the UN Framework Convention on Climate Change in 1992.[12] Discussions

national Organizations in Global Politics, Ithaca/London, Cornell University Press, 2004.

[11] Niklas Bremberg, "Do Regional Organizations Contribute to Security?", cit.

[12] Bentley B. Allan, "Second Only to Nuclear War: Science and the Making of Existential Threat in Global Climate Governance", in *International Studies Quarterly*, Vol. 61, No. 4 (December 2017), p. 809-820, https://doi.org/10.1093/isq/sqx048; Angela Oels, "From 'Securitization' of Climate Change to 'Climatization' of the Security Field: Comparing Three Theoretical Perspectives", in Jürgen Scheffran et al. (eds), *Climate Change,*

concerning the security implications of climate change also occurred in the UN Security Council starting from 2007.[13] Traditional security concerns, such as the potentially adverse effects of climate change on inter-state peace and stability in developing countries, tended to dominate early on, but more comprehensive understandings of climate security have emerged in recent years.[14] It is now common to emphasise that climate change simultaneously covers multiple dimensions of security, including human security, state security and international peace.[15]

The multidimensional character of the concept of climate security implies that responses at the global, regional and national levels should integrate diverse policy areas, relating both to mitigation and adaptation.[16] There are several interesting examples of international cooperation in the field of climate security. For example, the UN Mechanism for Climate Security was established in 2018 to fill an institutional

Human Security and Violent Conflict. Challenges for Societal Stability, Berlin/Heidelberg, Springer, 2012, p. 185-205; Andrew Baldwin, Chris Methmann and Delf Rothe, "Securitizing 'Climate Refugees': The Futurology of Climate-Induced Migration", in *Critical Studies on Security*, Vol. 2, No. 2 (2014), p. 121-130, https://doi.org/10.1080/21624887.2014.943570; Simon Dalby, *Security and Environmental Change*, Cambridge, Polity Press, 2009; Jon Barnett, "Security and Climate Change", in *Global Environmental Change*, Vol. 13, No. 1 (April 2003), p. 7-17.

[13] Maria Julia Trombetta, "Environmental Security and Climate Change: Analysing the Discourse", in *Cambridge Review of International Affairs*, Vol. 21, No. 4 (2008), p. 585-602, https://doi.org/10.1080/09557570802452920.

[14] See for instance, Renate Schubert et al., *Climate Change as a Security Risk*, Berlin, Earthscan, 2008, https://www.wbgu.de/en/publications/publication/welt-im-wandel-sicherheitsrisiko-klimawandel.

[15] Andrew Baldwin, Chris Methmann and Delf Rothe, "Securitizing 'Climate Refugees'", cit.; W. Neil Adger et al., "Human Security", in Christopher B. Field et al. (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge, Cambridge University Press, 2014, p. 755-791, https://www.ipcc.ch/report/ar5/wg2; Matt McDonald, "Discourses of Climate Security", in *Political Geography*, Vol. 33 (March 2013), p. 42-51; Jon Barnett, Richard A. Matthew and Karen L. O'Brien, "Global Environmental Change and Human Security: An Introduction", in Richard A. Matthew et al. (eds), *Global Environmental Change and Human Security*, Cambridge, MIT Press, 2010, p. 3-32.

[16] Richard A. Matthew, "Integrating Climate Change into Peacebuilding", in *Climatic Change*, Vol. 123, No. 1 (March 2014), p. 83-93.

gap within the UN with regard to assessing and mitigating the risks of insecurity arising from the interaction between climate change and social, economic and political factors.[17] Regional organisations such as the Association of Southeast Asian Nations and the South Asian Association for Regional Cooperation have also undertaken several initiatives to address climate-related security risks.[18] In the African Union (AU), the Department of Rural Economy and Agriculture has become the entry point for discussions on climate security, such as food security and migration, and the AU Interdepartmental Taskforce on Conflict Prevention has been instrumental in institutionalising a "climate cluster".[19] NATO as well as the Organization for Security and Cooperation in Europe (OSCE) are also more involved in the field of climate security compared to a few years ago. The OSCE has promoted regional cooperation on environmental security for several decades now, and its role in the field of climate security is currently being discussed among the participating states.[20]

In the EU, the work to develop responses to climate-related security risks as part of the Union's foreign and security policy is being advanced mainly through the European External Action Service (EEAS). The EU's Green Diplomacy Network was made part of the EEAS in 2012 to better integrate EU climate, environmental and developmental policies into EU external relations on climate security.[21] A key finding from a study on the

[17] Camilla Born, Karolina Eklöw and Malin Mobjörk, "Advancing United Nations Responses to Climate-related Security Risks", cit.

[18] Florian Krampe, Roberta Scassa and Giovanni Mitrotta, "Responses to Climate-related Security Risks: Regional Organizations in Asia and Africa", in *SIPRI Insights on Peace and Security*, No. 2018/2 (August 2018), https://www.sipri.org/node/4580.

[19] Vane Moraa Aminga and Florian Krampe, "Climate-related Security Risks and the African Union", in *SIPRI Policy Briefs*, May 2020, https://www.sipri.org/node/5133.

[20] Niklas Bremberg, "European Regional Organizations and Climate-related Security Risks: EU, OSCE and NATO", in *SIPRI Insights on Peace and Security*, No. 2018/1 (February 2018), https://www.sipri.org/node/4404; Niklas Bremberg and Anniek Barnhoorn, "Advancing the Role of the OSCE in the Field of Climate Security", in *SIPRI Policy Briefs*, September 2021, https://www.sipri.org/node/5520.

[21] Niklas Bremberg, "The EU and Climate-Related Security Risks: The Case of the Sahel", in Abdelhak Bassou, Aleksandra Chmielewska and Xira Ruiz-Campillo (eds), "Climate Security in the Sahel and the Mediterranean: Local and Regional Responses", in *EuroMeSCo*

EU's responses to climate-related security risks is that a European community of practice is emerging on climate security. However, the emergence of a European policy discourse has not guaranteed coherence once translated into policy measures in the climate diplomacy, development, security and foreign policy domains, nor effectiveness of the outcomes.[22] At the core of EU's climate policy is the European Green Deal, launched in 2019, and now in its implementation phase. While the Green Deal is mainly focused on achieving net zero emissions of greenhouse gases by 2050 within the EU, there are aspects that are relevant also from the perspective of broader Mediterranean climate security as the Deal allocates resources to support climate diplomacy and promote international cooperation on climate-related security issues. Relatedly, efforts by the EU at the COP26 meeting in Glasgow in November 2021 to increase climate financing to developing countries, included those on the southern and eastern shores of the Mediterranean, is a further example.[23]

Building early warning systems and creating risk assessment capacities are stressed by several IOs, including the EU, as important tools for mitigating climate-related security risks and strengthening the resilience of states and local communities. Actions to enhance risk assessments can support the identification of key risks and subsequently provide policy advice to states. In addition to improving risk assessment and early warning, research also suggests that information sharing and knowledge exchange are crucial to help states and societies better prepare for the adverse effects of climate change.[24] However, previous research highlights that many regional organisations in less developed

Joint Policy Studies, No. 13 (2019), p. 86-115, https://www.euromesco.net/publication/climate-security-in-the-sahel-and-the-mediterranean-local-and-regional-response.

[22] Niklas Bremberg, Hannes Sonnsjö and Malin Mobjörk, "EU and Climate Security: A Community of Practice in the Making?", in *Journal of European Integration*, Vol. 41, No. 5 (2019), p. 623-639.

[23] European Commission, *EU at COP26: Commission Pledges €100 Million to the Adaptation Fund*, 9 November 2021, https://ec.europa.eu/commission/presscorner/detail/en/ip_21_5886.

[24] Florian Krampe and Malin Mobjörk, "Responding to Climate-Related Security Risks: Reviewing Regional Organizations in Asia and Africa", in *Current Climate Change Reports*, Vol. 4, No. 4 (December 2018), p. 330-337.

parts of the world are dependent on external donors in order to develop activities and implement policies. Donor dependency could reduce the ability of both states and regional organisations in developing states to establish their own priorities and actions on climate-related security risks.[25] It is thus important to further explore issues of how climate funding relates to local ownership, especially in an emergent policy field such as climate security, and particularly in a region such as the Mediterranean in which most countries are exposed to many such risks at the same time as regional cooperation is hampered by geopolitical conflicts.

1.2 Climate-related security risks in the Mediterranean region

Countries in the Mediterranean region are heavily exposed to the adverse effects of climate change. A report issued by the Mediterranean Experts on Climate and Environmental Change (MedECC) notes how the "climate is changing in the Mediterranean Basin, historically and projected by climate models, faster than global trends".[26] Rising temperature levels and changing precipitation patterns will most probably lead to increased and prolonged periods of drought and water scarcity, affecting both the advanced economies in the northern Mediterranean and the less diversified economies in the southern and eastern Mediterranean.[27]

The Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region, led by the UN Economic and Social Commission for West Asia, provides climate models for the countries in the southern and eastern Mediterranean (SEM) as well as the wider Middle East and North Africa (MENA). These assessments estimate effects on the vulnerability of biodiversity, ecosystems, agriculture, infrastructure, health and employ-

[25] Florian Krampe, Roberta Scassa and Giovanni Mitrotta, "Responses to Climate-Related Security Risks", cit.

[26] Mediterranean Experts on Climate and Environmental Change (MedECC), "Summary for Policymakers", in Wolfgang Cramer, Joël Guiot and Katarzyna Marini (eds), *Climate and Environmental Change in the Mediterranean Basin. Current Situation and Risks for the Future. First Mediterranean Assessment Report*, MedECC, November 2020, p. 6, https://www.medecc.org/?p=3506.

[27] Richard P. Allan et al., "Summary for Policymakers", cit.

ment, and the probability of extreme weather events.[28] Climate impact scenarios for countries in the Mediterranean are a source of concern since temperatures are estimated to rise and droughts will be longer, more severe and more frequent than the global average, which will most likely have negative effects on biological systems and human societies. In short, climate projections show rapidly warming trends in an already hot and dry region. If current trends continue undiminished, parts of the region could become uninhabitable for humans in the future.[29]

The immediate climate-related security risks in the region are likely to be caused by increased water shortages, extreme weather events, floods and wildfires.[30] More indirect and long-term security risks caused by a changing climate are linked to sustained crop failures, sea level rise, desertification and changes to marine and terrestrial ecosystems that are expected to primarily impact less diversified SEM economies in a negative, meaningful way and potentially spur internal as well as international migration from affected areas.[31] It is nonetheless important to note that previous research on climate-related security risks stresses that climate change does not necessarily translate into security risks in a linear fashion. Instead, the changing climate interacts with pre-existing political, social and economic factors in rather complex ways to produce certain risks for states and societies in and across a particular region. This is of course true also for Mediterranean countries, where highly illustrative examples can be seen in the different ways in which climate change affects water and food security across the region.

[28] United Nations Economic and Social Commission for Western Asia (ESCWA) et al., *Arab Climate Change Assessment Report: Main Report*, Beirut, ESCWA, 2017, https://www.preventionweb.net/node/46443.

[29] Johan Schaar, "A Confluence of Crises: On Water, Climate and Security in the Middle East and North Africa", in *SIPRI Insights on Peace and Security*, No. 2019/4 (July 2019), p. 5, https://www.sipri.org/node/4879.

[30] Elizabeth Sellwood, "A Tougher Climate in the Eastern Mediterranean: Policy Directions in a Context of Climate Change and Regional Crises", in *Re-imagining the Eastern Mediterranean Series: PCC Reports*, No. 1/2018, https://www.prio.org/publications/11150.

[31] Ibid.

Large parts of the population in SEM countries currently live in areas with high or very high surface water stress (understood to mean that more water is used than replenished, in comparison with a global average of about 35 per cent).[32] In the MENA region, nearly all countries are among the most water stressed in the world. The World Bank expects economic losses from water scarcity to reach 6–14 per cent of GDP in the MENA region by 2050.[33] Moreover, water from rivers and other resources is used for agricultural, industrial and domestic purposes at unsustainable volumes. For example, Jordan is in a particularly vulnerable position as climate change is likely to exacerbate the current problem that the country's aquifer is no longer being refilled from rainfalls to cover its water consumption. On top of that, the population of Jordan is growing rapidly, not least due to the intake of Syrian refugees since 2011, which puts additional pressure on its already limited water supplies. Furthermore, decades of poor governance have led to unsustainable water management. The combination of these factors "has rendered Jordan one of the poorest nations on the planet in terms of its water resources".[34]

Johan Schaar notes that most water policy measures implemented by SEM countries are not necessarily aimed at saving water and ensuring efficient management, but rather increasing access through further exploitation of water resources.[35] Currently, few MENA countries can be said to use policy instruments and economic subsidies to promote more sustainable means of water usage and consumption. For example, more than 80 per cent of the region's wastewater, which could be used for irrigation or industrial processes, is lost.[36]

Another study conducted by Elizabeth Sellwood emphasises risks linked to transboundary water sources in the Mediterranean region,

[32] Johan Schaar, "A Confluence of Crises", cit.

[33] World Bank, *Beyond Scarcity. Water Security in the Middle East and North Africa*, Washington, World Bank, 2018, http://hdl.handle.net/10986/27659.

[34] Elizabeth Whitman, "A Land without Water: The Scramble to Stop Jordan from Running Dry", in *Nature*, Vol. 573, No. 7772 (5 September 2019), p. 20-23 at p. 21, https://doi.org/10.1038/d41586-019-02600-w.

[35] Johan Schaar, "A Confluence of Crises", cit., p. 3.

[36] World Bank, *Beyond Scarcity*, cit.

such as the Nile, the Jordan River and the Euphrates, as a source of potential conflicts in the region. She suggests that while

> inter-state tensions relating to transboundary watercourses are not a new phenomenon [in this part of the world], climate change, combined with rapid population growth and urbanization, will intensify competition over such shared water resources – particularly in the absence of rapid improvements in water management.[37]

However, agreements such as those from the 1990s and 2000s on joint management of transboundary water between Jordan and Israel as well as between Syria and Lebanon, and Syria and Jordan, are an exception. Yet, the lack of implementation of the latter two agreements due to the protracted crisis in Syria since 2011 clearly demonstrates these shortcomings.[38]

Increased water scarcity is also likely to negatively impact food security in many Mediterranean countries, especially in the southern and eastern parts.[39] Productivity growth in the agricultural sector has been slow in many MENA countries, and even though the sector's contribution to GDP is small, farming is still a major source of employment in some of the most populated SEM countries. For instance, farming occupies 39 per cent of the workforce in Morocco and 28 per cent in Egypt.[40] In contrast, Italy and Spain, two of the largest agricultural exporters in the northern Mediterranean, only have about 4 per cent of their workforce employed in the agricultural sector.[41] These fig-

[37] Elizabeth Sellwood, "A Tougher Climate in the Eastern Mediterranean", cit., p. 11.

[38] Johan Schaar, "A Confluence of Crises", cit.

[39] United Nations Economic and Social Commission for West Asia (ESCWA) and Food and Agriculture Organization (FAO), *Arab Horizon 2030: Prospects for Enhancing Food Security in the Arab Region*, Beirut, United Nations, 2017, https://www.unescwa.org/node/644.

[40] Ibid.

[41] European Commission, *Spain: Agriculture Statistical Factsheet*, June 2021, https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/agri-statistical-factsheet-es_en.pdf; European Commission, *Italy: Agriculture Statistical Factsheet*, June 2021, https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/farming/documents/agri-statistical-factsheet-it_en.pdf.

ures should be seen in relation to the expected population growth in the MENA region of about 2 per cent annually, which is anticipated to nearly double the population between 2000 and 2050 and suggests rising levels of food imports, alongside the likelihood of increased water insecurity in the region (see above). For example, in the period 1990–2016, the gap between production and consumption of cereals in the MENA region grew from 30 to 100 million metric tonnes; and in 2014–16, the region imported 65 per cent of its consumption of cereals and about 25 to 35 per cent of global trade in sheep meat, milk and wheat.[42] Thus, water and food security risks in the Mediterranean are deeply connected to climate change.

Still, specific climate risks related to water management and food production do not automatically translate into security challenges. Previous research does not only stress the complex pathways through which changing climate factors might lead to conflicts and tensions,[43] as many researchers also emphasise that one of the most important factors to take into account when trying to assess the impact of climate-related security risks is the capacity to adapt of affected societies.[44] States' capacities to adapt to climate change, reduce climate-related security risks and protect their populations are key. The capacity to adapt to a changing climate ultimately rests on institutional capacity in terms of knowledge, technology and infrastructure, as well as regulatory capacity and rule of law. Public trust in the government and low levels of corruption are also essential features of institutional capacity, since it is difficult for states to effectively implement policies to address the adverse effects of climate change without the support of their populations and officials.[45] Schaar notes

[42] Johan Schaar, "A Confluence of Crises", cit.

[43] Nina von Uexkull and Halvard Buhaug, "Security Implications of Climate Change: A Decade of Scientific Progress", in *Journal of Peace Research*, Vol. 58, No. 1 (January 2021), p. 3-17, https://doi.org/10.1177/0022343320984210.

[44] W. Neil Adger, Hallie Eakin and Alexandra Winkels, "Nested and Teleconnected Vulnerabilities to Environmental Change", cit.

[45] See for instance, Bo Rothstein, *The Quality of Government. Corruption, Social Trust, and Inequality in International Perspective*, Chicago/London, University of Chicago

that responses to climate-related security risks are thus "ultimately subordinate to politics".[46] At the same time, Schaar says,

> Adaptive capacity is not static. In the MENA region, conflicts displace populations, destroy infrastructure and damage economies, thus reducing societies' adaptive capacity. The depth of these changes may determine if climate-induced stress escalates into a severe crisis. Conversely, adaptive capacity can be strengthened through institution-building, providing access to resources and increasing political stability.[47]

It needs to be taken into account that the history of conflicts and protracted tensions in the Mediterranean region provides a distinctive challenge for promoting regional cooperation on climate-related security risks.[48] The Mediterranean is also one of the least integrated regions in the world, measured in terms of political and economic integration, and the gap between the advanced northern economies, all of which are deeply integrated in the EU's Internal Market, and the less diversified southern economies, situated in North Africa and the Middle East, is vast. The instability in the MENA region as a result of many authoritarian regimes' inability to answer to popular demands for political inclusion and social justice in the wake of the Arab uprisings in 2011, particularly in Syria, Libya and Egypt, has led to a situation where the prospects for developing regional cooperation on climate-related security risks appear even bleaker than a decade ago.

There are nonetheless a few promising examples of regional cooperation that are relevant for developing actions also in the field of climate security. These include, for example, the Mediterranean Action Plan (MAP) which was established back in 1975 as a multilateral environmental agreement under the auspices of the UN Environment Programme (UNEP) to address common challenges of marine environmental deg-

Press, 2011.

[46] Johan Schaar, "A Confluence of Crises", cit., p. 5.

[47] Ibid.

[48] Niklas Bremberg, "Do Regional Organizations Contribute to Security?", cit.

radation.[49] Furthermore, the EU has been involved in attempts to promote Mediterranean regional cooperation since the 1990s, such as the Euro-Mediterranean Partnership (EMP), and the European Commission supports regulatory capacity and economic reforms in countries such as Morocco and Tunisia within the framework of the European Neighbourhood Policy (ENP). The most recent attempt to promote regional cooperation is the Union for the Mediterranean (UfM), launched in 2008. The UfM brings together all EU member states and 15 countries in the southern and eastern Mediterranean with the aim of enhancing regional cooperation and dialogue, focusing on projects and initiatives with "tangible impact on the citizens" in the region. The UfM secretariat was created in Barcelona in 2010 and is meant to serve as an operational institution to promote projects as well as coordinate the dialogue between UfM member states, partners and stakeholders.

However, previous research points to various obstacles for advancing regional cooperation in the Mediterranean such as, on the one side, a too heavy emphasis placed by the EU and its member states on "exporting" lessons from the European integration process and practices of EU policymaking to non-members in the southern and eastern Mediterranean; and on the other, protracted conflicts among SEM countries and the enduring character of authoritarian rule in the broader MENA region.[50] It is noticeable that the shift from the EMP to the UfM entailed a significant de-emphasis on issues related to human rights and political reforms in favour of technical cooperation and economic development as a basis for regional cooperation, without this having led to any obvious advancements. As already suggested, the prospects for regional cooperation in the Mediterranean seem in many ways bleaker today than a few decades ago, but the shared vulnerabilities that societies in the region

[49] See for instance, Peter M. Haas, *Saving the Mediterranean. The Politics of International Environmental Cooperation*, New York, Columbia University Press, 1990.

[50] See for instance, Federica Bicchi, *European Foreign Policy Making toward the Mediterranean*, New York, Palgrave Macmillan, 2007; Niklas Bremberg, "From 'Partnership' to 'Principled Pragmatism': Tracing the Discursive Practices of the High Representatives in the EU's Relations with the Southern Mediterranean", in *European Security*, Vol. 29, No. 3 (2020), 359-375.

face as a result of the adverse effects of climate change may push even authoritarian regimes to embrace regional cooperation in order to try to ensure their own survival, although this of course remains to be seen.

