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**Water and
Environment Support**
in the ENI Southern Neighbourhood region



**PRIVATE SECTOR ENGAGEMENT TO
CATALYSE FINANCING FOR CLIMATE
ADAPTATION IN THE MEDITERRANEAN**
with emphasis in the coastal area of developing countries

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WATER AND ENVIRONMENT SUPPORT IN THE ENI SOUTHERN NEIGHBOURHOOD REGION

The "Water and Environment Support (WES) in the ENI Neighbourhood South Region" project is a regional technical support project funded by the European Neighbourhood Instrument (ENI South). WES aims to protect the natural resources in the Mediterranean context and to improve the management of scarce water resources in the region. WES mainly aims to solve the problems linked to pollution prevention and the rational use of water. WES builds on previous similar regional projects funded by the European Union (Horizon 2020 CB/MEP, SWIM SM, SWIM-H2020 SM) and strives to create a supportive environment and increase capacity for all stakeholders in the partner countries (PCs). The WES Project Countries are Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Libya, Palestine, Syria, and Tunisia. However, to ensure the coherence and effectiveness of EU funding or to promote regional cooperation, the eligibility of specific actions can be extended to neighbouring countries in the Southern Neighbourhood region.

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ABBREVIATIONS

ADF	Agricultural Development Fund
AF	Adaptation Fund
AFD	Agence France de Development
AfDB	African Development Bank
AI	Artificial Intelligence
AR5	IPCC Fifth Assessment Report
BCR	benefit-cost ratios
BMGF	Bill and Melinda Gates Foundation
CB/MEP	Capacity Building / Mediterranean Environment Programme
CBA	Cost-benefit analysis
CBO	Community Based Organisations (s)
CC	Climate Change
CCA	Climate Change Adaptation
CFM	Climate Fund Managers
CIF	Climate Investment Funds
CLIA	Cruise Lines International Association
CRA	Climate risk assessment
CRI	Climate Risk Insurance
CSP	Concentrated Solar Power
CSR	Corporate Social Responsibility
D4NC	Debt for nature and climate (swap)
DFC	Development Finance Corporation
DRR	Disaster Risk Reduction
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EEA	European Environment Agency
EIAs	Environmental Impact Assessments
EIB	European Investment Bank
ENI	European Neighbourhood Instrument
ESG	Environment, Social and Governance
EU	European Union
EUR	Euro
FDI	Foreign Direct Investments
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gas
GSS	Green Social Sustainable
GW	Gega Watt
GWP-Med	Global Water Partnership – Mediterranean
HORECA	Hotel, Restaurant, and Catering
ICT	information and communication technology Artificial
ICZM	Integrated Coastal Zone Management
IFC	International Finance Corporation

IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LLC	Limited Liability Company
NAMA	Nationally Appropriate Mitigation Action
MAD	Moroccan Dirham
MAMDA	Mutuelle agricole marocaine d'assurance
MENA	Middle East and North Africa
MIGA	Multilateral Investment Guarantee Agency
MPA	Marine Protected Areas
MW	Mega Watt
MWp	Mega Watt peak
Nbs	Nature-based solutions
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisations
NPV	Net Present Value
OECD	Organisation for Economic Cooperation and Development
PC	Partner Country
PPP	Public-Private Partnerships
PRI	Political Risk Insurance
PV	Photo Voltaic
SME	Small and Medium Enterprises
SPV	Special Purpose Vehicle
SWIM	Sustainable Water Integrated Management
SWIM-Horizon2020 SM	Sustainable Water Integrated