1.3 Recent regional climate actions in the Mediterranean

Before the COP26 meeting in Glasgow, the second UfM Ministerial Conference on Environment and Climate Action was held on 4 October 2021 in Cairo (the COP27 meeting in 2022 is scheduled to be held in Sharm el-Sheikh, Egypt). Ministers from UfM member states, as well as Frans Timmermans, Vice President of the European Commission responsible for the European Green Deal and Virginijus Sinkevičius, European Commissioner for Environment, issued a declaration stressing their shared intention to implement global and regional climate commitments, including increased "action on adaptation by taking appropriate measures aimed at enhancing the countries' capacities to respond to the impacts of climate change and make the Mediterranean region more climate-resilient".[51] Such adaptive measures should include "ecosystems management and restoration; sustainable water and coastal management solutions; actions targeting land degradation, desertification and coastal erosion; disaster risk reduction including emergency preparedness; climate-proofing infrastructures and investments; and promotion of nature-based solutions".[52]

The UfM conference in Cairo in 2021 was preceded by the first UfM Ministerial Meeting on Environment and Climate Change held in Athens in 2014. Following this initial meeting, the network of Mediterranean Experts on Climate and Environmental Change (MedECC) was created in 2015 as an international network of scientific experts to assist decision-makers on the basis of available research. Gathering about 600 scientists from 35 countries, MedECC is also supported by the UNEP/MAP through the Regional Framework for Climate Change Adaptation in the

[51] Union for the Mediterranean, *Declaration from 2nd Union for the Mediterranean Ministerial Conference on Environment and Climate Action*, Cairo, 4 October 2021, p. 3, https://ufmsecretariat.org/?p=125338.

[52] Ibid.

Mediterranean. The MedECC's first assessment report on the risks associated to climate and environmental changes in the Mediterranean was presented at the fourth UfM Regional Forum for Ministers of Foreign Affairs in Barcelona in 2019.

In terms of UfM-supported projects to enhance climate action in the Mediterranean region, CLIMA-MED is particularly worthy of mention. Financed by the EU and promoted by the European Commission, the project seeks to enhance energy security and adaptive capacity in Algeria, Egypt, Israel, Jordan, Lebanon, Palestine, Morocco and Tunisia while at the same time encouraging transition to low-carbon and climate-resilient economies. Other initiatives include the SEMed Private Renewable Energy Framework which aims to promote private renewable energy markets in Morocco, Tunisia, Egypt, Jordan and Lebanon, with financing from the European Bank of Reconstruction and Development, the Clean Technology Fund and the Global Environment Facility. The UfM Energy University by Schneider Electric, meanwhile, aims to develop expertise in energy efficiency and renewable energy for professionals via online courses, initially in Morocco, Tunisia, Turkey and Algeria; alongside the Tafila Wind Farm in Jordan which the UfM frames as a good example of a partnership between government and private sector in the field of renewable energy.

That said, it should be acknowledged that UfM-supported projects are rather limited and the effects are still to be seen. Yet, given the difficult circumstances that any project of this kind would face in the Mediterranean region it is worth pointing out that the cooperative logic that informs such projects at least does not run counter to what previous research on international cooperation on climate-related security risks has stressed as key factors for developing global and regional responses. This is because a crucial yet inherently difficult task for actors in the region is to develop capacities to continuously make context-specific assessments on such risks (see also above). Furthermore, in early 2021 the EU launched its "New Agenda for the Mediterranean" to strengthen its partnership with countries in the southern Mediterranean. The New Agenda includes an Economic and Investment Plan to spur economic development, and under the EU's Neighbourhood, Development and International Cooperation Instrument, up to 7 billion euro

for 2021–27 is said to be allocated to the implementation of the agenda. It should be noted that one focus area of the New Agenda is "green transition", including climate resilience, energy and environment.[53] While taking these recent initiatives to promote cooperation on climate-related security risks into account, it should also be mentioned that countries in the region have engaged in civil protection cooperation to better respond to natural and man-made disasters for several decades now. Euro-Mediterranean civil protection cooperation was launched in the 1990s and brings together practitioners from Mediterranean countries in training exercises and operations.[54] Currently, the EU-funded Prevention, Preparedness and Response to Natural and Man-Made Disasters in Middle East and North Africa Partnership Countries (PPRD) South III programme aims to increase resilience and reduce the social, economic and environmental costs of natural and man-made disasters in ENP partner countries (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia). More specifically, the PPRD South III aims to: further develop national approaches to disaster management, based on prevention, mitigation and preparedness rather than on response; strengthen coordinated responses of Mediterranean Basin countries affected by the same disaster; and deepen institutional cooperation between the EU Civil Protection Mechanism and the national civil protection agencies in SEM countries.[55] These efforts can be said to enhance much-needed capacities for adapting to the adverse effects of climate change, in a region where regional cooperation in many other policy areas is poorly developed.

[53] European Commission, *Southern Neighbourhood: EU Proposes New Agenda for the Mediterranean*, 9 February 2021, https://ec.europa.eu/commission/presscorner/detail/en/ip_21_426.

[54] Niklas Bremberg, *Diplomacy and Security Community-Building. EU Crisis Management in the Western Mediterranean*, London/New York, Routledge, 2016; Niklas Bremberg, "Security, Governance and Community beyond the European Union: Exploring Issue-Level Dynamics in Euro-Mediterranean Civil Protection", in *Mediterranean Politics*, Vol. 15, No. 2 (2010), p. 169-188.

[55] EU Neighbours portal: *PPRD South III: Prevention, Preparedness and Response to Natural and Man-Made Disasters in Middle East and North Africa Partnership Countries*, https://www.euneighbours.eu/en/node/33959.

1.4 Prospects for regional cooperation on climate security

There is little doubt that all Mediterranean countries are facing a climate emergency and that they need to seriously step up efforts to accelerate their transition into low-carbon economies as well as boost their capacities to manage immediate and more long-term climate-related security risks. Of course, the reduction of state revenues from fossil fuels presents huge challenges for those SEM economies that remain heavily dependent on hydrocarbons, at a time when there are deeply felt concerns over political instability and social unrest in the region, which might only contribute to making the necessary transition even harder to achieve. Nonetheless, developing responses in the field of climate security is fundamentally a political issue, and improving adaptive capacities is ultimately a question of strengthening institutional capacity as well as accountability within and among Mediterranean countries.

To be sure, the many protracted conflicts and tensions in the region suggest that it is difficult to advance regional cooperation on the highest political level, but examples such as projects and initiatives promoted by the UfM and EU discussed above nonetheless suggest that there are avenues for practical and technical cooperation to explore among actors on sub-state and local levels, not least in the fields of civil protection and climate risk assessment. This kind of cooperation could be further supported and expanded, for instance through the OSCE Mediterranean Partnership. In light of previous research stressing that knowledge exchange on climate-related security risks between international, national and local actors is key to developing adequate responses, the projects and initiatives referred to above, not least the MedECC and the PPRD South III, point to the potential of such practical cooperative ventures.

Finally, the sense of shared vulnerabilities facing all Mediterranean countries in the face of the adverse effects of climate change could become a factor that might push political elites in SEM countries to embrace regional cooperation to a larger extent than in the past, as well as motivating governments in northern Mediterranean countries to push harder for sustainable development. That said, the fact that it took almost seven years for the UfM to convene a second ministerial meeting on environment and climate action does not bode well in this regard. The advanced economies in the northern Mediterranean need to take

on further responsibilities and seek to compensate for their larger share in carbon emissions and pollution in the past as well as in the present; but as long as governments in the southern and eastern Mediterranean are not held fully accountable to their citizens it is difficult to see how they would be able to develop and implement policies that help transform their societies in a more sustainable direction. In this way, the climate emergency does not only revolve around issues of historic responsibilities and the adverse effects of climate change being felt today and increasingly tomorrow, it also highlights the disastrous consequences that the lack of democracy and cooperation as well as poor governance have on societies across and beyond the Mediterranean region.

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2.

The Mediterranean as a Climate Change Hotspot: Implications for State and Societal Resilience

Wolfgang Cramer and Joël Guiot

The Mediterranean Basin is characterised by a long history of human settlement and is now widely recognised as a hotspot of risks to people and their livelihoods, due to a combination of socio-cultural and economic tensions on the one hand, and rapid environmental change on the other.[1] A growing human population is faced with critical instability due to rapid warming, increased droughts and heat waves, sea level rise, pollution of air and all water on land and in the ocean. These changes affect human lives directly and negatively, but they also impact the underlying ecosystems that provide essential benefits to people and represent fundamental ("intrinsic") values on Earth. Through tens of thousands of publications, scientific studies have analysed multiple, but not all, aspects of environmental degradation across Mediterranean states and societies, permitting a robust understanding of risks and also projections of future developments. Overall, a synthesis of this literature shows that impacts of environmental change on people and ecosystems are likely to reduce the resilience of socio-ecological systems, including governance and human security, during coming decades.[2]

[1] Jacques Blondel et al. (eds), *The Mediterranean Region. Biological Diversity in Space and Time*, 2nd ed., Oxford, Oxford University Press, 2010.

[2] Wolfgang Cramer, Joël Guiot and Katarzyna Marini (eds), *Climate and Environmental Change in the Mediterranean Basin. Current Situation and Risks for the Future. First*

The primary drivers of these negative trends are climate change, pollution, unsustainable use of land and sea, and the arrival of invasive species, acting in combination. The consequences on people and ecosystems are highly dependent on location, however disadvantaged populations in fragile or conflict-ridden contexts, especially in southern and eastern Mediterranean countries, are significantly more likely to suffer from environmental change compared to others, particularly among northern Mediterranean countries. The following contribution builds on the multi-sectoral comprehensive risk analysis framework developed by the network of Mediterranean Experts on Climate and Environmental Change (MedECC) and will first analyse the key determinants of climate and non-climatic risks in the Mediterranean. It then moves to discuss several likely impacts of environmental change, examining both the climatic and socio-economic aspects of such impacts before ending with a few remarks regarding possible pathways to foster greater state and societal resilience across the Mediterranean Basin.

2.1 Climate-related drivers of risk

Average air temperature increase across the Mediterranean Basin has now reached +1.5°C above the pre-industrial period (1850–1900), more than the global average increase which recently passed +1.1°C. This more rapid warming is similar to most of the world's land areas that generally warm faster than the ocean surface. The Mediterranean Sea, being semi-enclosed and relatively shallow, is also warming faster than the global ocean (+0.3°C to +0.4°C per decade vs. approximately 0.2°C globally). Over Mediterranean land areas, future additional warming during the 21st century is projected to be at least 0.9–1.5°C for a highly ambitious scenario of greenhouse gas emission reductions, but more likely in the range of 3.7–5.6°C in the event of a continued absence of strong climate policies (Figure 1). In all pathways, future regional warming will exceed global mean values by approximately 20 per cent on an annual basis and up to 50 per cent in the summer. With such high warming

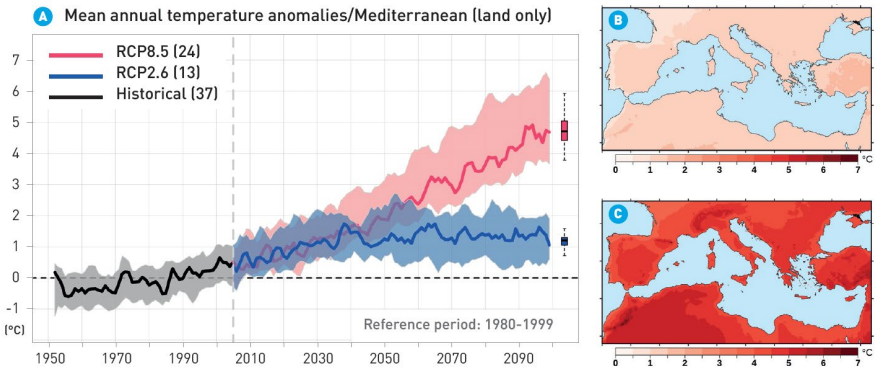
Mediterranean Assessment Report, Mediterranean Experts on Climate and Environmental Change (MedECC), November 2020, https://www.medecc.org/?p=3506.

rates, the intensity and frequency of heat waves will increase strongly, particularly in urban settings but also in the ocean. In addition, acidification of the Mediterranean Sea, caused by the rise in atmospheric CO2, is expected to progress more rapidly than it does in the global ocean, due to the higher alkalinity of Mediterranean waters. By 2100, the increased acidity could reach as much as -0.46 pH units, causing significant losses of shell-forming organisms and other biota.

Mediterranean coastal areas are heavily impacted by global sea level rise, caused by thermal expansion of the world oceans, but increasingly also by ice loss in the world's mountains and in Greenland – the current rate is accelerating and has recently reached 4.8 mm per year. Depending on emission pathways, sea levels in the Mediterranean will likely be 40–120 cm higher than today in 2100. The most recent Intergovernmental Panel on Climate Change (IPCC) report noted that much higher levels (1.7 m in 2100), caused by the destabilisation of Antarctic ice-sheets, cannot be ruled out.[3] Even without such catastrophic events, the commitment for additional sea level rise during coming centuries will be locked into the climate system, possibly reaching 7–15 m in 2300. This means that, even with ambitious climate policies and dramatic reductions in greenhouse concentrations, sea level rise is bound to continue. In the major river deltas and estuaries, this causes rapid retreat of the coastline, a process which is amplified further by the decrease in sediment input from the rivers due to upstream dams and urbanisation. Sea level rise poses particular problems for the densely populated Mediterranean coasts where, due to the absence of tides, people, agrosystems, cultural heritage sites and coastal infrastructure are all located dangerously near the coastline. The city of Venice in Italy is only the most famous example for a Basin-wide situation, with widely differing conditions between various places due to coastal landscapes but also large differences in technical and financial means for coastal protection.

[3] Intergovernmental Panel on Climate Change (IPCC), "Summary for Policymakers", in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the IPCC*, Geneva, 2021, https://www.ipcc.ch/report/ar6/wg1.

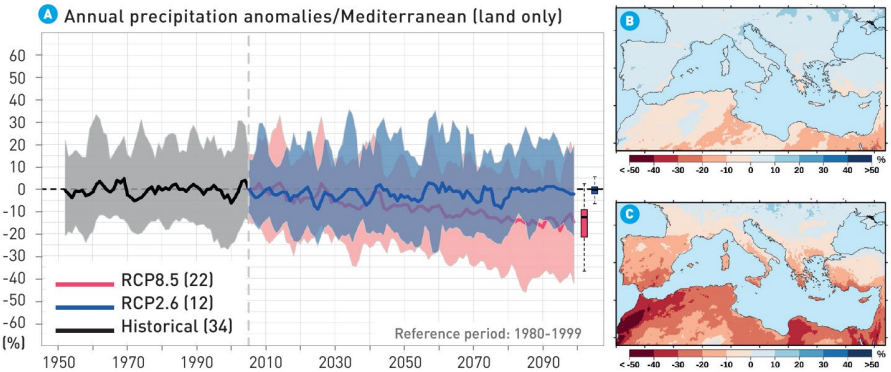
Figure 1 | Projected warming in the Mediterranean Basin



Note: Projected changes in annual temperature relative to the period 1980–1999, a: simulations for low and high greenhouse gas emission pathways (RCP2.6 and RCP8.5), b: temperature change at the end of the 21st century (2080–2099) for RCP2.6, c: idem for RCP8.5.

Source: Wolfgang Cramer, Joël Guiot and Katarzyna Marini (eds), *Climate and Environmental Change in the Mediterranean Basin*, cit., p. 10.

Figure 2 | Projected rainfall change in the Mediterranean Basin



Note: Projected changes in annual rainfall relative to the period 1980–1999, a: simulations for low and high greenhouse gas emission pathways (RCP2.6 and RCP8.5), b: rainfall anomalies at the end of the 21st century (2080–2099) for RCP2.6, c: idem for RCP8.5.

Source: Wolfgang Cramer, Joël Guiot and Katarzyna Marini (eds), *Climate and Environmental Change in the Mediterranean Basin*, cit., p. 11.

The contrast between dry summers and wet winters, a characteristic of all "Mediterranean" climates, will be intensified by drier summers and increased heavy rains and thus flood risk in the winter months.

While such extremes are already common in some regions, the increase is likely to be strong in most areas. Overall, precipitation is projected to decrease only slightly (about 4 per cent for each degree of global warming), but by the end of the 21st century even this small change adds up to an important reduction (Figure 2) which, together with stronger evaporation with higher temperatures, substantially reduces water availability for all forms of use.

2.2 Non-climatic drivers of risk

The impacts of climate change are exacerbated by strong non-climatic changes in the environment. In the Mediterranean Basin, these include multiple forms of pollution (air, land, rivers and ocean), the changing and unsustainable use of land (urbanisation, tourism, agricultural intensification) and the sea (overfishing) as well as the arrival of non-indigenous plant and animal species. Sulphur dioxide (SO2) and nitrogen oxide (NOx), produced by transport and industries, continue to increase drastically, the strongest cause being increased shipping activity in the Mediterranean. Tropospheric ozone (O3) concentrations increase due to the combination of pollution and warming, and high-level episodes will be more frequent in the future, with high impacts on human health, notably during hot summers. Saharan dust transport is likely to also increase due to stronger southern wind, likewise with impacts on human health.

The Mediterranean Sea is heavily polluted by multiple substances including plastic, emerging contaminants, heavy metals, faecal bacteria and viruses. All of these are expected to increase in the future. Urban and peri-urban areas are growing rapidly all over the Mediterranean, especially along the coasts of North Africa and among eastern Mediterranean countries. Urbanisation is also a major driving force of biodiversity loss and loss of open habitats. Outside urban areas and areas with intensive agriculture, forest and shrub encroachment, as a consequence of abandoned agro-pastoralism, mainly affects marginal lands with high importance for biodiversity, as well as arid and mountain regions, primarily in the north. In many regions of the Middle East and North Africa (MENA), remaining forests are degraded by unsustainable land management. In the sea, fishing activities have strongly increased since the 1990s. In 2010, 60 per cent of fish stocks were overexploited or had

collapsed across the Mediterranean, especially in the eastern basin.[4] The Mediterranean Sea is invaded by many non-indigenous species, in particular from the Red Sea but also through the Strait of Gibraltar, migrating by their own means but also through maritime transport and aquaculture. On land, non-indigenous species are particularly invasive in regions with high infrastructure and commerce development, including accidentally introduced phytophagous pests which cause damage to crops and forests. A common feature of all these trends is that they are expected to continue and further aggravate in the future.

2.3 Risks for water resources and food supply

Water resources in the Mediterranean are generally scarce, even in the absence of environmental change, particularly among southern and eastern Mediterranean countries where freshwater supplies are limited, unevenly distributed and often insufficient to satisfy human and environmental needs.[5] In these countries, which hold less than 30 per cent of the freshwater in the entire region, agriculture currently uses 76–79 per cent of this resource. In southern Europe, the four main sectors of cooling, industrial use, household use and agriculture are more evenly balanced (Figure 3). As a consequence, 180 million people in the southern and eastern Mediterranean countries currently suffer from water scarcity (<1000 m3 capita-1 yr-1) and 80 million people from extreme water shortage (<500 m3 capita-1 yr-1).[6]

Overall, water demand is expected to increase by 22–74 per cent by 2100 due to enhanced irrigation needs for agriculture, population growth and tourism. The resulting shortfall will be most significant in southern and east-

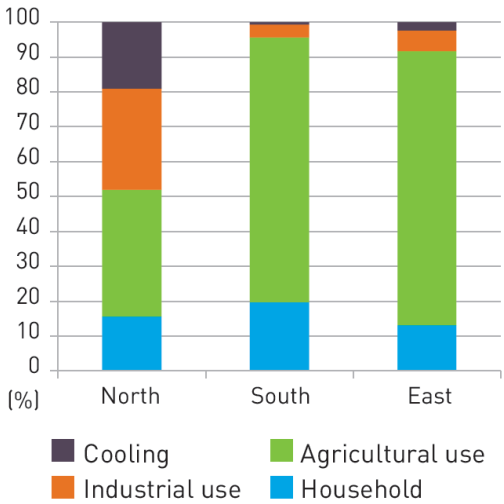
[4] Paraskevas Vasilakopoulos, Christos D. Maravelias and George Tserpes, "The Alarming Decline of Mediterranean Fish Stocks", in *Current Biology*, Vol. 24, No. 14 (21 July 2014), p. 1643-1648, https://doi.org/10.1016/j.cub.2014.05.070.

[5] Stèphane Simonet, "Adapting to Climate Change in the Water Sector in the Mediterranean: Situation and Prospects", in *Blue Plan Papers*, No. 10 (September 2011), https://issuu.com/mohamedhassouna/docs/cahier10_eau_cc_en.

[6] Marianne Milano et al., "Current State of Mediterranean Water Resources and Future Trends under Climatic and Anthropogenic Changes", in *Hydrological Sciences Journal*, Vol. 58, No. 3 (2013), p. 498-518, https://doi.org/10.1080/02626667.2013.774458.

ern Mediterranean countries where three quarters of the Basin's population live. Climate change will significantly increase the area affected by water shortages for all uses, but the exact numbers depend both on the pathway of climate policies and the implementation of adaptation measures. There is indeed considerable adaptive potential, mainly in the improvement of water use efficiency and reuse.[7] Further important adaptation options are changing agriculture practices and the reduction of food waste. Maintaining the traditional Mediterranean diet and shifting back to locally produced Mediterranean food, in conjunction with a reduction of food waste, could generate significant water savings in comparison to the present increasingly meat-based diet, often involving large quantities of imported animal feed, in addition to benefits for health (obesity, diabetes) and for local economies.

Figure 3 | Total water consumption rates across four main sectors and the three Mediterranean sub-regions



Source: Wolfgang Cramer, Joël Guiot and Katarzyna Marini (eds), *Climate and Environmental Change in the Mediterranean Basin*, cit., p. 16. Data from FAO 2016 Aquastat main database.

[7] Arthur Deboos et al., "Reuse of Treated Waste Water in the Mediterranean and Impacts on Territories", in *IPEMED Palimpsestes*, No. 19 (March 2018), http://www.ipemed.coop/en/publications-r17/ipemed-palimpsestes-c47/n%C2%B019-reuse-in-the-mediterranean-and-its-impact-on-territories-a3322.html.

Food production on land and in the sea is strongly impacted by climate change, notably through more frequent and intense extreme events, together with soil salinisation, ocean acidification and land degradation. Rising sea levels challenge agricultural production in river deltas such as the Nile Delta: even if land is not submerged, irrigation potential will be more limited due to saltwater intrusion from the sea. Crop yield reductions are therefore projected for the next decades in most current areas of production and for most crops (up to 60 per cent with 3–4°C global warming). These reductions could be worsened by emerging pests and pathogens. There is large adaptation potential in changing farming practices and management to agroecological methods, providing also important potential for climate change mitigation by increased carbon storage in soils.[8] Marine food production, already threatened by unsustainable fishing practices, encounters further challenges from invasive species, warming, acidification and water pollution. Taken together, these factors may affect species distribution and trigger local extinction of more than 20 per cent of commercially exploited fish and marine invertebrates around 2050.[9] Mitigation of these risks is possible but requires more rigorous management of fisheries in the Mediterranean. The sustainability of the Mediterranean food sector is also affected by changes in highly interconnected global food markets – which may be affected by environmental change in other world regions.

2.4 Risks for marine and terrestrial ecosystems

Marine ecosystems and their biodiversity are impacted by overfishing, warming (notably marine heat waves), acidification and the spread of non-indigenous species. Consequences include increased jellyfish outbreaks, mucilage and algal bloom outbreaks, and general biodiversity

[8] Eduardo Aguilera et al., "Managing Soil Carbon for Climate Change Mitigation and Adaptation in Mediterranean Cropping Systems: A Meta-Analysis", in *Agriculture, Ecosystems and Environment*, Vol. 168 (15 March 2013), p. 25-36.

[9] Miranda C. Jones and William W.L. Cheung, "Multi-model Ensemble Projections of Climate Change Effects on Global Marine Biodiversity", in *ICES Journal of Marine Science*, Vol. 72, No. 3 (March/April 2015), p. 741-752, https://doi.org/10.1093/icesjms/fsu172.

loss due to altered conditions for all organisms throughout the trophic web, from primary producers to top predators. In addition, tropical species arriving through the Suez Canal or the Strait of Gibraltar now find a sufficiently warm sea to replace many native species. The effects of warming are amplified by ocean acidification and increasing nutrient flows from the land. In coastal systems, sea level rise will impact coastal wetlands throughout the Basin – ultimately many current wetlands risk disappearing entirely during the present century. The survival and growth of seagrass "meadows" (which represent an important store of carbon) is also at risk from many processes in coastal systems, including warming and sea level rise.

All measures that improve marine ecosystem health, resilience or biodiversity have the potential to delay and reduce adverse effects of climate and non-climatic drivers. There is some potential for mitigating impacts through improved conservation within and beyond marine protected areas, more sustainable fishing practices and by reducing pollution from agriculture, urban areas and industry. Marine protected areas can provide an "insurance" role for biodiversity if they are placed in locations with limited vulnerability for ocean acidification and climate change. While marine protected areas cannot halt climate change and are fully exposed to its consequences such as ocean acidification, they are still an important tool for enhancing the resilience and adaptive capacity of ecosystems. To be efficient, surveillance will need to be strongly enhanced given that a large part of current protected areas do not have sufficient protection. The multiple levels of land-sea interactions could benefit from application of new approaches of ecosystem-based Integrated Coastal Zone Management and conservation planning. With current rates of land degradation, overfishing and sea level rise, all these approaches will nevertheless encounter "hard limits", meaning they are at risk to fail.

On land, biodiversity is at risk of decline in most parts of the Basin, in multiple ways. During the last 40 years, biodiversity changes and species loss, largely caused by unsustainable land use (agricultural intensification, urbanisation, land abandonment) have led to homogenisation and a general simplification of biotic interactions. In countries of the northern rim, forest area increases at the expense of extensive agriculture and grazing, while forested landscapes in southern countries are

more at risk of fragmentation or even disappearance due to clearing and cultivation, overexploitation and overgrazing. Freshwater ecosystems offer many important ecosystem services (e.g., water supply for drinking, agriculture and industries, water purification, erosion control, recreation, tourism and flood mitigation), yet they are at risk from higher temperatures, increased evaporation and water pollution. Between 1970 and 2013, 48 per cent of Mediterranean wetlands have been lost, with 36 per cent of wetland-dependent animals in the Mediterranean threatened by extinction.[10] Increases in wildfires and hence burnt areas are projected in Mediterranean Europe under most global warming scenarios. Burnt area could increase in this part of the basin by 40 per cent for 1.5°C warming and up to 100 per cent of current levels for 3°C warming at the end of the 21st century.[11] Mediterranean drylands have a large and specific biodiversity, with many plants and animals that are highly adapted to limited water conditions – their areal extent may actually increase due to drier conditions, at the expense of other biota.

For most land ecosystems, multiple adaptation options exist that can enhance their stability despite a changing environment.[12] One is the promotion of "climate wise connectivity", or the facilitation of expected range shifts[13] which in many areas may be achieved by "building" linear and latitudinal corridors and taking advantage of the river network. Such connectivity networks may facilitate, for example, upward migrations of lowland species to higher areas. In forests, there are many ways to promote more appropriate management taking into account local conditions and future projections, such as mixed-species forest stands, thin-

[10] Ilse Geijzendorffer et al. (eds), *Mediterranean Wetland Outlook 2. Solutions for Sustainable Mediterranean Wetlands*, Mediterranean Wetlands Observatory, 2018, https://medwet.org/publications/med-wetlands-outlook-2-2018.

[11] Marco Turco et al., "Exacerbated Fires in Mediterranean Europe Due to Anthropogenic Warming Projected with Non-Stationary Climate-Fire Models", in *Nature Communications*, Vol. 9 (2018), Article 3821, https://doi.org/10.1038/s41467-018-06358-z.

[12] Didier Aurelle et al., "Biodiversity, Climate Change and Adaptation in the Mediterranean", in *Ecosphere*, Vol. 13 (2022), forthcoming.

[13] Annika T. H. Keeley et al., "New Concepts, Models, and Assessments of Climate-Wise Connectivity", in *Environmental Research Letters*, Vol. 13, No. 7 (2018), Article 073002, https://doi.org/10.1088/1748-9326/aacb85.

ning and management of understory. The management of spatial heterogeneity in landscapes can also help reduce fire extent under climate warming scenarios. For freshwater ecosystems, preservation of natural flow variability of Mediterranean rivers and streams and wide riparian zones, along with reductions in water demand may assist their adaptation to future environmental change.

2.5 Risks for human livelihoods

Already today, human health is impacted by high temperatures as well as air and water pollution throughout the Mediterranean Basin.[14] The combined impacts of expected environmental changes (notably pollution and climate change) increase risks for human health in multiple ways, primarily from longer, more frequent and hotter heat waves (the deadliest of all extreme events), but also through food shortages as well as vector-borne, respiratory and cardio-vascular diseases.[15] Vector-borne disease outbreaks in the Mediterranean region are favoured by warmer climate and changing rainfall patterns which create hospitable environments for mosquitoes, ticks and other climate-sensitive vectors, particularly for the West Nile virus, chikungunya and leishmaniasis. All these health risks are particularly strong for populations including the elderly and young children, and virtually the entire population in disadvantaged areas and lower income countries.

Mediterranean cities grow due to increasing population and socio-economic change, notably on the coasts of southern countries. Increasing heat stress, exacerbated by urban "heat island" effects and also by further local warming caused by more widespread use of air-conditioning, kills people and challenges the planning and management of cities around the Mediterranean. Soil sealing for roads and parking spaces is an additional

[14] Cristina Linares et al., "Impacts of Climate Change on the Public Health of the Mediterranean Basin Population: Current Situation, Projections, Preparedness and Adaptation", in *Environmental Research*, Vol. 182 (March 2020), Article 109107.

[15] Jos Lelieveld et al., "Cardiovascular Disease Burden from Ambient Air Pollution in Europe Reassessed Using Novel Hazard Ratio Functions", in *European Heart Journal*, Vol. 40, No. 2 (May 2019), p. 1590-1596, https://doi.org/10.1093/eurheartj/ehz135.

hazard amplifier for flooding during heavy storms in most urban areas. Urban development that promotes the uptake of nature-based solutions, provides benefits to biodiversity and contributes to ecosystem services however also presents important opportunities for a stronger focus on human health and general resilience to environmental change.

Human livelihoods are also affected by increasing risks for infrastructure and housing associated with extreme events and coastal flooding. In addition to the risks faced by the resident population, these factors will also impact tourism which will lose attractiveness due to reduced thermal comfort, degradation of natural resources, including freshwater availability, and coastal erosion due to sea level rise and urban development.[16] The net effect on tourism will depend on country and season. Mediterranean tourism has a major role for employment and thus socio-economic sustainability throughout the region and has potential to become more resilient to climate change than the overall economy, for instance by becoming more oriented towards culture and outdoor activities[17] – although this potential could also be limited by the need to substantially curb greenhouse gas emissions from transport, including aviation and cruise ship tourism.

Recent human migration (mostly within southern and eastern Mediterranean countries but also south–north) has been partially attributed to environmental change (notably drought destabilising agricultural systems), but other drivers such as economic, security and political factors are usually more important.[18] While slow-onset environmental and climatic events have significantly affected human well-being in some areas, strengthened adaptation remains a key for reducing migration drivers. In contrast, fast-onset events with associated environmental

[16] Arnau Amengual et al., "Projections for the 21st Century of the Climate Potential for Beach-based Tourism in the Mediterranean", in *International Journal of Climatology*, Vol. 34, No. 13 (15 November 2014), p. 3481-3498.

[17] Mita Drius et al., "Tackling Challenges for Mediterranean Sustainable Coastal Tourism: An Ecosystem Service Perspective", in *Science of the Total Environment*, Vol. 652 (20 February 2019), p. 1302-1317.

[18] Mohamed Charef and Kamel Doraï, "Human Migration and Climate Change in the Mediterranean Region", in Jean-Paul Moatti and Stéphane Thiébault (eds), *The Mediterranean Region under Climate Change. A Scientific Update*, Marseille, IRD éditions, 2016, p. 439-444, https://books.openedition.org/irdeditions/23727.

degradation (such as storms and floods) have indeed led to migration, mostly temporary and over a short distance.[19]

2.6 Increasing economic resilience through mitigation and adaptation

All Mediterranean countries have significant potential to enhance their resilience by mitigating the various drivers of environmental change, as well as by enhancing adaptation efforts to face some of its unavoidable manifestations – the two forms of environmental policy are needed and complement each other. The primary and unavoidable goal is the mitigation of environmental change, in the Mediterranean Basin just like everywhere else. It is essential to reduce greenhouse gas emissions and all forms of pollution to zero within a few years, a target requiring a dramatically accelerated energy transition, implying the rapid phasing out of fossil fuels and an accelerated development of renewable energy resources. This objective is often considered "unrealistic" for a large number of reasons, however it must also be recognised that current policies favouring "small steps" are unrealistic since they are proven to be insufficient to reduce significant harm to human livelihoods, ecosystems and the economy.

An ambitious energy transition, reaching beyond the plans and targets announced by governments and policy makers in line with commitments made for the 2015 Paris Agreement requires a significant transformation of energy policies and economic models in Mediterranean countries, as well as their international context. Most northern rim countries show some progress towards an energy transition by gradually diversifying their energy mix, improving energy efficiency and enlarging the fraction of renewables, however both declarations and their implementation are clearly insufficient for the achievement of "Paris goals". Most eastern and southern rim countries lag further behind in these developments and require stronger financial support, technology transfer and capacity building to sustain their own transitions in already fragile socio-politi-

[19] Stefanie Schütte et al., "Connecting Planetary Health, Climate Change, and Migration", in *Lancet Planetary Health*, Vol. 2, No. 2 (February 2018), p. e58-e59, https://doi.org/10.1016/S2542-5196(18)30004-4.

cal contexts. Under current transition scenarios, the share of renewables in these countries could triple to reach 13–27 per cent in 2040, but much stronger efforts will be necessary, based on existing technologies, notably solar and wind, but also techniques under development, notably using ocean currents. Current policies are constrained by many factors, including the absence of regional energy market integration.[20]

Air and water pollution are also sectors with high potential for the mitigation of environmental change drivers, notably through a transformation of the transport sector and many industrial processes. The food production system has capacity to increase its resilience while simultaneously reducing its environmental footprint, through improved water management, better storage of soil organic carbon and carbon sequestration, nitrogen fertilisation optimisation, management of crop residues and agroindustry by-products.[21] Soil organic carbon content in Mediterranean croplands is responsive to management changes such as organic amendments, cover crops and tillage reduction. This provides the basis for high potential to enhance soil organic carbon storage through land restoration. Organic fertilisers, tillage reduction and residue retention are effective practices in herbaceous systems. Marine food production would experience gains in resilience from both improved management of fishing quotas and enhanced and well supervised marine protected areas.

2.7 The Mediterranean potential for sustainability transformation

In a recent Plan Bleu report,[22] a large group of experts developed an updated view on the Mediterranean region's potential to advance

[20] Observatoire Méditerranéen de l'Energie (OME), *Mediterranean Energy Perspectives 2018. Executive Summary*, Paris, OME, 2018, https://www.ome.org/mep-2018-2.

[21] Xavier Poux and Pierre-Marie Aubert, "An Agroecological Europe in 2050: Multifunctional Agriculture for Healthy Eating", in *IDDRI Studies*, No. 9/18 (September 2018), https://www.iddri.org/en/node/23298.

[22] United Nations Environment Programme/Mediterranean Action Plan and Plan Bleu, *State of the Environment and Development in the Mediterranean* (SoED 2020), Nairobi, UNEP, 2020, https://planbleu.org/en/soed-2020-state-of-environment-and-development-in-mediterranean.

towards greater environmental sustainability. In their conclusions, they point towards the need for major changes in production and consumption patterns, with an explicit focus on climate change concerns, biodiversity protection and restoration, the circular economy and a transition towards the blue/green economy. Such inclusive development will have to address inequalities and involve civil society in design and implementation, directly and explicitly. Women, but also younger generations and their demands and potential for action are central to short- and long-term progress. Achieving food and water security in the Mediterranean will require integrated water resources management, the use of new nonconventional water resources and better water demand management. For energy, both improved efficiency and stronger reliance on low-carbon energy solutions will be key. Currently, there are substantial subsidies and other incentives for fossil fuel use and even exploration throughout the Mediterranean Basin, and these obviously need to be replaced by policies in support of demand reduction through energy-saving measures. Moving towards more sustainable tourism will involve the development of more sustainable models that capture economic, social and environmental benefits. Tourism can also benefit from a transition to sustainability in all components of the transport sector.

In closing, the Plan Bleu report notes that the "economic benefits of the blue economy are accompanied by threats to the health of marine and coastal ecosystems",[23] calling for better planning policies to avoid negative consequences. These threats are substantial and go well beyond ecosystems. Most likely, deeper transformation will be needed to outweigh the benefits of conventional economics for most current pathways of greenhouse gas emissions. A step in this direction, so far not taken with a focus on Mediterranean countries, would be to address actual human needs beyond growing consumption of goods, and what socio-economic conditions might satisfy such needs.[24] After identifying

[23] Ibid., p. 7.

[24] Jefim Vogel et al., "Socio-economic Conditions for Satisfying Human Needs at Low Energy Use: An International Analysis of Social Provisioning", in *Global Environmental Change*, Vol. 69 (July 2021), Article 102287, https://doi.org/10.1016/j.gloenvcha.2021.102287.

these, the "social tipping points" that might enable the transition could be studied in detail, following an approach recently proposed for global climate action.[25] Unfortunately, such studies are currently lacking in the Mediterranean Basin, and most of the literature is characterised by conventional economic growth optimisation.

2.8 Equity, climate justice and human rights

Poverty, inequalities and gender imbalances presently hamper the achievement of sustainable development and climate resilience across Mediterranean Basin countries. Culture is a key factor to the success of adaptation policies in a highly diverse multicultural setting such as the Mediterranean Basin. There are important cultural dimensions to how societies respond and adapt to climate-related risks since culture mediates changes in the environment and changes in societies. Culture is thus central to understanding and implementing adaptation; the identification of risks, decisions about responses and means of implementation are all mediated by culture. Cultures are dynamic and reflexive and are therefore in turn shaped by the idea of climate change. This is highly relevant in the multi-cultural Mediterranean context.

Policies for climate adaptation and environmental resilience potentially infringe on human rights – they need to account for concerns such as justice, equity, poverty alleviation, social inclusion and redistribution.[26] Broadly speaking, environmental change currently enhances the existing disequilibrium between south/east and north, through the uneven change in human livelihoods and economic losses, all of which amplify the risks of conflict, migration and significant suffering of populations. Even if the southern/eastern countries have so far contributed only a small fraction of past greenhouse gas emissions, they now confront significantly higher

[25] Ilona M. Otto et al., "Social Tipping Dynamics for Stabilizing Earth's Climate by 2050", in *PNAS*, Vol. 117, No. 5 (4 February 2020), p. 2354-2365, https://doi.org/10.1073/pnas.1900577117.

[26] Mohamed Behnassi, Himangana Gupta and Olaf Pollmann (eds), *Human and Environmental Security in the Era of Global Risks. Perspectives from Africa, Asia and the Pacific Islands*, Cham, Springer, 2019.

risks for people and ecosystems than the northern countries and their capacity of adaptation is lower. The Covid-19 crisis visibly put additional strain on the adaptive capacity and the resilience of these countries. Even if more ambitious climate policies were implemented today, there remains high urgency for additional adaptation efforts, but even with such efforts, a significant gap will remain as long as the 2015 Paris Agreement is not fully applied to transform production systems.[27]

The international community's past failure (and insufficient current actions) to mitigate climate change and biodiversity loss are a recognised issue of justice since they ultimately threaten human livelihoods and human rights. In particular, the rights of vulnerable peoples, who are already experiencing the adverse effects of climate change, are especially threatened in the Mediterranean, alongside some other world regions. Adaptation policies have the potential to infringe on human rights in the Mediterranean region if they are disconnected from concerns such as equity, poverty alleviation, social inclusion and income redistribution. This concerns policies for food, water, forests, fisheries and the availability of other resources that support the livelihoods of vulnerable populations. States must therefore ensure that appropriate adaptation measures are taken to protect and fulfil the rights of all people, particularly those most threatened by negative climate impacts.[28]

To implement adaptation policies, Mediterranean countries need sufficient resources. Lower income and climate-vulnerable countries are generally not in a financial position to give sufficient priority to policies that protect their environment, whether in relation to climate change, pollution or unsustainable use. Since much of their limited public budgets are dedicated to cover sectors considered to be even more vital, such as infrastructure, health, nutrition and education, adaptation policies require other sources of funding. Although the UNFCCC established the

[27] Lea Berrang-Ford et al., "A Systematic Global Stocktake of Evidence on Human Adaptation to Climate Change", in *Nature Climate Change*, Vol. 11, No. 11 (November 2021), p. 989-1000.

[28] Center for International Environmental Law (CIEL), *Climate Change & Human Rights: A Primer*, Washington/Geneva, CIEL, 2013, https://www.ciel.org/?p=3962.

Green Climate Fund (GCF),[29] from which many Mediterranean countries are already benefiting to support their adaptation policies, mechanisms to ensure social and environmental safeguards have yet to be applied to the fund. To do so, institutions involved in funding climate-related activities are required to provide transparent processes, maintain policies and procedures that respect internationally recognised rights, and allow meaningful opportunities for public participation.

Many Mediterranean countries also lack the scientific and technological capacities to deal appropriately and efficiently with environmental change. Thus, science and technology transfer remain critical to supporting sustainability and avoiding the shifting of polluting industries from developed countries to the developing world, including from northern Mediterranean countries to the southern ones. Establishing an institutional mechanism for science and technology transfer could help to implement a future climate framework in the region. In terms of effective implementation of adaptation strategies, the Sustainable Development Goals framework can help ensure that scientific inputs required by the most vulnerable peoples and communities are systematically considered a priority.

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[29] GCF website: https://www.greenclimate.fund.

Mohamed Behnassi, Himangana Gupta and Olaf Pollmann (eds), *Human and Environmental Security in the Era of Global Risks. Perspectives from Africa, Asia and the Pacific Islands*, Cham, Springer, 2019

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Paraskevas Vasilakopoulos, Christos D. Maravelias and George Tserpes, "The Alarming Decline of Mediterranean Fish Stocks", in *Current Biology*, Vol. 24, No. 14 (21 July 2014), p. 1643-1648, https://doi.org/10.1016/j.cub.2014.05.070

Jefim Vogel et al., "Socio-economic Conditions for Satisfying Human Needs at Low Energy Use: An International Analysis of Social Provisioning", in *Global Environmental Change*, Vol. 69 (July 2021), Article 102287, https://doi.org/10.1016/j.gloenvcha.2021.102287

3.

Drought, Desertification and Displacement: Re-Politicising the Climate-Conflict Nexus in the Sahel

Luca Raineri

3.1 The Sahel, a key test for the climate-conflict nexus hypothesis

Environmental fragility is a defining characteristic of the Sahel. The concept of "Sahel" as a geo-political identifier was hardly in use until early post-colonial times.[1] Its salience increased dramatically after the major droughts that hit the region in the 1970s and 1980s. The early regional organisations grouping Sahelian countries – such as the Sahel Group at the Organization for Economic Cooperation and Development (OECD), the Community of Sahel-Saharan States (CEN-SAD), the Comité permanent inter-État de lutte contre la sécheresse au Sahel (CILSS) and the Autorité du Liptako-Gourma (ALG) – all stressed environmental fragility as a defining feature of the region. Building on this view, the modern Sahel was then identified as a transitional eco-region characterised by a scarce – but not absent – pluviometry, in between the absolute dryness of the Sahara and the abundant rainfall of the tropical band.[2]

[1] Gregory Mann, *From Empires to NGOs in the West African Sahel. The Road to Nongovernmentality*, Cambridge, Cambridge University Press, 2014.

[2] Olivier Walther and Denis Retaillé, "Sahara or Sahel? The Fuzzy Geography of Terrorism in West Africa", in *CEPS/Instead Working Papers*, No. 2010-35 (November 2010), https://liser.elsevierpure.com/en/publications/

Structural environmental fragility in the area is increasingly compounded by climate change, which risks exacerbating the vulnerability of Sahelian countries, societies and individuals. Traditionally, the rhythmic alternation of dry and rainy seasons (respectively, from October to June, and from July to September) dictates the sequencing of agriculture and pastoralism. These activities contribute to the livelihoods of the overwhelming majority of the Sahelian population – 60 to 75 per cent in Mali and Niger, according to the World Bank.[3] Rainfall determines a complex social organisation based on the rotation of land use and animal transhumance.[4] Climate change, however, can seriously affect the fragile balance that sustains this customary way of life. Available evidence suggests that the Sahel is exposed to major rainfall variability. Rainfall decreased overall throughout the 20th century, with extreme droughts in the 1970s and 1980s prompting fears that the frequency and severity of Sahelian droughts was experiencing an upward spiral.[5]

More recently, growing precipitation has been compounded by greater unpredictability, with irregular seasonal cycles, erratic geographic migration of the Sahel rainband and more frequent extreme events. Furthermore, long-term climate trends indicate that temperatures are rising across the region – albeit unevenly[6] – leading to unprecedented heat peaks. Increasing evaporation, in combination with ill-devised irrigation schemes and unsustainable logging to meet the demands of a growing

sahara-or-sahel-the-fuzzy-geography-of-terrorism-in-west-africa.

[3] World Bank Data: *Employment in Agriculture (% of Total Employment)*, https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS.

[4] Luca Raineri and Youssouf Bâ, "Hybrid Governance and Mobility in the Sahel: Stabilisation Practices Put to Test", in Bernardo Venturi (ed.), *Governance and Security in the Sahel: Tackling Mobility, Governance and Climate Change*, Brussels, FEPS / Rome, IAI, 2019, p. 15-38, https://www.iai.it/en/node/10476.

[5] Sharon E. Nicholson, Chris Funk and Andreas H. Fink, "Rainfall over the African Continent from the 19th through the 21st Century", in *Global and Planetary Change*, Vol. 165 (June 2018), p. 114-127, https://doi.org/10.1016/j.gloplacha.2017.12.014.

[6] Aoife McCullough, Leigh Mayhew and Sarah Opitz-Stapleton, "When Rising Temperatures Don't Lead to Rising Tempers. Climate and Insecurity in Niger", in *BRACED Working Papers*, September 2019, https://odi.org/en/publications/when-rising-temperatures-dont-lead-to-rising-tempers-climate-and-insecurity-in-niger.

population, is feared to be paving the way to desertification of the Sahel. This trend was first detected in the late 20th century, although evidence is today more ambiguous.[7] Overall, these changes run the risk of upsetting local patterns of productivity, mobility and livelihoods across the region, with potential reverberations on social stability and even peace and conflict.

Over the last decade, the Sahel's environmental fragility has been predicated in the context of a variety of complex and interconnected crises. While the Sahel is stricken by worsening climatic trends, demographic growth in the region is reaching worldwide heights, fuelling fears of a rapid depletion of natural resources. At the same time, the Sahel is experiencing major political and security crises, in which weakening state control and communal polarisation have unleashed widespread violence and massive population displacement. The Tuareg-led rebellion of 2012 has precipitated Mali into a spiral of political crises, military-led coups and overall state collapse. Profiting from the weaknesses of Mali, transnational networks of organised crime and terrorism have proliferated across the region, progressively sweeping across large portions of neighbouring countries including Burkina Faso and Niger. The growing presence of criminal, rebel and terrorist cells across the broader region, including in Nigeria, Libya, Ivory Coast and Chad, are testing the resilience of local societies and the capacities of international responses.

Within this framework, the Sahara-Sahel region is increasingly portrayed as a conveyor belt which, owing to its inherent connectivity, could project its shockwaves to North Africa, fuelling the destabilisation across the Mediterranean Basin.[8] The trans-Saharan smuggling of weapons between North and Sub-Saharan Africa is rampant, and the strong connections between jihadist formations in Algeria and Mali, as well as

[7] Tor A. Benjaminsen, "Let the Desertification Zombie Rest in Peace", in *Climate and Conflict PRIO Blog*, 4 December 2017, https://blogs.prio.org/ClimateAndConflict/?p=42.

[8] Judith Scheele, *Smugglers and Saints of the Sahara. Regional Connectivity in the Twentieth Century*, Cambridge, Cambridge University Press, 2012; Mark Micallef, *The Human Conveyor Belt: Trends in Human Trafficking and Smuggling in Post-Revolution Libya*, Geneva, Global Initiative Against Transnational Oragnised Crime, March 2017, https://globalinitiative.net/?p=19042.

Libya and Niger, are now well documented.[9] It is therefore not by chance that the Sahel has been framed as part of the broader Mediterranean space by regional security strategies of foreign interveners, first and foremost the EU and its member states. In this context, the migration flows from Africa to Europe via the Sahel, the Sahara and North Africa are depicted as an illustration of the complex interactions between fragile environments, conflict settings and precarious livelihoods.

The concomitance of these trends has spurred debate that the coexistence of worsening climatic and security trends may be in fact indicative of correlation, if not causation. Policy and media discourses increasingly air the belief that there may be a direct causal link between climate change and armed conflicts.[10] Building more or less explicitly on the Malthusian assumption that population growth erodes the sustainability of ecosystems and will lead to the exhaustion of natural resources, the so-called climate-conflict nexus hypothesis argues that climate change, in combination with population growth, leads to environmental degradation and dwindling natural resources, which in turn fuel increased competition and conflict escalation. The prominence of climatic stress and conflict dynamics makes the Sahel a quintessential case to test this hypothesis and explore its scope-conditions.

3.2 Exploring the nexus across time

In recent years, several studies have tested the validity of the climate-conflict nexus hypothesis, whether in general[11] or in the Sahel in

[9] Djallil Lounnas, *Le djihad en Afrique du Nord et au Sahel. D'AQMI à Daech*, Paris, L'Harmattan, 2019.

[10] Illustrating this, the French President Emmanuel Macron frequently emphasises the alleged link between climate change and conflicts, most notably in the Sahel (see: Statement by the President of France, Emmanuel Macron, at the UN video-teleconference on "Maintenance of international peace and security: Climate and security", 23 February 2021, https://undocs.org/en/S/2021/198). Also, international (UNCCD) and regional (EU, AU, G7) organisations have embraced the idea that the fight against environmental degradation can contribute to tackling the root causes of violent conflicts in the Sahel.

[11] Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence*, Princeton, Princeton University Press, 1999; Ole Magnus Theisen, Nils Petter Gleditsch & Halvard Buhaug,

particular.[12] These studies, have reached divergent conclusions regarding how and how much climate change is impacting the Sahel. Most importantly, they have failed to exhibit any unambiguous and consistent causal link between climate factors and (in-)security events in the region.[13] Instead of climatic factors per se, these studies highlight the significance of governance, especially at local level: the legitimacy, efficacy and cogency of customary norms, local institutions, dispute-settlement mechanisms and participatory commissions matter overwhelmingly in making potential conflicts over natural resources veer towards either conflict escalation or peaceful management.

These results, while providing a healthy dose of scepticism vis-à-vis simplistic Malthusian assumptions underpinning the early conceptualisations of the climate-conflict nexus, are arguably influenced by methodological shortcomings.[14] The search for correlations – in this case, between climate and conflict events – has in fact led scholars to uncritically import positivistic approaches originally devised for econometric studies, which however are ill-suited to exploring complex social phenomena. The well-known challenge of coding conflicts is only magnified by the diversity of proxies used to capture the independent variable (climate change), with some studies focusing on rainfall levels and others on changing temperatures, freshwater availability, natural disasters, agricultural output and so on. Furthermore, most of these stud-

"Is Climate Change a Driver of Armed Conflict?", in *Climatic Change*, Vol. 117, No. 3 (2013), p. 613-625.

[12] Sebastien Hissler, *Econometric Study on the Impact of Rainfall Variability on Security in the Sahel Region*, Paris, OECD, 2010, https://www.oecd.org/swac/publications/44245104.pdf; Tor A. Benjaminsen et al., "Does Climate Change Drive Land-Use Conflicts in the Sahel?", in *Journal of Peace Research*, Vol. 49, No. 1 (January 2012), p. 97-111; Erik Alda, *Rising Tempers, Rising Temperatures: A Look at Climate Change, Migration and Conflict and the Implications for Youth in the Sahel*, Washington, World Bank, 2014, http://hdl.handle.net/10986/23838.

[13] See also Halvard Buhaug, "Climate Not to Blame for African Civil Wars", in *PNAS*, Vol. 107, No. 38 (21 September 2010), p. 16477-16482, https://doi.org/10.1073/pnas.1005739107.

[14] Jan Selby, "Positivist Climate Conflict Research: A Critique", in *Geopolitics*, Vol. 19, No. 4 (2014), p. 829-856.

ies are based on the analysis of temporal correlations between climate events (however considered) and conflicts (however coded) occurring in the same year. Some more sophisticated studies perform analyses to explore whether climatic variations might affect conflict in the year that immediately follows. These approaches implicitly assume a mechanism whereby exceptional climatic variations are supposed to trigger competition and conflict in a very short timeframe. Yet, as political ecologists have long argued, "resource conflicts" are less akin to sudden outbursts of violence than to protracted processes of political contention intercepting long-term socio-political struggles. It is therefore unsurprising that positivistic analyses of the climate-conflict nexus have proved unable to identify any meaningful linkage between climatic and conflict events.

At the same time, the lack of a demonstrable correlation between climate change (proxies) and conflicts has led a second generation of studies to tone down the early scholarship's emphasis on causal claims and positivistic approaches. Following the 2015 *New Climate for Peace* report commissioned by the G7, recent research has reframed the understanding of the climate-conflict nexus less in terms of direct causality than of a multiplier of threats and risks coming from pre-existing vulnerabilities. Methodologically, this more recent scholarship has increasingly rejected abstract, generalisable approaches, and focused instead on single case-studies. This has paved the way to the analysis of fine-grained qualitative evidence – including interviews with experts and key informants – across longer timespans. Such developments have enabled scholars to illustrate that climatic and environmental factors may indeed be linked to conflict exacerbation in the Sahel, particularly in countries like Mali,[15] Niger[16] or Burkina Faso.[17] Nevertheless, the actual "weight" of climatic

[15] Chitra Nagarajan, *Climate-Fragility Risk Brief: Mali*, Berlin, Adelphi, 28 May 2020, https://www.adelphi.de/en/node/56472; Fara Hegazi, Florian Krampe and Elizabeth Seymour Smith, "Climate-Related Security Risks and Peacebuilding in Mali", in *SIPRI Policy Papers*, No. 60 (April 2021), https://www.sipri.org/node/5411.

[16] Aoife McCullough, Leigh Mayhew and Sarah Opitz-Stapleton, "When Rising Temperatures Don't Lead to Rising Tempers", cit.

[17] Sanfo Abroulaye et al., "Climate Change: A Driver of Crop Farmers - Agro Pastoralists Conflicts in Burkina Faso", in *International Journal of Applied Science and Technol-*

factors in determining conflict outcomes is only vaguely addressed by these studies, meaning that the overall climate-conflict nexus hypothesis remains underspecified.

The mixed results of existing research exhibit some common shortcomings and highlight where additional research is most needed. Both the difficulty that quantitative studies encounter in demonstrating a verifiable correlation, and the shallowness of qualitative studies in illustrating a compelling connection, point to the need to devote more attention to understanding the causal mechanisms that can reasonably link climate trends and events to conflict dynamics.

Building on the available literature and extensive fieldwork experience, this study hypothesises at least four mechanisms[18] that, in the case of the Sahel, can plausibly link climate and conflict events, especially when the problematic temporal correlation assumption is dropped, and potential impacts are considered throughout longer timespans:

1) *The Malthusian mechanism*: Worsening climatic trends (combined with other environmental stressors, such as demographic growth and/or unsustainable livelihoods) contribute to the progressive depletion of valuable natural resources, including fertile agricultural land, pasturelands and water sources. This dynamic exacerbates competition over increasingly scarce resources, in a struggle for survival. This competition can be political; or, in the most acute cases, it can escalate and lead to violent conflicts.

2) *The Greed mechanism*: Like in the Malthusian mechanism, climatic factors (possibly in combination with other factors) reduce the availability of natural resources. Yet in this case reduced supply is not seen as a survival threat, but as an economic opportunity, because the inelas-

ogy, Vol. 5, No. 3 (June 2015), p. 92-104, http://www.ijastnet.com/journal/index/749.

[18] A focus on mechanisms provides a promising departure from abstract econometric models, with a more bottom-up emphasis on fine-grained empirical accuracy. By mechanisms, we do not refer here to linear regularities, but to pathways in which causality is emergent in combination with parallel processes, as argued in non-deterministic approaches to mechanism research. See for instance, Stefano Guzzini (ed.), *The Return of Geopolitics in Europe? Social Mechanisms and Foreign Policy Identity Crises*, Cambridge, Cambridge University Press, 2012.

tic demand of basic consumption goods pushes prices upward. Conflict then results from the hoarding of resources driven by greedy (violent) entrepreneurs.

3) *The Sons-of-the-Soil mechanism*: Climate change–induced depletion of resources is not uniform, but uneven and irregular. Enhanced mobility, including migration and rural exoduses, therefore represent a valuable coping strategy, especially for traditionally mobile groups such as pastoralists and nomads. This trend is further amplified by forced displacement flows caused by "natural" disasters such as floods and droughts, whose frequency and magnitude are also increased due to climate change.[19] Yet population movements may intensify frictions and heighten tensions between indigenous/host communities and displaced/migrant groups, possibly leading to violent conflict escalation.

4) *The Political Ecology mechanism*: By prompting meteorological unpredictability, climate change critically undermines the fragile balance between natural ecosystems and productive systems that has long sustained the traditional way of life of Sahelian populations. As a result, the social organisation is upset: customary mechanisms of social integration and conflict regulation are less and less adapted to changing conditions, thereby prompting disenfranchisement and leaving grievances unaddressed, while the competition to redistribute the "goods and bads" resulting from climatic and social changes increases the risk of violent conflicts.

The analysis below will explore the plausibility of these mechanisms to explain alleged manifestations of the climate-conflict nexus in the Sahel. This does not mean that the climate-conflict nexus is assumed to exist unproblematically. On the contrary, if the analysis were to show that none of these mechanisms apply, the overall confidence in the heuristic value of the climate-conflict nexus hypothesis would be significantly diminished. Alternatively, the identification of one (or more) of these mechanisms at play in the Sahel would help corroborate the valid-

[19] This is not to imply a reductionist view whereby climatic factors and events "cause" migration in a deterministic fashion. Research has demonstrated the complexity of the socio-political dynamics shaping "push" and "pull" factors of migratory flows. See: Lily Salloum Lindegaard, "What Makes a Climate Migrant?", in *DIIS Long Read*, 2 March 2021, https://www.diis.dk/en/node/24648.

ity, and specifying the actual content and scope-conditions of the overall climate-conflict nexus hypothesis.

To this end, the analysis empirically investigates the mechanisms – if any – potentially linking changing climate dynamics and conflict outcomes in the two cases that most arguably illustrate the climate-conflict nexus in the Sahel: (i) the droughts and famines that hit the region in the 1970s and 1980s; (ii) the ongoing alleged desertification of central Sahel and the agro-pastoral competition for the use of natural resources. Looking at the complex interactions between environmental stressors, mobility and access to natural resources, the cross-time exploration of these cases will help address the temporal correlation bias of positivist climate-conflict research, whose implausibility has been noted above. The findings of such a research design are expected to provide policy-relevant indications on how to address conflict drivers in the Sahel and – possibly – in the broader Mediterranean space. Furthermore, given that the Sahel provides a most-likely case for the climate-conflict hypothesis to hold, as discussed above, the analysis herein delineated can provide valuable insights of more general applicability.

3.3 Droughts, famines and rebellions

Between the late 1960s and the late 1980s, the Sahel experienced severe precipitation decline. Rainfall levels fell by 15–25 per cent compared to the long-term average, and by 25–50 per cent compared to the extraordinarily wet period that preceded it since the 1950s. As a result, the region went through more frequent and severe droughts, which also proved exceptionally long in time and extensive in space, affecting an area of almost 5 million square kilometres across West Africa.

Early studies tended to attribute these events mostly to local anthropic factors, that is, the aggregated impact of human mismanagement of natural resources by Sahelian communities through overgrazing, deforestation and poor land management, compounded by rapid population growth. Later research however suggested that the prolonged drought was more probably among the indirect consequences of air pollution generated in Europe and North America, as global warming altered the

trajectories of monsoons and tropical rains.[20]

Given its inherent environmental fragility, the impact of these dynamics on the semi-arid Sahelian band was particularly severe. Scholars have found that the Sahelian droughts of the 1970s and 1980s brought about a major loss of biodiversity and ecological degradation, with unprecedented soil exhaustion and erosion.[21] The non-reproduction of pasturelands and the disruption of transhumance patterns also caused large-scale herd losses. Livestock depletion is hard to quantify, but was arguably massive. As a result, social groups whose livelihoods are based on pastoralism – most notably the ethnic Tuareg and Fulani – plunged into poverty.

The Sahelian droughts of the 1970s and 1980s were also accompanied by major famines, which became particularly acute in 1973 and 1985. The causal link between these two phenomena – droughts and famines in the Sahel – remains controversial however. There is little doubt that resource depletion and widespread poverty, caused by a prolonged drought, contributed to the Sahel's overall proneness to food crises. Yet one may argue that the Sahel's famines of those years could have been mitigated, if not averted, had it not been for the contribution of exogenous political factors. In the 1970s, for instance, the concomitant global oil crisis and hyperinflation rates drastically eroded the purchasing power of the vulnerable poor in oil-importing Sahelian countries. In the 1980s, the famines highlighted the failure of market-based regulatory mechanisms promoted by international financial institutions such as the World Bank and the International Monetary Fund. As it turned out, neoliberal doctrines underestimated the devastating impact of fluctuation in exchange rates and commodity prices for the cash-starved Sahelian populations.

Furthermore, discriminatory policies fostered by the region's authoritarian regimes exacerbated horizontal inequalities and unpaired access

[20] Isaac M. Held et al., "Simulation of Sahel Drought in the 20th and 21st Centuries", in *PNAS*, Vol. 102, No. 50 (13 December 2005), p. 17891-1789, https://doi.org/10.1073/pnas.0509057102.

[21] Bruno A. Walther, "A Review of Recent Ecological Changes in the Sahel, with Particular Reference to Land-Use Change, Plants, Birds and Mammals", in *African Journal of Ecology*, Vol. 54, No. 3 (September 2016), p. 268-280.

to critical food supplies and food aid for marginalised nomadic groups, as documented in the cases of northern Mali[22] and northern Nigeria.[23] These observations suggest that the mere lack of food availability was possibly less important than the lack of food accessibility and affordability in bringing about the famines that struck the Sahel in the 1970s and 1980s. One may therefore see such famines less as the result of mere food shortages than of inadequate food policies, thereby undermining the plausibility of the hypothesis posing a deterministic link between climate change–induced droughts and famines.

The environmental and food crises that struck the Sahel impacted local communities heavily. Estimates of drought-related deaths in those two decades range between 100,000 and 1 million people. Another 7–800,000 became dependent on food aid. Hundreds of thousands also left the hardest stricken areas straddling across the Sahel and the Sahara, and swelled the ranks of regional migratory flows, moving either to larger towns or to neighbouring countries. It is precisely in those years that numerous Tuaregs from northern Mali and northern Niger left their countries of origin and settled with their families in North African countries – Algeria and Libya most notably – whose hydrocarbons-based economies were then booming.[24] This circumstance by the way highlights the significant intersections of security dynamics affecting the Sahel and the broader Mediterranean region.

It is noteworthy that such crises, in spite of their huge economic, social and human impact, did not trigger any notable escalation of armed violence, at least in the short term. Paradoxically, the 1970s and 1980s represent an uncommon period of peace in Mali and Niger. The rebellious northern regions of these countries make no exception: Tuareg-led revolts broke out here in the 1960s and then in the 1990s and 2000s, but the peak years of the environmental and food crises were not accompanied by any obvious manifestation of armed violence. These obser-

[22] Gregory Mann, *From Empires to NGOs in the West African Sahel*, cit.

[23] Michael Watts, *Silent Violence. Food, Famine and Peasantry in Northern Nigeria*, 2nd ed., Athens, University of Georgia Press, 2013.

[24] Judith Scheele, *Smugglers and Saints of the Sahara*, cit.

vations contribute to questioning the applicability of the "Malthusian mechanism" to this case: in the face of dramatic climate changes and food shortages, armed resistance has arguably proved to local communities a less convincing option than creative adaptation. Noteworthy, mobility – including transhumance, trans-Saharan migration and rural exodus – has provided one of the most common coping strategies.

It is nevertheless possible to argue that the experience of dispossession and displacement nurtured feelings of anger and widespread grievances, especially among the Tuaregs.[25] Such feelings planted the seeds of revanchist ideals, which found a particularly fertile ground in the Libyan camps where displaced Tuaregs took refuge. Gaddafi's hospitality proved capricious and manipulative, but the large-scale recruitment in Libyan militias nevertheless exposed Sahelian Tuareg refugees to revolutionary ideologies and combat expertise. Such political and military skills empowered the Tuaregs who subsequently mounted a series of rebellions in north Mali and north Niger, starting from the 1990s. It is no coincidence that most of these rebellions were first planned in, if not supported by, Libya. In 2012, too, the Tuareg insurrection that triggered Mali's state collapse and soon enflamed the entire region was prompted by the Sahelian diaspora in Libya, who made return to northern Mali after the Gaddafi regime crumbled, bringing "home" combat experience and military hardware.

These observations may contribute to drawing a possible, although admittedly tenuous, link between the droughts and famines of the 1970s and 80s, and the insurgencies of the 1990s and 2000s in north Mali and north Niger, that is: between climate and conflict events. The lack of temporal overlap should not cause us to overlook the plausibility of a cross-temporal – and even cross-generational – linkage. At the same time, the "weight" of climatic factors in determining conflict outcomes should be viewed with caution. In light of the mismatch between the slowness of incremental climate change, and the sudden disruption through which longstanding tensions erupt into violent conflicts, a multiplicity of addi-

[25] Baz Lecocq, *Disputed Desert. Decolonization, Competing Nationalism and Tuareg Rebellions in Northern Mali*, Leiden, Brill, 2010.

tional factors should be accounted for to trace the causal chain possibly connecting armed conflicts to climate and environmental crises that occurred decades earlier. Process-tracing such an alleged causal chain would be a necessary but onerous endeavour, that falls beyond the scope of the present analysis.

Here we should content ourselves with highlighting the overall poor applicability of most of the mechanisms sketched above to the case in point. The limited explanatory power of the "Malthusian mechanism" has been already noted. The "Greed mechanism", too, contrasts with the temporal mismatch between climate and conflict events, and there are no obvious indications that commodity price fluctuations may have motivated the Tuareg-led insurgencies that swept the Sahel since the 1990s up to date. Instead of greed, the predominant explanations for these insurgencies highlight the grievances – to borrow a widely influential dichotomy of civil war studies – of disenfranchised Tuaregs against authoritarian rule, marginalisation and horizontal inequalities.[26]

The explanatory capacity of the "Sons-of-the-Soil mechanism" is also limited. The massive population displacement triggered by the environmental crisis of the 1970s and 80s did not lead to violent conflict escalations between groups forced to relocate and host communities. The reliance on transnational family networks and longstanding inter-ethnic solidarities helped assuage tensions. One could argue, however, that such tensions surfaced decades later. In fact, the Tuareg-led insurrections propelled by former "climate refugees" returning from Libya in the 1990s and then after the capitulation of Gaddafi in 2011 prompted the violent reaction of other indigenous Sahelian ethnic groups, who then formed self-protection armed factions some of which explicitly hailed a "Sons-of-the-Soil" rhetoric. In this case too, however, reductionist explanations attributing such polarisation to climate-induced mobility and competition over natural resources would be misleading. Recent research has

[26] Pierre Boilley, *Les Touaregs Kel Adagh. Dépendances et révoltes: du Soudan français au Mali contemporain*, Paris, Karthala, 2012; Hélène Claudot-Hawad, "La question touarègue: quels enjeux?", in Michel Galy (ed.), *La guerre au Mali. Comprendre la crise au Sahel et au Sahara: enjeux et zones d'ombre*, Paris, La Découverte, 2013, p. 125-147.

in fact demonstrated that political manoeuvring by local and national leaders played a prominent role in accelerating the fragmentation and antagonism of social and ethnic groups in northern Sahel.[27]

The "Political Ecology" approach may possibly provide a more promising explanation. There is evidence that the environmental crises of the 1970s and 80s, while disrupting the economic fabric, contributed to upsetting the social organisation and to severing inter- and intra-ethnic ties.[28] The rapid decay of customary institutions that followed diminished the threshold for violence seen as a legitimate means of conflict regulation. The outbreaks of armed violence in the Sahel over the last decades can be partly attributed to this long-term trend, originating since the 1970s at the intersection of environmental, economic, social and political crises. When Tuareg refugees came back from Libya in 2011–12 carrying their weapons, the capacity of local mechanisms for inter-ethnic conflict management was so eroded that, in the face of competing entitlement claims, nothing was left to prevent a violent escalation.

3.4 Desertification, regreening and competition for land use

Policy and media discourses have insistently claimed that the Sahel is going through a process of rapid desertification.[29] Such claims are arguably based on the inherent environmental fragility of the Sahelian band, its proximity to the Sahara Desert and the expected impact of diminishing precipitation combined with unsustainable logging to meet the increasing demand for wood by a rapidly growing population. The con-

[27] Luca Raineri and Francesco Strazzari, "Drug Smuggling and the Stability of Fragile States. The Diverging Trajectories of Mali and Niger", in *Journal of Intervention and Statebuilding*, 17 May 2021, DOI: 10.1080/17502977.2021.1896207.

[28] Georg Klute, "From Friends to Enemies: Negotiating Nationalism, Tribal Identities, and Kinship in the Fratricidal War of the Malian Tuareg", in *L'Année du Maghreb*, Vol. 7 (2011), p. 163-175, https://doi.org/10.4000/anneemaghreb.1191.

[29] See We Are Water Foundation, *The Sahel, Desertification beyond Drought*, 17 June 2019, https://www.wearewater.org/en/the-sahel-desertification-beyond-drought_318262. For a more explicit reference to the linkage between desertification, conflicts and security, see Jérôme Piodi, "La désertification : une bombe à retardement au cœur du Sahel", in *Revue Défense Nationale*, No. 783 (2015), p. 28-32, https://doi.org/10.3917/rdna.783.0028.

cern about the alleged desertification of the Sahel has fuelled fears that the exhaustion of natural resources would lead to heightened competition for access and exploitation, with the risk to prompt violent escalations and climate-induced migration. The discourse securitising the alleged desertification of the Sahel has gained traction in policy circles, also because of the support granted by international institutions such as the UN Environment Programme (UNEP) and the UN Convention to Combat Desertification (UNCCD). Even today's UN Secretary General António Guterres, speaking before the Security Council in 2012, argued that in the Sahel "poverty and underdevelopment, exacerbated by desertification and the effects of climate change, are being exploited by ideologies that are either based on ethnicity or religious extremism".[30]

In spite of such claims, there is now a growing scholarly consensus that the alleged desertification of the Sahel, if it ever occurred, has halted. The southward push of the Sahara Desert is receding, and the Sahelian belt features much higher degrees of green cover and water availability now than it used to be the case in the late 20th century.[31]

Several explanations have been put forward to account for this unexpected trend reversal. Some highlight natural dynamics, such as the spontaneously changing cycles of pluviometry that underpin the Sahel's inherent rainfall variability. Others instead underline the positive impact of policies deliberately devised since the 1970s drought in order to increase local ecosystems' resilience and mitigate the impact of environmental degradation, including large-scale reforestation programmes, logging bans and the expansion of agricultural production to meet the population's food needs. The fear of desertification in the Sahel has in fact prompted international donors – including Western

[30] UNHCR, *Statement by António Guterres, United Nations High Commissioner for Refugees, to the United Nations Security Council*, New York, 10 December 2012, http://www.unhcr.org/50c7346e9.html.

[31] Roy H. Behnke and Michael Mortimore (eds), *The End of Desertification? Disputing Environmental Change in the Drylands*, Berlin/Heidelberg, Springer, 2016, https://doi.org/10.1007/978-3-642-16014-1; Martin Brandt et al., "Changes in Rainfall Distribution Promote Woody Foliage Production in the Sahel", in *Communications Biology*, Vol. 2 (2019), Article 133, https://doi.org/10.1038/s42003-019-0383-9.

countries and international organisations – to relaunch late-colonial projects to stop the southward advance of the Sahara by raising a "great green wall" at the edge of the desert.[32] At the same time, Sahelian governments have enforced strict regulations against informal wood collection and for the overall conservation of natural resources. Moreover, international donors and Sahelian governments have supported ambitious programmes to strengthen food security by enhancing domestic agricultural output. Building on the "green revolution" blueprint, the production of cereals and staples in Sahelian countries has drastically increased in the last few decades, while malnutrition rates have conversely declined.[33]

These observations call into question the applicability of the "Malthusian mechanism" in this case. It is true that sporadic clashes for access to and control of water (re)sources have been observed in the Sahel over the last few years. Yet, contrarily to Malthusian expectations, conflict escalations have paradoxically taken place as rainfall and overall water and food availability were rising. If access to vital resources was at stake, it was arguably less due to climate-induced reduction of natural resource stocks than to social inequality and general demographic growth trends. The "Greed mechanism" is equally questioned. The substantial overlap – both temporal and spatial – between escalating conflict events and increasing food availability and affordability is in fact in contradiction with this hypothesis.

A more promising pathway possibly linking resource competition and conflict trends consists in shifting the analytical focus away from food availability and affordability per se, to the factors of food production, first and foremost the land. The retreat of the desert and the increase in food production, in fact, have been achieved through the exploitation of almost all the land suitable for agricultural purposes. Shrinking land availability, combined with growing demand as a result of population

[32] See Green Great Wall website: https://www.greatgreenwall.org/about-great-green-wall.

[33] International Crisis Group (ICG), "The Central Sahel: Scene of New Climate Wars?", in *Crisis Group Africa Briefings*, No. 154 (24 April 2020), https://www.crisisgroup.org/node/13812.

growth, has pushed land prices considerably upwards across the entire Sahel.[34] While the "Malthusian mechanism" still does not apply here, because land ownership per se is not a survival need, the "Greed mechanism" becomes more persuasive when applied to land shortages.

The large-scale land privatisation schemes (the phenomenon dubbed land-grabbing) are seen as profitable by domestic and international investors, but they have aggravated the competition for the acquisition of land – a resource customarily experienced and managed as a common good. Amidst uncertain legal frameworks and management schemes, land competition is arguably one of the main drivers of the current conflict dynamics in central Sahel.[35] The linkage with climate change is however paradoxical in this case: it is not so much climate change per se that fuelled conflict escalation in the Sahel; instead, the ill-conceived environmental protection programmes to fight desertification and prevent food crises – mentioned above – have ended up contributing to the exacerbation of conflict drivers, by alienating natural resource management and use to local communities for productive and protective purposes.

The applicability of "Sons-of-the-Soil mechanism" to this case appears to follow the same logic. The processes of desertification and regreening of the Sahel have arguably prompted flows of population displacement, driven respectively by humanitarian needs and livelihood opportunities. Conflict data however suggest that communal clashes over access to natural resources have been more frequent and acute during the last couple of decades, thereby correlating more with food and water abundance, and land scarcity. Indeed, many of the ongoing conflicts in the Sahel are linked to competing claims of autochthony and priority rights over the access to land and use of the natural resources localised therein.[36] The

[34] Ruth Hall, Ian Scoones and Dzodzi Tsikata (eds), *Africa's Land Rush: Rural Livelihoods and Agrarian Change*, Woodbridge, James Currey, 2015.

[35] Tor A. Benjaminsen and Boubacar Ba, "Why Do Pastoralists in Mali Join Jihadist Groups? A Political Ecological Explanation", in *The Journal of Peasant Studies*, Vol. 46, No. 1 (2019), p. 1-20.

[36] Tor A. Benjaminsen and Boubacar Ba, "Fulani-Dogon Killings in Mali: Farmer-Herder Conflicts as Insurgency and Counterinsurgency", in *African Security*, Vol. 14, No. 1 (2021), p. 4-26, https://doi.org/10.1080/19392206.2021.1925035.

clashes escalating between the Dogon and the Fulani in central Mali, or between Fulani, Tuaregs and Zerma at the Mali–Niger border illustrate this trend: they articulate with increasing violence the longstanding competition over land use between sedentary farmers and transhuman pastoralists, which violent extremist groups skilfully manipulate to gain local rooting.

Too narrow a focus on mobility, population displacement and claims of indigeneity, however, runs the risk of reifying abstract categories (such as host-migrant), and overlooking deeper political dynamics, which the "Political Ecology" framework appears more suited to capturing. As political ecologists have pointed out,[37] all environmental transformation – including instances linked to climate change – generate winners and losers, depending on the capacity of social groups to reap the benefits of environmental change and externalise costs onto other groups. This capacity is shaped by the political and economic power of such groups, and the case of the desertification and regreening of the Sahel makes no exception. The environmental protection programmes to fight desertification – mentioned above – have unequally impacted sedentary farmers and transhumant pastoralists. Reforestation initiatives, for instance, have largely encroached upon grazing lands. At the same time, the harsh and uneven implementation of the logging bans across the Sahel has been perceived as discriminating against pastoralists, and especially the most vulnerable among them. Furthermore, the enhancement of food production has largely been achieved through the expansion of agriculture to the detriment of pastoralism. Grazing areas have been turned to cultivation, and the shrinking of pasturelands and transhumance routes has considerably increased the chances for friction and the potential for conflict.

These outcomes are not merely the result of technical choices but reflect the power balance shaping Sahelian polities. Large-scale agricultural development, in fact, underpins narratives of modernisation, sedentarisation and capital accumulation long connected to state-build-

[37] Susan Paulson, Lisa L. Gezon and Michael Watts, "Locating the Political in Political Ecology: An Introduction", in *Human Organization*, Vol. 62, No. 3 (Fall 2003), p. 205-217.

ing. From this perspective, the underprivileged status of pastoralism in Sahelian environmental protection policies reflects not only the perceived greater food output of agriculture, but also, and importantly, the greater alignment of the latter with the political and economic interests of ruling elites in Sahelian capital cities.[38]

Looking at the processes of desertification and regreening in the Sahel, one could therefore conclude that climate changed–induced environmental change (rainfall variability and desertification) in combination with context-insensitive environmental protection policies (regreening via green "walls" and green "revolutions") have contributed to unsettling the customary organisation of production rooted in local ecosystems. The disruption of the fragile ecological balance between agricultural and pastoralist activities, based on rotating land use, has exacerbated inequalities and grievances, while undermining the cogency of traditional dispute settlement mechanisms and authorities. These dynamics have, on the one hand, increased the frequency and gravity of conflicts related to land allocation and use while, on the other, fuelled the disenfranchisement of vulnerable communities, and their resentment vis-à-vis the state. Indeed, available evidence suggests that the growing frustration and (unfulfilled) demand for protection by animal farmers are among the main drivers of violent escalation and terrorist mobilisation across the Sahel.[39]

From this point of view, then, in the case of the desertification and regreening of the Sahel the mechanism labelled "Political Ecology" appears to provide the most convincing pathway connecting climatic and environmental dynamics, on the one hand, and conflict outcomes, on the other.

[38] Gregory Mann, *From Empires to NGOs in the West African Sahel*, cit.; Luca Raineri, "Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism", in *EUISS Policy Briefs*, No. 20 (November 2020), https://www.iss.europa.eu/node/2495.

[39] Marc-Antoine Pérouse de Montclos, *L'Afrique, nouvelle frontière du djihad?*, Paris, La Découverte, 2018; Luca Raineri, *If Victims Become Perpetrators. Factors Contributing to Vulnerability and Resilience to Violent Extremism in the Central Sahel*, London, International Alert, 2018, https://www.international-alert.org/?p=2624.

3.5 Re-politicising the climate-conflict nexus

The Sahel is subject to a seemingly intractable, multifaceted crisis, illustrated by soaring levels of instability and violence across the region. What are the causes of this unprecedented conflict escalation? While the contributing factors are arguably complex and manifold, this analysis has investigated the applicability of some mechanisms which may help trace a plausible connection between conflict outcomes in the Sahel and climatic factors. The analysis has focused in particular on two micro-cases in which the exceptional prominence of the independent variable (climate events) makes the climate-conflict nexus hypothesis more likely: on the one hand, droughts (and famines), and their possible link to Tuareg irredentism; and on the other hand, desertification (and regreening), allegedly connected to inter-ethnic polarisation and the rise of violent extremism. Both cases span across decades, from the early manifestations of environmental stress in the 1970s to the ongoing security crisis in the region.

Among the four mechanisms analysed – dubbed "Malthusian", "Greed", "Sons-of-the-Soil", and "Political Ecology" – only the "Political Ecology" appears to retain some degree of applicability to the cases analysed. The pathway of "Political Ecology" has in fact proved the most plausible linkage between climatic and conflict events in both cases, while the three other mechanisms turn out to provide ill-suited explanations for the dynamics observed in each case. These findings have two important theoretical implications: first, that the hypothesis of a possible nexus between climate and conflicts dynamics retains some validity in some cases; second, that the "Political Ecology" mechanism provides the most convincing explanation of this nexus. This means that climatic change may indeed fuel violent conflicts, mostly because they contribute to upsetting fragile socio-economic systems and the relative mechanisms of conflict regulation.

At the same time, demonstration of the heuristic value of the "Political Ecology", alongside lack of substantiation of the other three mechanisms hypothesised, indicates that climate dynamics per se are neither sufficient nor necessary to trigger violent conflicts, and that additional exogenous factors need to be considered in order to provide an exhaustive causal explanation of conflict outcomes.

The key "Political Ecology" features – that is, the resilience of existing modes of production, and the legitimacy of the rules regulating them – are first and foremost political issues, which changing climatic conditions can influence, but not determine. This observation thus places emphasis on the crucial "weight" of governance schemes (including customary norms, domestic institutions and international laws) in making emerging tensions over natural resources veer towards either conflict escalation, or peaceful management.

This conclusion is not trivial, because it further contributes to ruling out the simplistic yet still influential Malthusian assumptions about the climate-conflict nexus. But it is not surprising either, as it corroborates the findings of a long tradition of positivist climate-conflict research. Interestingly, the "Political Ecology" framework, by focusing on cross-temporal causal paths, complements these findings by noting that, while it is true that climate-induced conflict outcomes depend primarily on governance mechanisms, it is also true that in the long run governance mechanisms themselves can be affected, modified or disrupted by changing climatic conditions.

Furthermore, the analysis of both cases highlights that mobility is another crucial factor mediating between climatic stressors and possible conflict outcomes in the Sahel. Rooted in customary practices, mobility is arguably the most widespread coping strategy put in place by Sahelians in the face of both incremental climatic changes and sudden climate disasters. The perceptions and practices of local populations, therefore, tend to see mobility much more as a source of resilience than as a threat. At the same time, the cases of Sahelian drought and desertification processes show that climate dynamics – as well as ill-suited climate change mitigation projects – can drastically affect customary mobility patterns. Forced displacement and spatial dispossession, in turn, often fuel resentment and plant the seeds of revenge, which in the long run can contribute to violent conflict escalation. While mobility thus seems to offer an immediate response to the challenges of climate change, the spatial and temporal dispersion brought about by forced mobility can ultimately lead to unravelling the social fabric and loosening the political bond. By eroding the social organisation, these dynamics crate a fertile ground to trigger the "Political Ecology" mechanism and transform climatic stressors into conflict drivers.

Lastly, one needs to observe that, in both cases analysed above, the social disruption inherent to the "Political Ecology" framework would arguably be insufficient to translate widespread grievances about unequal access to natural resources into violent conflicts, unless two additional conditions are met: the unimpeded accessibility of weapons to prospective insurgents, and the supply of political narratives and ideologies legitimising the resort to violence by non-state actors. Both conditions are verified in the Sahel, largely owing to the weakness and poor professionalism of local states' security apparatuses. Weapons diverted from local state arsenals are widely available across the Sahel's black market. And extremist ideologies – whether irredentism, ethno-nationalism or jihadism – have been frequently mobilised by the Sahel's violent entrepreneurs to reframe small-scale conflicts for access to natural resources into large-scale armed conflicts.[40]

From this perspective, it may be useful to borrow concepts and methods from the study of social movements of political contention in order to investigate conflicts seemingly influenced by climatic and environmental factors. In order to make sense of the conflicts over natural resources, one needs to look at the broader spectrum of material and immaterial resources that contribute to violent mobilisations: that is, not only more or less legitimate grievances linked to changing natural resource availability, affordability and accessibility, but also weapons, ideologies, material incentives and mobility opportunities, amongst others. Within this framework, climate factors contribute to changing the structure of political opportunity – either progressively or suddenly – by undermining existing modes of production and related social hierarchies.

In conclusion, this analysis has highlighted the relevance of political ecology and social movement studies lenses to make sense of how climate and conflict dynamics interact in the Sahel. The approach sketched herein therefore stresses the key importance of re-politicising (the anal-

[40] Morten Bøås, Abdoul Wahab Cissé and Laouali Mahamane, "Explaining Violence in Tillabéri: Insurgent Appropriation of Local Grievances?", in *The International Spectator*, Vol. 55, No. 4 (December 2020), p. 118-132, https://doi.org/10.1080/03932729.2020.1833567.

ysis of) the climate-conflict nexus. As can be expected, in fact, the securitisation of climate change has paved the way to the progressive de-politicisation of conflicts over natural resources in the Sahel. Sahelian governments have deliberately encouraged the narrative linking conflict escalation in the region and climate change, as a way to attract financial assistance by connecting two issues that mobilise international donors. The recent efforts by the government of Niger to foster a climate security narrative – and, most importantly, a resolution – within the UN Security Council provides an illustration of this.[41] However, laying blame on a "natural" phenomenon – one for which foreign, formerly colonial countries could be reproached – can also be seen as helping Sahelian rulers divert attention from their own responsibilities for growing insecurity and social unrest.[42]

Similarly, the belief that violent conflicts and climate change are somehow connected has offered international donors the opportunity to address jointly what are arguably the most pressing issues facing the international community, thereby overcoming political divides.[43] The European Union, in particular, has eagerly embraced this narrative, which seems to provide a coherent framework to reconcile its diverse (divergent?) ambitions: fighting climate change, stabilising the (extended) neighbourhood, fostering green development and undercutting irregular migration. The Commission's emphasis on Africa has made of the Sahel a laboratory to devise and test new foreign policy approaches combining the security-development nexus with the climate-conflict nexus in the name of climate security and green development.

These rather simplistic assumptions and deterministic rhetoric actually run the risk of obfuscating the root causes of the violent disruptions currently undermining the Sahel's stability, in which political and social factors are predominant. They could therefore jeopardise the adoption of appropriate responses to prevent, pre-empt and manage conflicts

[41] ICG, *Time for the UN Security Council to Act on Climate Security*, 7 December 2021, https://www.crisisgroup.org/node/18545.

[42] ICG, "The Central Sahel", cit.

[43] Luca Raineri, "Sahel Climate Conflicts?", cit.

over the access to natural resources in the region, both locally and internationally. From this perspective, re-politicising the climate-conflict nexus amounts not only to a matter of theoretical consistency, but also of political expediency in order to devise relevant strategies of risk reduction and conflict management.

3.6 Recommendations

Building on the above, it is possible to draw some recommendations on how to address the climate-conflict nexus in the Sahel in a more cogent, evidence-based fashion.

Firstly, research suggests that, in the Sahel, climate change depends more on macro drivers, while conflicts are more often the result of micro-dynamics. The articulation of these two levels is non-linear, and leads to complex, hardly predictable outcomes. This highlights the need for a holistic and nuanced understanding of the climate-conflict nexus, one that rules out simple mechanistic correlations and puts instead political struggles at the core of the analysis and policy-making. From this perspective, the current securitisation of climate change at the macro level (such as the proposed UN-resolution on climate security, or the UNCCD strategy) is as misleading as the blaming of micro-level environmental practices, no matter how predatory, for large-scale climate changes, which was in vogue in the 1980s and 1990s. This approach should therefore be equally dropped, replaced by strategies that recognise the politicisation of climate change and environmental struggles.

Secondly, portrayed as the quintessential illustration of environmental and political fragility, the Sahel has become the target of a plethora of programmes and projects to foster environmental protection. Such initiatives may have a positive impact and help reduce the overall security volatility of the region, provided that foreign interveners realise they do not operate in a vacuum. Past experiences demonstrate that large-scale projects of green- "revolutions", "walls", and "development" in the Sahel can do more harm than good if they are administered in a top-down fashion by authoritarian or technocratic elites without local buy-in. By overlooking local customs and governance mechanisms, such projects often tend to exacerbate tensions and grievances, paving the way to conflict escalation. In the domain of environmental protection, too, conflict

sensitivity is therefore paramount. The recent turn to community-based conservation has led to the development of approaches and tools which could provide valuable guidelines to this end.[44]

Thirdly, while the actual contribution of environmental and climate factors to conflict drivers remains uncertain, there is little doubt that conflicts over natural resources, irrespective of their cause, would hardly escalate to large-scale violence were it not for the widespread availability and accessibility of weapons. Therefore, while fighting climate change remains a worthwhile objective per se, combating arms trafficking appears to be a more effective and immediate means of reducing the lethality of conflicts and the overall regional instability. Sahel states' partners should invest in better monitoring arms transfers, securing arms stockpiles, disciplining arms users and combating organised crime.

Fourthly, the simplistic belief whereby security relevant phenomena as disparate as conflicts for natural resources, terrorist mobilisation and long-range migration can be traced back to the common root cause of climatic changes is flawed, and it is a recipe for policy failure. In particular, the specific characteristics of the Sahel's social-economic fabric make of mobility less a manifestation of vulnerability than of resilience in the face of climatic changes, whether incremental or sudden, while the evidence for climate change-induced migration remains contested. This prompts the observation that climate change and conflict mitigation strategies in the Sahel may be in contradiction with the EU-sponsored securitisation and interdiction of cross-border mobility to fight irregular migration. Foreign interveners – first and foremost the EU and its member states – should then carefully balance their priorities in the Sahel to avoid wasting resources or producing contradicting outcomes. Enhancing, rather than fighting, regional and trans-Saharan circulation schemes has the potential to help mitigate the drivers of conflict escalation and terrorist mobilisation.

[44] Mikkel Funder and Marie Ladekjær Gravesen, "Biodiversity and Development: The Evolution of Community-based Conservation and Implications for Danish Development Cooperation", in *DIIS Working Papers*, No. 2021:16, https://www.diis.dk/en/node/25282.

Lastly, the strength and legitimacy of governance makes a crucial difference in making potential conflicts over natural resources veer over either violent escalation or peaceful management. With its emphasis on governance, the EU's recently adopted Integrated Strategy in the Sahel[45] represents a step in the right direction. In the implementation of the Strategy, the EU and its member states should devote a special attention to the multi-level and multi-actor governance of natural resources. In particular, there is a need to better integrate customary rules, equitable legal frameworks and international norms, and to promote a less technocratic and more socially inclusive approach to land governance reforms in Sahelian countries.

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[45] Council of the European Union, *The European Union's Integrated Strategy in the Sahel*, 16 April 2021, https://data.consilium.europa.eu/doc/document/ST-7723-2021-INIT/en/pdf.

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4.

Renewable Energy in the Mediterranean: Pathways for Multilateral Cooperation

Silvia Pariente-David and Philippe Drobinski

While it is difficult to clearly define a Mediterranean identity, three characteristics are often listed as specific to the region: olive trees, blue sea and sun. Far from just being good for tourism (the Mediterranean is among the top world destinations), the sun and sea represent invaluable assets for energy and climate. The Mediterranean is one of the world's climate change hotspots, which might compromise the natural and cultural heritage of the Mediterranean, with consequences for people's livelihoods and economic growth more generally. However, the region has all the resources not only to combat climate change, but also to contribute to the objective of climate neutrality elsewhere, due to its vast untapped potential for renewable energy.

To materialise that potential, enhanced cooperation and regional integration are required. However, the complexity of the Mediterranean ecosystem and the fraught geopolitics of the region make the task arduous. Diverging interests of regional and international players fuel rivalries and conflicts for influence and control over energy resources, intensifying regional fragmentation and instability. Europe in particular has a key role to play (more than half of the Mediterranean countries are part of the European Union), and could draw in its wake the rest of the Mediterranean Basin on the journey towards carbon neutrality. This might help restore the long-gone Mediterranean grandeur while demonstrating that addressing climate change and maintaining economic welfare can go hand-in-hand if all resources are mobilised through a cooperative approach. Indeed, the Mediterranean is a veritable microcosm of that

challenge. Nowhere else in the world are so many developing countries in such close physical proximity to so many developed ones. About ten per cent of the world's countries are clustered together around the "sea in the middle of the land",[1] sharing an ecosystem, being interconnected by infrastructure, exchanging goods and services, and witnessing significant, multi-directional human flows of different kinds. The time may be ripe for a more *genuine* Mediterranean Union.

This chapter first presents the policy context toward carbon neutrality. It then presents the renewable energy potential of the Mediterranean region. The following section explains why that potential cannot be mobilised without Mediterranean energy market integration. Finally, the last section attempts to identify pathways for multilateral cooperation to implement an integrated Mediterranean energy market propitious for renewable energy development.

4.1 The policy context

The Mediterranean region stands at the crossroads of three continents: Europe, Asia and Africa. The future of the Mediterranean energy market is bound to be shaped by energy and climate policies in those three continents. Among those, Europe will be the one having overwhelming influence over the process – since it is the first continent to endorse climate neutrality as a political objective – and will therefore labour to draw the rest of the world along towards this objective of climate neutrality. To reach this ambitious objective, it will need to start by strengthening ties and cooperation with third countries in the Mediterranean Basin, developing means to access the necessary carbon-free energy resources from southern and eastern Mediterranean states, while embracing more genuine forms of cooperation, solidarity and burden sharing in the process.

4.1.1 The EU Green Deal and the "Fit for 55" Package

The European Green Deal, presented by the European Commission in December 2019,[2] is both the EU's new growth strategy and a plan to

[1] From the Latin "Mediterraneus".

[2] European Commission, *The European Green Deal* (COM/2019/640), 11 December

make Europe the world's first climate-neutral continent by 2050, an objective endorsed by the European Parliament in March 2019. Although it is first and foremost a set of internal plans and strategies for the EU, it will have global effects, as the EU intends to lead the world in the quest for carbon neutrality and for that purpose will need partners and further resources.[3] The European Green Deal is articulated around eight areas for action, which are interlinked and mutually reinforcing: (i) increasing the EU's climate ambition for 2030 (reduction of 55 per cent of GHG emissions compared to 1990[4]) and achieving climate neutrality by 2050, (ii) supplying clean, affordable and secure energy, (iii) mobilising industry for a clean and circular economy, (iv) building and renovating in more efficient ways, (v) accelerating the shift to sustainable and smart mobility, (vi) designing a fair, healthy and environmentally friendly food system, (vii) preserving and restoring ecosystems and biodiversity and (viii) a zero pollution ambition for a toxic-free environment.

The "Fit for 55" Package,[5] proposed on 14 July 2021, is the set of policy, regulatory and legislative tools to implement the Green Deal. It updates the "Clean Energy for All Europeans" Package to reflect the new

2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640.

[3] Some have deemed the European Green Deal a form of "climate colonialism", as it places significant burdens on partner countries and tends to obfuscate Europe's historical responsibility in increasing Mediterranean vulnerability to climate change through the foreign policies of certain member states. The emphasis placed on resources from the south has led some to criticise elements of the Green Deal. See for instance, Myriam Douo, "Climate Colonialism and the EU's Green Deal", in *Al Jazeera*, 23 June 2021, https://aje.io/rnvwvr. The EU Green Deal, in particular the proposal to introduce a carbon border tax, could be interpreted as being in contradiction with the Paris Agreement principle of "common but differentiated responsibilities and respective capabilities". While not disagreeing with that view, the present chapter takes a different angle: the EU quest for carbon neutrality represents an opportunity for the Mediterranean, as it opens new markets for products and resources for which it has a comparative advantage, thus feeding its economic growth and contributing to prosperity.

[4] Target endorsed by the European Council on 11 December 2020 and enshrined into legislation by the Climate Law of July 2021.

[5] European Commission, *'Fit for 55': Delivering the EU's 2030 Climate Target on the Way to Climate Neutrality*, (COM/2021/550), 14 July 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0550.

objectives of 55 per cent GHG emission reductions by 2030 and climate neutrality by 2050. The package consists of 13 legislative proposals, of which five are new and eight are revisions of existing laws (see Table 1).

Table 1 | The legislative proposals of the Fit for 55 Package

1. Revision of the EU emission trading scheme (EU ETS)
2. Revision of the regulation on land use, land use change and forestry (LULUCF)
3. Revision of the effort sharing regulation (ESR)
4. Amendment to the renewable energy directive (RED)
5. Amendment to the energy efficiency directive (EED)
6. Revision of the alternative fuels infrastructure directive (AFID)
7. Amendment of the regulation setting CO_2 emission standards for cars and vans
8. Revision of the energy taxation directive
9. New EU forest strategy
10. A carbon border adjustment mechanism (CBAM)
11. A Climate Action Social Facility
12. ReFuelEU Aviation – on sustainable aviation fuels
13. FuelEU Maritime – on greening Europe's maritime space

In addition, a Directive and a Regulation were proposed on 15 December 2021, as part of the Package, to decarbonise gas markets, promote hydrogen and reduce methane emissions. The European Commission proposals lay the conditions for a shift from fossil natural gas to renewable and low-carbon gases, including hydrogen and biomethane. In particular, they establish a framework for renewable and low-carbon gases to access existing gas transport infrastructure. To avoid locking-in fossil fuels and to create markets for the new gases, the proposals call for long-term fossil natural gas contracts not to be extended beyond 2049.

One important element of Fit for 55 which is likely to have critical implications for EU trading partners is the CBAM proposal.[6] The nature of trade with southern Mediterranean countries is also likely to be affected by the switch to renewable energy as Europe will need to import less hydrocarbons from those countries that are oil and gas

[6] European Commission, *Proposal for a Regulation Establishing a Carbon Border Adjustment Mechanism* (COM/2021/564), 14 July 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0564.

producers. The main objective of the CBAM proposal is to prevent carbon leakages and to preserve the competitiveness of Europe's industry, as Europe adopts more stringent climate objectives. Under the current proposal, the CBAM system would initially target a selected number of carbon-intensive goods including cement, iron and steel, aluminium, fertilisers and electricity. EU importers of these goods will be required to buy CBAM certificates, the price of which is to mirror that of the ETS, and surrender them to a newly established CBAM Authority.

Several non-EU Mediterranean countries are interconnected with the EU power system and trade electricity regularly with EU countries. According to the current proposals, they would be subject to the CBAM, unless their electricity market is coupled with those of the EU, they have adopted ambitious CO2 reduction targets commensurate with those of Europe or are implementing an ETS or analogous carbon pricing measures.

Moreover, the proposed CBAM would affect the export of various other products and equipment according to their carbon content. This could severely affect the economies of third countries that trade extensively with the EU, including those from the eastern and southern Mediterranean shores. Thus, the CBAM provides an incentive for non-EU Mediterranean countries to adopt ambitious climate change policies, including accelerated coal phase-out where this is relevant. However, it might be perceived negatively, as a threat and source of friction between trading partners. To be effective, the CBAM needs to be implemented with a spirit of cooperation, working together to avoid carbon leakages and reaching the ambitious objectives of the Paris Agreement.

4.1.2 Green Deal diplomacy and the Mediterranean

The Council conclusions on "Climate and Energy Diplomacy" of January 2021 invited the Commission to further reinforce the external dimension of the European Green Deal.[7] This seeks to make appropriate capacity available and to strengthen – together with the member states –

[7] Council of the European Union, *Climate and Energy Diplomacy - Delivering on the External Dimension of the European Green Deal*, 25 January 2021, https://www.consilium.europa.eu/media/48057/st05263-en21.pdf.

coordination and information exchanges through, among others, the EU Green Diplomacy Network and the Energy Diplomacy Expert Group. EU energy diplomacy aims to accelerate the global energy transition, while ensuring affordability, safeguarding the environment and achieving the Sustainable Development Goals. To this end, EU energy diplomacy promotes the deployment of safe and sustainable low-carbon technologies, the increasing uptake and system integration of renewable energy (including through increased interconnections) and international cooperation on hydrogen. Moreover, the EU calls for a complete phase-out of fossil-fuel subsidies and an immediate end to all financing of new coal infrastructure in third countries.

As part of the external dimension of the Green Deal, in February 2021 the European Commission proposed a new policy framework called "Renewed Partnership with the Southern Neighbourhood – A New Agenda for the Mediterranean".[8] The framework proposes a range of actions in the following areas: (i) human development, good governance and the rule of law; (ii) resilience, prosperity and digital transition; (iii) peace and security; (iv) migration and mobility and (v) green transition: climate resilience, energy and environment. Under the energy heading, the Communication states that cooperation is essential, given that "Europe and the Mediterranean region have interdependent, complementary and converging energy interests". The following priorities have been identified for cooperation: (i) massive deployment of renewable energy and clean hydrogen production; (ii) a stronger interconnection of electricity systems; (iii) energy efficiency efforts and measures, with a focus on buildings and appliances, and (iv) policies to address fugitive methane emissions from fossil fuel production, transport and use.

The New Agenda for the Mediterranean is accompanied by an Economic and Investment Plan (EIP)[9] that focuses on long-term socio-eco-

[8] European Commission, *Renewed Partnership with the Southern Neighbourhood. A New Agenda for the Mediterranean* (JOIN/2021/2), 9 February 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021JC0002.

[9] European Commission, *Renewed Partnership with the Southern Neighbourhood Economic and Investment Plan for the Southern Neighbours* (SWD/2021/23), 9 February 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021SC0023.

nomic recovery and aims to increase the region's attractiveness for investors. The EIP announces several flagship activities, among them technical and financial cooperation in Morocco to accelerate green hydrogen production, intensification of international cooperation in Egypt on energy research and technologies, support of the Jordanian national energy strategy, in particular regarding the energy-water-food nexus, and support for Algeria to diversify its economy and international energy trade away from hydrocarbons.

4.1.3 Policy in non-EU Med countries

According to the Energy and Climate Intelligence Unit,[10] 137 countries around the world have committed to carbon neutrality by 2050. Those countries account for 72 per cent of global GHG emissions and 75 per cent of world GDP. Those commitments are gradually being turned into national law, including in seven EU countries, none of them a Mediterranean country. While the ten EU countries that are part of the Mediterranean and account for around 55 per cent of Mediterranean CO2 emissions are committed to carbon neutrality under the EU Climate Law, none of the southern and eastern Mediterranean (SEM) countries has yet committed to carbon neutrality, with the exception of Turkey. Barely three weeks before the start of COP26, Turkey ratified the Paris Agreement and adopted the objective of net zero emissions by 2053. Turkey alone accounts for over 30 per cent of the Mediterranean emissions, while only three countries account for 73 per cent (Egypt and Algeria in addition to Turkey).

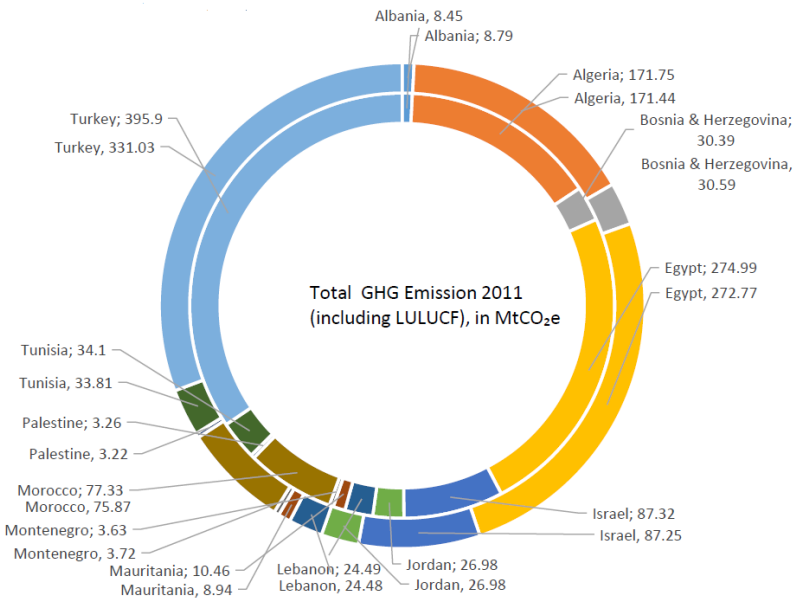
An analysis of the nationally determined contributions (NDCs)[11] concluded that Mediterranean Basin countries, as a whole, are not in line with the 1.5 °C goal, because 77 per cent of the emissions budget that should

[10] See Energy and Climate Intelligence Unit website: *Net Zero Scorecard*, https://eciu.net/netzerotracker.

[11] CITEPA, *Enhancement of Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for the Southern and Eastern Mediterranean (SEMed) Region. Regional Analysis on Nationally Determined Contributions (NDCs) – 2nd phase*, Barcelona, Union for the Mediterranean, 2020, https://ufmsecretariat.org/wp-content/uploads/2021/01/Enhancement-of-NDCs-in-the-SEMed-Region_WEB.pdf; Jaime D. Fernández M. and Ashanapuri Herta, *Regional Analysis of (I)NDCs in the SEMed Region*, cit.

be available until 2100 will already have been emitted by 2030. The NDCs show significant differences in the degree of ambition across countries, as indicated in the table 2 below on NDCs in SEM countries; however, a common feature is that more ambitious commitments are conditioned on external financial and technical support. Morocco and Israel are the countries with the most ambitious objectives, with Morocco having pledged for a 18.3 per cent reduction of its greenhouse gases emissions by 2030 and 45.5 per cent reduction conditional on international assistance under the NDC submitted in June 2021 and Israel having pledged a more ambitious target of 85 percent reduction by 2050 under the revised NDC submitted in July 2021. By end September 2021, none of the other SEM countries had submitted updated NDCs. Some of the countries also have targets for renewables: 52 per cent of installed power generating capacity by 2030 in Morocco, 42 per cent of electricity production by 2035 in Egypt and 30 percent of electricity production by 2030 in Israel.

Figure 1 | Total GHG emission (excluding LULUCF), 2011



Source: Jaime D. Fernández M. and Ashanapuri Herta, *Regional Analysis of (I)NDCs in the SEMed Region*, Barcelona, Union for the Mediterranean, 2020, p. 23, https://www.medecc.org/?p=2753.

Table 2 | SEM country commitments under first NDCs

	Unconditional (%)	Conditional (%)	Base year
Albania	-	11.50	2016
Algeria	7	22	-
Bosnia & Herzegovina	-	3	1990
Egypt	-	-	-
Israel	26	-	-
Jordan	1.50	12.5-14	2006
Lebanon	15	30	-
Mauritania	12	88	2010
Montenegro	30	-	1990
Morocco	17	42	2010
Palestine		12.8 (status quo) 24.4 (independence	
Tunisia	13	41	2010
Turkey	-	21	2012

Source: Jaime D. Fernández M. and Ashanapuri Herta, *Regional Analysis of (I)NDCs in the SEMed Region*, cit., p. 25.

The EU Green Deal could entice SEM countries to adopt more stringent climate objectives, as financial assistance is available under the new EU Neighbourhood, Development and International Cooperation Instrument (NDICI) and as a solution to avoid trade barriers such as the CBAM.[12] Consequently, they could also adopt more ambitious renewable energy targets, thus developing their vast solar potential to serve their home market and feed Europe's increasing appetite for carbonless electricity and green hydrogen. In order to trade clean energy and derived products such as green hydrogen, SEM countries would have to adopt, as part of the energy and climate policies, a system to certify that those products are indeed free of carbon. Some funding from the Euro-

[12] For instance, that was partially the case for Turkey's climate neutrality target. See Zia Weise, "EU's Looming Carbon Tax Nudged Turkey toward Paris Climate Accord, Envoy Says", in *Politico*, 6 November 2021, https://www.politico.eu/?p=1883551.

pean Commission is available to help SEM countries set up certification schemes, either from the bilateral twinning programmes or the Neighbourhood Instrument.

Achieving the ambition of the European Green Deal will not be possible without commensurate efforts on the part of third countries, in particular in the EU neighbourhood, with whom member states share gas and electricity infrastructure. In this context, the initiatives aimed at implementing the external dimension of the European Green Deal, such as the Green Agenda for the Western Balkans, the Energy Community Treaty or the New Agenda for the Mediterranean, could provide platforms to address the particular challenges arising in third countries. The EU Green Deal has the potential to spur new forms of cooperation towards a more genuine Mediterranean Union. Yet, if managed improperly and not accompanied by carefully tailored policies that reflect the current socio-economic challenges affecting individual SEM states, it could instead exacerbate regional fragmentation and even add further stress to already struggling states and societies in the Mediterranean.

4.2 The Mediterranean wealth: Plentiful carbonless energy resources

4.2.1 Mediterranean energy: An overview

As of now, renewables only account for a limited share of the primary energy supply in the Mediterranean Basin (11 per cent in 2016, Figure 2), with a strong North-South divide which complicates the picture even further.[13] In 2019, among MENA countries, only 4 per cent of overall power generation came from renewables,[14] which account for nearly 35 per cent in EU Mediterranean countries, where the share has doubled over the last 15 years.[15] The most used renewable energy sources are biomass and hydropower. Geothermal energy represents an important source in only a few countries – mainly Italy, Turkey and, to a lesser extent, France, Spain and Portugal. In recent years, wind and solar, both

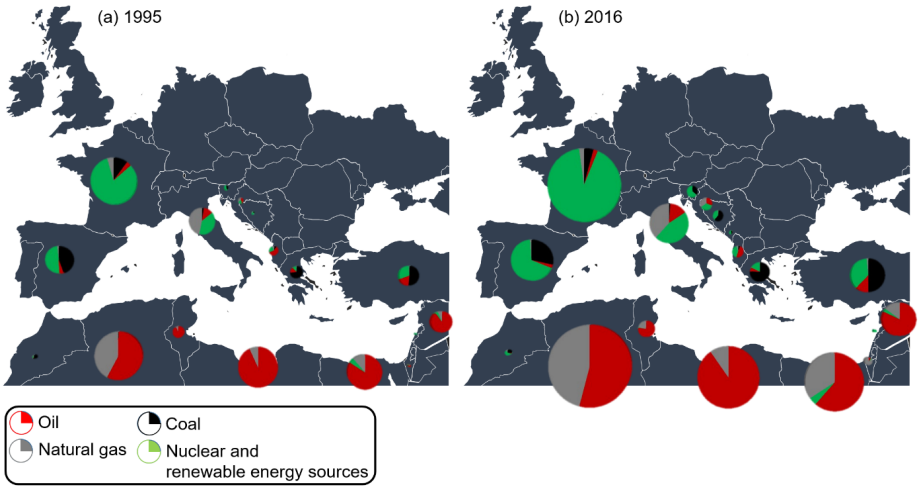
[13] Data source: IEA (2019).

[14] Data source: Enerdata (2019).

[15] Data source: Eurostat.

for electricity and for heat production, have entered the energy mix. Figure 2 shows the recent evolution of primary energy production by juxtaposing what it looked like in 1995 and in 2016. During this period, the contribution of oil has remained stable, while the contribution of coal has decreased by about 10 per cent. Consumption of natural gas has doubled, while the contribution of low-carbon energy, such as nuclear and renewable energy sources, has increased by about 43 per cent. In the Mediterranean region, France has the biggest energy-consuming economy with roughly 50 per cent of the primary energy consumption produced locally thanks to the large share of nuclear power in the country's energy mix. The vast majority of Mediterranean nations are strongly dependent on hydrocarbons both for imports to service the economy and as exports to garner funds and investments.

Figure 2 | Primary energy mix across the Mediterranean in 1995 (a) and 2016 (b)



Source: Philippe Drobinski et al., "Energy Transition in the Mediterranean", in Wolfgang Cramer, Joël Guiot, Katarzyna Marini (eds.), *Climate and Environmental Change in the Mediterranean Basin. Current Situation and Risks for the Future. First Mediterranean Assessment Report*, Marseille, Union for the Mediterranean, Plan Bleu, UNEP/MAP, p. 265-322, https://www.medecc.org/?p=3506

Against this background, it is necessary to rapidly improve the penetration of renewable energies in the Mediterranean to address both the depletion of fossil fuels and climate change mitigation. This would

be favoured by the large potential the region has for energy production from terrestrial renewable energy, as well as for the development of marine energy. Yet, such an energy transition needs to consider both positive and negative externalities on material resources,[16] the environment[17] and societies across the region.[18]

4.2.2 Renewable energy as a driver for Mediterranean complementarity

Renewable energy resources are unevenly distributed across the region. In Europe, large scale on- and offshore wind and photovoltaic (PV), as well as low cost hydropower and geothermal electricity, can be produced in some EU member states.[19] Looking south, countries from the SEM region (Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Occupied Palestinian Territory, Lebanon, Syria and Turkey) have huge solar irradiation levels, which makes these countries the ideal location for large-scale development of solar PV and concentrated solar power (CSP),[20] even compared to Southern Europe. The most promising regions for solar power plants are located in deserts which are sparsely inhabited and not used for agriculture or urban settlement. Efficiency is also higher in these areas.

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[16] Samuel Carrara et al., *Raw Materials Demand for Wind and Solar PV Technologies in the Transition towards a Decarbonised Energy System*, Luxembourg, Publications Office of the European Union, 2020, https://op.europa.eu/s/vJi3.

[17] Charles J. Vörösmarty et al., "Anthropogenic Sediment Retention: Major Global Impact from Registered River Impoundments", in *Global and Planetary Change*, Vol. 39, No. 1-2 (October 2003), p. 169-190; Christiane Zarfl et al., "A Global Boom in Hydropower Dam Construction", in *Aquatic Science*, Vol. 77, No. 1 (January 2015), p. 161-170; Rosamond L. Naylor et al., "The Ripple Effect: Biofuels, Food Security, and the Environment", in *Environment*, Vol. 49, No. 9 (November 2007), p. 30-43.

[18] Charlotte von Möllendorff and Heinz Welsch, "Measuring Renewable Energy Externalities: Evidence from Subjective Well-Being Data", in *SOEPpapers on Multidisciplinary Panel Data Research*, No. 779 (2015), http://hdl.handle.net/10419/115874; Tatyana Bulavskaya and Frédéric Reynès, "Job Creation and Economic Impact of Renewable Energy in the Netherlands", in *Renewable Energy*, Vol. 119 (April 2018), p. 528-538.

[19] These include northern European countries as well as Spain and Portugal for wind electricity production, southern European countries for solar, in mountainous regions and along major rivers for hydropower.

[20] Rosaria Ciriminna et al., "Solar Energy and New Energy Technologies for Mediterranean Countries", in *Global Challenges*, Vol. 3, No. 10 (October 2019), Article 1900016, https://doi.org/10.1002/gch2.201900016.

Theoretically, about 1 per cent of the earth's total desert surface could provide enough energy to supply the entire population of the world.[21] In this context, the Sahara Desert is the world's sunniest area year-round.[22] Covering 8 per cent of the Sahara with solar panels would be enough to supply all the energy needed by the whole planet.[23]

Regarding wind energy, large wind resources exist in Northern Europe. The sustained high winds of this region correspond to the storm track associated with near-surface westerly wind blowing all year long with some seasonal modulation. More to the south, Atlantic trade winds extend far inland into the Sahara Desert. Indeed, the Sahara is one of the windiest areas on the planet, especially on the west coast, with quite steady winds throughout the year, making this region a favourable place for wind power generation.[24] Regional channel flows accelerated in the valleys of the mountain ranges surrounding the Mediterranean Sea are also favourable for wind energy production. Higher wind resources are found offshore compared to onshore. This is primarily due to the reduced roughness over the sea. In the Euro-Mediterranean, offshore areas of sustained high winds are the storm track region over the Atlantic Ocean and the North Sea; and in the Western Mediterranean the windiest areas are at the exit of the main valleys along which the strong regional winds blow (e.g., mistral, tramontane, cierzo, bora, jugo). Over the Eastern Mediterranean, in the Levantine Basin, the prevalent winds

[21] See, DESERTEC, *Clean Power from Deserts. The Desertec Concept for Energy, Water and Climate Security*, WhiteBook fourth ed., Bonn, Protext Verlag, February 2009, https://www.earthpolicy.org/downloads/articles/trec_white_paper.pdf; Data source: IEA (2019).

[22] Peter F. Varadi, Frank Wouters and Allan R. Hoffman, *The Sun Is Rising in Africa and the Middle East. On the Road to a Solar Energy Future*, Singapore, Pan Stanford Publishing, 2018.

[23] Ad van Wijk, Els van der Roest and Jos Boere, *Solar Power to the People*, Amsterdam, IOS Press, 2017, https://ebooks.iospress.nl/book/solar-power-to-the-people.

[24] Peter Meisen and Oliver Pochert, A Study of Very Large Solar Desert Systems with the Requirements and Benefits to Those Nations Having High Solar Irradiation Potential, Global Energy Network Institute (GENI), 2006, http://www.geni.org/globalenergy/library/energytrends/currentusage/renewable/solar/solar-systems-in-the-desert/Solar-Systems-in-the-Desert.pdf.

are the Etesians which persist all year long with a maximum intensity in summer.[25] From a climatological point of view, these coastal regions are promising for offshore wind farm deployment. However, environmental and economic constraints (dense maritime transport activity, tourism, etc.) must be accounted for when planning the installation of offshore wind farms.

The world's electricity sector strongly depends on the availability and temperature of water resources for hydropower generation and for cooling of thermoelectric power (nuclear, fossil-fuelled, biomass-fuelled and geothermal). Thermoelectric power is the dominant power-generating technology except in South America where hydropower dominates.[26] In the Mediterranean region, utilisation rates are fairly constant, around 80–90 per cent for hydropower and 50–60 per cent for thermoelectric power. In Northern Europe, the utilisation rates are similarly constant, exceeding 95 per cent for hydropower and around 50–60 per cent for thermoelectric power. The utilisation rates are significantly reduced during periods of drought (severe streamflow drought impacts hydropower while streamflow drought and high water temperature impacts thermoelectric power, corresponding to a utilisation decrease of about 3–6 per cent).[27]

Among the available renewable sources, ocean energy is experiencing increasing interest and development.[28] The ocean energy sector clearly

[25] Stefano Zecchetto and Francesco De Biasio, "Sea Surface Winds over the Mediterranean Basin from Satellite Data (2000–04): Meso- and Local-Scale Features on Annual and Seasonal Time Scales", in *Journal of Applied Meteorology and Climatology*, Vol. 46, No. 6 (2006), p. 814-827, https://doi.org/10.1175/JAM2498.1.

[26] Michelle T.H. van Vliet et al., "Power-Generation System Vulnerability and Adaptation to Changes in Climate and Water Resources", in *Nature Climate Change*, Vol. 6 (2016), p. 375-380.

[27] Michelle T.H. van Vliet et al., "Impacts of Recent Drought and Warm Years on Water Resources and Electricity Supply Worldwide", in *Environmental Research Letters*, Vol. 11, No. 12 (December 2016), Article 124021, https://doi.org/10.1088/1748-9326/11/12/124021.

[28] Henry Jeffrey, Brighid Jay and Mark Winskel, "Accelerating the Development of Marine Energy: Exploring the Prospects, Benefits and Challenges", in Technol*ogical* Forecast*ing and* Soc*ial* Change, Vol. 80, No. 7 (September 2013), p. 1306-1316.

stands at the intersection of all the converging paths of energy policy. It promises substantial breakthroughs in low-carbon and clean energy technologies, reinforces EU competitiveness on the global market, calls for transnational regulation and management, reduces dependence on energy imports by leveraging indigenous resources, lowers emissions and drives the economic growth of coastal communities.[29] Although the availability of ocean energy resources is higher in the oceans, considerable resources are also available in the Mediterranean Sea, offering new prospects for sustainable energy production in coastal areas and for economic development in southern Europe. In the Mediterranean Sea the two most interesting ocean energy sources are represented by tidal currents and waves.[30] Such developments should be envisaged in the frame of the EU's Blue Economy for a Sustainable Future.[31]

Weather- and climate-driven energy sources are characterised by a significant spatial and temporal variability. One of the commonly mentioned solutions to overcome the mismatch between demand and supply provided by renewable generation is a hybridisation of two or more energy sources into a single power station (like wind-solar, solar-hydro or solar-wind-hydro). The operation of hybrid energy sources is based on the complementary nature of renewable sources.[32] Harnessing and optimising renewable power generation to deliver reliable and continuous supply for Mediterranean Basin states requires the integration of a geographically and operationally diverse range of supply sources – such

[29] European Technology and Innovation Platform for Ocean Energy, *Strategic Research Agenda for Ocean Energy*, Ocean Energy Europe, 2016, https://www.oceanenergy-europe.eu/wp-content/uploads/2017/03/TPOcean-Strategic_Research_Agenda_Nov2016.pdf.

[30] Takvor H. Soukissian et al., "Marine Renewable Energy in the Mediterranean Sea: Status and Perspectives", in *Energies*, Vol. 10, No. (2017), Article 1512, https://doi.org/10.3390/en10101512.

[31] See, European Commission, *A New Approach for a Sustainable Blue Economy in the EU. Transforming the EU's Blue Economy for a Sustainable Future* (COM/2021/240), 17 May 2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0240.

[32] Jakub Jurasz et al., "A Review on the Complementarity of Renewable Energy Sources: Concept, Metrics, Application and Future Research Directions", in *Solar Energy*, Vol. 195 (1 January 2020), p. 703-724, https://doi.org/10.1016/j.solener.2019.11.087.

as the vast solar potential of the arid deserts of North Africa, the hydro capability of hill and mountain regions surrounding the Mediterranean Sea, onshore and offshore wind farms in Northern Europe and the capture of ocean tidal and wave power, which is still to be developed.

4.2.3 Climate change and its impact on renewable energy resources in the Mediterranean

Climate change in the Mediterranean is expected to affect energy demand due to lower heating demand and increased cooling needs, as well as energy production.[33] Climate change has a strong impact on the evolution of extreme hydrometeorological events. The Euro-Mediterranean area is particularly prone to extreme events which can cause damage to the energy infrastructure. Heat waves, winter storms, floods and fires can affect the power grid in different ways.[34] They can be associated with power outages as they undermine the foundations of transmission towers, damage electrified equipment and cause lines to either break or touch each other. The resilience of energy systems to climate change may be at stake as future climate projections for the Euro-Mediterranean show a significant increase in frequency and intensity of heat waves, droughts[35] and heavy precipitation[36] which are natural hazards having large impacts on the energy system.

Warming in the region also has an impact on renewable energy production. Indeed, it is shown to result in losses in renewable energy

[33] Philippe Drobinski et al., "Energy Transition in the Mediterranean", cit.

[34] Georgios Marios Karagiannis et al., *Power Grid Recovery after Natural Hazard Impact*, Luxembourg, Publications Office of the European Union, 2017, https://op.europa.eu/s/vJld.

[35] Philippe Drobinski et al., "How Warmer and Drier Will the Mediterranean Region Be at the End of the Twenty-First Century?", in *Regional Environmental Change*, Vol. 20, No. 3 (September 2020), Article 78; Florian Raymond et al., "Evolution of Mediterranean Extreme Dry Spells During the Wet Season Under Climate Change", in *Regional Environmental Change*, Vol. 19, No. 8 (December 2019), p. 2339-2351.

[36] Philippe Drobinski et al., "Scaling Precipitation Extremes with Temperature in the Mediterranean: Past Climate Assessment and Projection in Anthropogenic Scenarios", in *Climate Dynamics*, Vol. 51, No. 3 (August 2018), p. 1237-1257, https://doi.org/10.1007/s00382-016-3083-x.

production, with marginal impact if global warming does not exceed 2 °C (losses <5 per cent), but deteriorates rapidly above 2 °C.[37] The usable capacity of traditional hydropower and thermoelectric power is expected to decrease due to declines in stream flow and the increase in water temperature, resulting in a decrease in hydropower by 2.5 to 7 per cent and in thermal energy from 10 to 15 per cent by 2050.[38] Adaptation measures to mitigate the vulnerability of the electricity sector to future water constraints under changing climate have been investigated in the form of six options: increase in efficiencies of hydropower plants and thermoelectric power plants, replacement of fuel sources of thermoelectric power plants, replacement of once-through cooling systems by recirculation cooling systems, switching to seawater cooling for thermoelectric power plants close to the coast and decoupling from freshwater resources by switching to seawater and dry air cooling for 10 per cent of the thermoelectric power plants that are most vulnerable to water constraints under climate change.[39]

Except for electricity supply systems relying on water resources, the impact of climate change on renewable energy production remains on the whole limited and can be attenuated by technological innovation and re-powering actions. In 2040, renewables are expected to overtake natural gas and coal and become the second most used energy source in the Mediterranean region.[40] Among the various renewable energy technologies, solar is expected to experience the fastest growth in the region.

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[37] Isabelle Tobin et al., "Vulnerabilities and Resilience of European Power Generation to 1.5 °C, 2 °C and 3 °C Warming", in *Environmental Research Letters*, Vol. 13, No. 4 (April 2018), Article 044024, https://doi.org/10.1088/1748-9326/aab211.

38 Christopher Cooper and Benjamin K. Sovacool, "Miracle or Mirage? The Promise and Peril of Desert Energy Part 1", in *Renewable Energy*, Vol. 50 (February 2013), p. 628-636; Data source: Eurostat.

[39] Ibid.

[40] Observatoire méditerranéen de l'energie (OME), *Mediterranean Energy Perspectives 2018*, Paris, OME, 2018.

4.2.4 Renewable energies for green hydrogen production

Most SEM countries have huge potential in terms of land and resources to produce green hydrogen from solar and wind for export. Indeed, hydrogen can build the bridge between Europe and SEM, with an energy system based on renewable electricity and green hydrogen.[41] For an energy system increasingly based on variable renewables as forecast in many published outlooks,[42] hydrogen could become indispensable for transport and storage. In a Europe-Mediterranean collaboration, green hydrogen could consist of hydrogen produced in Europe, complemented by hydrogen imports, especially from North Africa, and could be beneficial for both Europe and SEM states in terms of energy security, technology leadership, economic development and social stability. Existing infrastructure transporting gas from Algeria and Libya to Europe via Italy and Spain could be used to transport hydrogen from the southern and eastern Mediterranean countries to Europe.[43]

4.3 Mediterranean energy market integration

Regional energy market integration is the least costly and most overlooked solution for climate change mitigation, and it is in the Mediterranean that it holds the best promises. Europe has ambitious climate change objectives, which require rapid decarbonisation of the energy system. The SEM countries have the perfect characteristics to cooperate with Europe towards carbon neutrality: a vast untapped solar energy potential and adequate demographic, climatic and geographical conditions to develop that potential.

[41] Ad van Wijk and Frank Wouters, "Hydrogen–The Bridge Between Africa and Europe", in Margot P. C. Weijnen, Zofia Lukszo and Samira Farahani (eds), *Shaping an Inclusive Energy Transition*, Cham, Springer, 2021, p. 91-119, https://doi.org/10.1007/978-3-030-74586-8_5.

[42] Philippe Drobinski et al., "How Warmer and Drier Will the Mediterranean Region Be", cit.

[43] Sebastian Timmerberg and Martin Kaltschmitt, "Hydrogen from Renewables: Supply from North Africa to Central Europe as Blend in Existing Pipelines – Potentials and Costs", in *Applied Energy*, Vol. 237 (1 March 2019), p. 795-809.

4.3.1 Benefits and challenges

To integrate a high level of renewables, power systems need flexibility to cope with the stress resulting from sudden and unpredictable variations in the availability of renewable energy. Power system flexibility is defined as the ability to manage the variability of demand and supply cost-effectively across all relevant timescales, from ensuring instantaneous stability of the power system to supporting long-term security of supply.[44] Flexibility can be provided by dispatchable power plants, demand-side response, storage and network infrastructure (in particular infrastructure that supports regional market integration)[45] and requires a combination of regulatory, operational and investment measures.[46] Whereas storage addresses the time dimension of flexibility, regional market integration is directed at the spatial dimension. A large power system is easier to balance in real time with vast quantities of intermittent renewables, as wind is always blowing and the sun is shining somewhere.[47]

Regional electricity market integration offers other benefits to the power systems and the economies of participating countries, such as enhanced energy security and power system reliability, reduced need for back-up capacity thanks to reserve sharing, supply mix diversifi-

[44] International Renewable Energy Agency (IRENA), *Power System Flexibility for the Energy Transition. Part 1: Overview for Policy Makers,* Abu Dhabi, IRENA, November 2018, https://www.irena.org/publications/2018/Nov/Power-system-flexibility-for-the-energy-transition; Baraa Mohandes et al., "A Review of Power System Flexibility With High Penetration of Renewables", in *IEEE Transactions on Power Systems*, Vol. 34, No. 4 (July 2019), p. 3140-3155.

[45] Manuel Baritaud and Dennis Volk, *Seamless Power Markets. Regional Integration of Electricity Markets in IEA Member Countries*, Paris, International Energy Agency, 2014, https://www.iea.org/reports/seamless-power-markets.

[46] Lion Hirth and Inka Ziegenhagen, "Balancing Power and Variable Renewables: Three Links", in *Renewable and Sustainable Energy Reviews*, Vol. 50 (October 2015), p. 1035-1051.

[47] Silvia Pariente-David, "Successful Grid Integration of Renewable Energy: Integration is the Name of the Game", in *IAEE Energy Forum*, First Quarter 2014, p. 29-30, https://www.iaee.org/en/publications/newsletterdl.aspx?id=223; Karsten Neuhoff et al., "Renewable Electric Energy Integration: Quantifying the Value of Design of Markets for International Transmission Capacity", in *Energy Economics*, Vol. 40 (November 2013), p. 760-772.

cation, more efficient use of power plants, lower power system costs (both investment and operating) and therefore lower consumer prices.[48] Although several studies have estimated the costs and benefits of the integration of electricity markets in Europe,[49] there is less research on the preconditions and required policies for establishing a successful and integrated Mediterranean market for electricity and a truly seamless transmission system. Studies have estimated the benefits of integrating EU markets at 13–40 billion euro per year for the EU as a whole, depending on assumptions on fuel and carbon prices, renewable energy costs and penetration, among others. If the market integration were broadened to include the whole Mediterranean region, savings would be even larger—possibly reaching 30 billion euro per year according to studies conducted by Dii.[50] Moreover, research has shown that an integrated energy market and a cooperative approach would reduce the cost of meeting the ambitious EU CO2 reduction and renewables targets.[51]

The idea of exporting solar electricity from the Sahara is not new and dates back to the 1940s,[52] but the concept gained momentum when the first EU Renewable Directive was being prepared.[53] The period 2008–2012 saw a flurry of initiatives (Mediterranean Solar Plan – MSP, Desertec,[54] Dii and Medgrid, amongst others) to connect the southern

[48] World Bank, "Regional Power Sector Integration. Lessons from Global Case Studies and a Literature Review", in *ESMAP Briefing Notes*, No. 004/10 (June 2010), http://hdl.handle.net/10986/17507.

[49] David Newbery, Goran Strbac and Ivan Viehoffc, "The Benefits of Integrating European Electricity Markets", in *Energy Policy*, Vol. 94 (July 2016), p. 253-263.

[50] Florian Zickfeld et al., *Desert Power 2050. Perspectives on a Sustainable Power System for EUMENA*, Munich, Dii, June 2012, http://www.desertec-uk.org.uk/reports/DII/DPP_2050_Study.pdf.

[51] Gustav Resch et al., *Dialogue on a RES Policy Framework for 2030*, Final Report of the Towards 2030-Dialogue Project, 2017.

[52] Gonzalo Escribano et al., "Geopolitical Context for CSP in Europe", in *MUSTEC Project Deliverables*, No. 6.4 (March 2019), https://www.mustec.eu/node/91.

[53] For a comprehensive overview of the historical development of energy cooperation in the Mediterranean, see Simone Tagliapietra, *Energy Relations in the Euro-Mediterranean. A Political Economy Perspective*, Cham, Palgrave Macmillan, 2017.

[54] Trans Mediterranean Renewable Energy Cooperation (TREC) was formed in 2003

and northern shores of the Mediterranean, when it seemed that many EU countries would face difficulties in meeting their commitments under the Directive. Yet, most of these initiatives went into hibernation as EU countries did not express much interest in cooperation mechanisms with southern Mediterranean countries, either because they could meet their 2020 targets from their own resources (in part because of stagnant demand) or because they preferred to use other means such as statistical transfers or cooperation mechanisms with other EU countries. Scholarly research[55] also identifies the following reasons for the failures of Dii, MSP and other ambitious Mediterranean integration initiatives: underdeveloped legal and regulatory frameworks, weak grid infrastructures (in particular lack of interconnection between the two shores), lower than expected socio-economic benefits, high upfront costs and lack of financing mechanisms, high fossil fuel subsidies in SEM countries, energy policy giving priority to domestic production over electricity imports, and electricity surpluses in EU countries.

After a period of lull, there is a revival of interest in electricity exchanges across the Mediterranean, and the quest for carbon neutrality in the EU and elsewhere makes circumstances more auspicious to relaunch the Mediterranean Energy Union process. The cost of renewable energy sources has fallen considerably and there has been progress in fossil fuel subsidy reform in SEM countries. Moreover, cooperation, coordination (both of national policies and of power system operations) and regional market integration are central components of the Fit for 55 Package.

However, challenges remain serious in a region which is one the least integrated in the world and where integration is crucial to boost trade in goods and services in support of economic development. Some of the most serious barriers include the complexity of numerous and diverse trade agreements, inadequate transport

and then became Desertec.

[55] Natàlia Caldés et al., "Renewable Energy Cooperation in Europe: What Next? Drivers and Barriers to the Use of Cooperation Mechanisms", in *Energies*, Vol. 12, No. 1 (2019).

and logistics infrastructure and numerous tariff barriers, as well as lack of harmonisation in regulatory frameworks.[56] Lack of institutional capacity and political will, as well as political instability and conflicts between countries, are also obstacles to the creation of a context favourable to regional energy market integration, as exemplified by the recent decision of Algeria to halt natural gas exports through Morocco.

4.3.2 Implementation issues

Successful regional energy market integration requires substantial physical infrastructure (the "hardware" of regional integration) but this is not enough. "Software" is needed so that markets can interact and operate harmoniously.

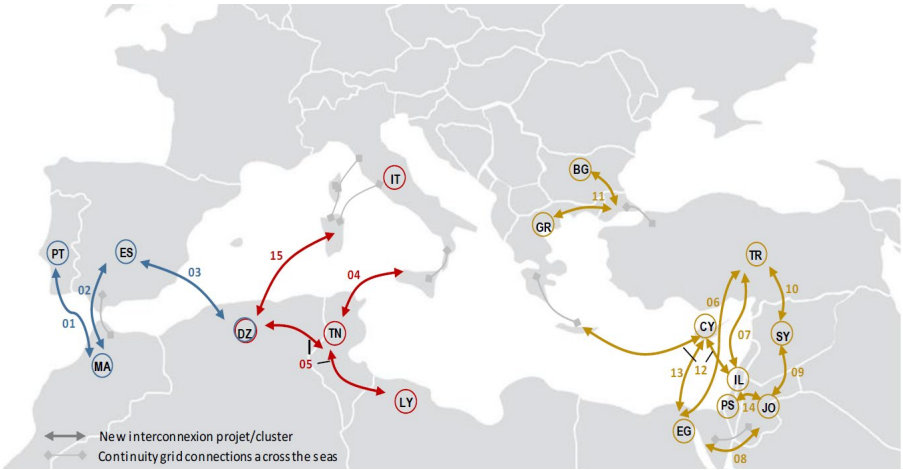
For the moment, the two shores are interconnected electrically by a submarine cable of 1400 MW under the Strait of Gibraltar connecting Spain and Morocco, and the resulting exchanges have at times been substantial, covering up to 25 per cent of Morocco's electricity needs. The networks are interconnected in the Eastern Mediterranean, with Turkey connected to Bulgaria through two 400 kV lines (for a total capacity of 2500 MW) and to Greece through a 400 kV line with a capacity of 500 MW. Since 2015, the Turkish electricity system has been synchronised with that of the European continent. Other interconnections between Europe and the southern shore of the Mediterranean are being planned or studied: ELMED Mediterranean power interconnector between Italy and Tunisia, the EuroAsia Interconnector between Israel, Cyprus and Greece and the EuroAfrica Interconnector between Egypt, Cyprus and Greece. All three projects have the status of Project of Common Interest under the Connecting Europe Facility. A more ambitious project to link Morocco to the UK has also been recently announced.[57]

[56] Organisation for Economic Co-operation and Development (OECD), *Regional Integration in the Union for the Mediterranean. Progress Report*, Paris, OECD, 2021, https://doi.org/10.1787/325884b3-en.

[57] "World's Longest Subsea Cable Will Connect Morocco to UK Grid", in *The North Africa Post*, 24 April 2021, https://northafricapost.com/?p=49278.

The master plan of Med-TSO, the Association of Mediterranean Transmission System Operators, has identified and analysed 15 projects to strengthen Mediterranean electricity interconnections, which have been grouped into three clusters: the West Mediterranean, Central Mediterranean and Eastern Mediterranean corridors (see Figure 3 and 4 below).

Figure 3 | New interconnectors planned in the Mediterranean



Source: Mediterranean Transmission System Operators (Med-TSO), Mediterranean Network Development Plan at 2020, 2020, p. 26, https://www.med-tso.com/publications4.aspx.

What kind of infrastructure will be needed to further integrate the European and SEM energy markets will depend on whether the interconnectivity develops through exchanges of electrons or molecules (hydrogen or other gases). A holistic approach to planning electricity transmission and gas transport infrastructure and to operating electricity and gas markets is needed. This is likely to be challenging, given the lack of an institutional structure to overview the process. The coordination between ENTSO-E and ENTSO-G, with the help of ACER, to prepare joint scenarios and long-term development plans is barely starting in the EU, so it will take time before this practice extends to the Mediterranean.

Figure 4 | Med-TSO project groups and expected merits

Projects groups	Projects composing the group	Additional BTC (MW)	Potential Expected benefit from the cluster
West Mediterranean corridor	Project 1: Morocco – Portugal	+1000	
	Project 2: Spain – Morocco	900	
	Project 3: Algeria – Spain	+1000	
Central Mediterranean corridor & North Africa Backbone	Project 4: Italy - Tunisia	+600	
	Project 15: Algeria – Italy	+1000	
	Project 5: Algeria – Tunisia - Libya	+750/+1250	
East Mediterranean interconnectors	Project 6: Egypt – Turkey	3000	
	Project 7: Israel – Turkey	2000	
	Project 12: Greece – Cyprus – Israel	1000/1000	
	Project 13: Cyprus - Egypt in addition to Project 12.	1000	
South East Mediterranean hub	Project 8: Egypt – Jordan	550	
Eastern Balkan corridor	Project 11: Bulgaria – Turkey – Greece	500/500	
Mediterranean Middle East reinforcement	Project 9: Jordan – Syria	800	
	Project 10: Syria – Turkey	600	
	Project 14: Jordan – Palestine	100	

Where the legend is:

Project Merits	Symbol
Reduce high price differentials between different market nodes and/or countries	
Positively contribute to the integration of renewables	
Contribute to solving adequacy and security of supply issues	
Fully or partially contribute to resolving the isolation of countries in terms of power system connectivity or to meeting specific interconnection targets	
Introduce additional System Restoration mechanisms	

Project Merits	Symbol
Improve system flexibility and stability	
Increase system voltage stability	
Enable cross-border flows to overcome internal grid congestions	
Mitigate loop flows in bordering systems	
Contribute to the flexibility of the power systems through the control of power flows	

Source: Med-TSO, Mediterranean Network Development Plan at 2020, cit., p. 47-48.

The existence of interconnectors or pipelines connecting the two shores of the Mediterranean is necessary but not sufficient to support the development of an integrated Euro-Med energy market. To operate a flawlessly integrated market where energy can flow freely with no hindrance requires more than physical infrastructure, it requires the "software" of regional integration. This includes compatible market designs, interoperability of power systems, coordination of wholesale markets, joint balancing markets, flexibility assessments, adequate management of interconnection capacity, regulatory convergence, harmonisation of pricing principles and tariff setting, among others.

As experience in Europe shows, it can take several decades to assemble all the right conditions for an integrated electricity market, and the single EU market is still in the making in 2021. The process takes place in stages with sub-groups of countries integrating into sub-regional power pools. For instance, in South East Europe, Western Balkan countries – seven of which are Mediterranean countries – are at an advanced stage of integration with the EU single energy market. Experience around the world indicates that partial integration that enables countries to begin reaping some of the benefits of a regional electricity market can happen relatively rapidly.[58]

4.4 Pathways for multilateral cooperation

The Mediterranean region is endowed with a vast potential for carbonless forms of energy. Developing that potential is crucial for reaching the objectives of the Paris Agreement. Moreover, it could be a source of economic growth and social welfare, possibly bringing political stability to the region. The cost-effective and efficient development of Mediterranean renewable energy resources requires energy market integration, coordination between the various stakeholders and cross-country cooperation. However, this is a major challenge in a region plagued by conflicts and political instability and characterised by diversity of economic

[58] Musiliu O. Oseni and Michael G. Pollitt, "The Promotion of Regional Integration of Electricity Markets: Lessons for Developing Countries", in *Energy Policy*, Vol. 88 (January 2016), p. 628-638.

development, economic and social structures. Flexible forms of cooperation and differentiated integration are necessary to make a Mediterranean Union possible. All stakeholders have to collaborate, including governments, the private sector and financial institutions.

Experience around the world[59] indicates that, although full regional integration of neighbouring electricity markets and the creation of regional power pools can take decades to be realised, regional electricity market integration can start with simple forms of cooperation for reserve sharing and mutual help in case of emergency. This can then evolve to more elaborate integration, with multi-country power systems, technical and regulatory harmonisation, formal common power exchanges, converging market design and competitive trade across borders. Regional power pools often start (and should start) with a small number of countries, and expand over time as success attracts more participants. The creation of cross-border capacity often induces further market integration. The most difficult obstacle is often political. However, power pools can be developed even between countries with a history of conflict, as was the case with the Southern African Power Pool and the South East Europe market.

A realistic interim target in the Mediterranean might be the creation of an integrated Maghreb electricity market (or at least integrating the power systems of Morocco, Algeria and Tunisia as a starting point), given that the Maghreb Electricity Committee (COMELEC) already fulfils some of the functions of a power-pool-type coordinating entity. The process could be similar to the one under way in South East Europe, where Western Balkan countries – seven of which are Mediterranean countries – are at an advanced stage of integration with the EU single energy market. Under the Sofia Declaration of November 2020, they adopted the Green Agenda for the Western Balkans and committed to work in line with the Green Deal towards climate neutrality in 2050.

The rate of progress is likely to depend on many factors, a key one being the institutional capacity for integration and the existence of a supranational institution to coordinate, monitor and guide the overall

[59] Ibid.

effort. As part of the latest train of reforms, the EU has proposed the creation of Regional Coordination Centres that have the responsibility, among others, of sizing and procurement of balancing reserves, of assessing the maximum contribution of external resources in capacity markets and of tasks related to the risk-preparedness of the power sector. Similar institutions could be created in the Mediterranean.

As we have seen above, the EU has a vital interest in the development of Mediterranean renewable energy governance. The need for cooperation is two-way: Europe needs to tap into the vast carbonless resources of the South to reach its climate neutrality objective, while the South needs Europe for technology transfer, financial assistance and technical cooperation. While the rationale for cooperation is strong, the risk is that any EU-led initiative may be experienced by SEM countries as an external imposition and that there will be a lack of ownership in the SEM. Even if the European Green Deal represents a reference model, a Euro-Mediterranean Green Deal could be the key for integration of the Mediterranean energy market, which is essential for an effective energy transition in the region. The challenge is that there is no similar regional counterpart institution to dialog with the EU institutions.

Despite several attempts to revive the Mediterranean Energy Union process, an intergovernmental organisation for the Mediterranean region remains elusive. Regional cooperation in the Mediterranean takes place under the Union for the Mediterranean (UfM), a multilateral partnership created in Paris in 2008 by 43 Euro-Mediterranean heads of state and government. However, this is far from a Mediterranean Energy Community;[60] as the name indicates it is a Union *for* the Mediterranean, not a Union *of* the Mediterranean. The institution remains weak, there is no ownership by SEM countries and the EU hand is visible everywhere given that the financing for the organisation is provided by the EU. Nevertheless, the Lisbon UfM Ministerial Declaration on Energy of June 2021 lays the basis for Mediterranean energy market integration. Moreover, institutions have been established to enable coordination and cooper-

[60] The institution, as proposed by Greece and Italy in 2007, was to have been tailored on the model of the Energy Community for South-East Europe.

ation of Mediterranean stakeholders, including the Association of Mediterranean Transmission System Operators (Med-TSO) and the Association of Mediterranean Regulators (MEDREG), that are the equivalent of ENTSO-E and ACER in Europe. Three platforms (one for gas, one for electricity and one for renewable energies and energy efficiency) were created under the stewardship of the UfM secretariat. Their purpose is to offer all stakeholders a permanent forum to discuss the objectives and implementation of energy policies, and to enable them to identify concrete actions and cooperation projects that promote regional integration.

The forms of multilateral cooperation that are most likely to succeed in the region are flexible and pragmatic ones, initially focusing on specific issues before later broadening the scope (somewhat like the European Coal and Steel Community which was at the origin of the European Union). The recent craze for hydrogen might provide that opportunity. Hydrogen is a game changer in the energy transition, and the Mediterranean is ideally positioned to take a major role in the development of this market. Industry could take the lead in creating the market, which might be the best way to overcome the political difficulties and conflicts between different countries that would be involved in such an initiative. The creation of a Mediterranean Hydrogen Alliance (something similar to the European Airbus imitative), for instance, could help in this regard. This is an opportunity that needs to be seized now as conditions seem to exist in the second decade of the 21st century for the kickstart of a Mediterranean hydrogen market, with extensive trade across the Mediterranean. More generally, SEM countries need to take ownership of the process and design their own Green Deal.[61] Clearly, this will take time given the lack of appropriate institutions to manage the process, possibly missing the opportunity, as the time to act is now to have any chance to reach carbon neutrality by 2050. In this regard, renewable energy and green hydrogen could provide the long-awaited opportunity and form

[61] Blanca Moreno-Dodson, Silvia Pariente-David and Constantin Tsakas, *A Mediterranean Green Deal for an Effective Energy Transition as Part of the Sustainable Post-COVID Recovery*, Marseille, Center for Mediterranean Integration (CMI), November 2021, https://www.cmimarseille.org/node/4998.

the basis for the Mediterranean Union, as did coal and steel at the onset of the European Community.

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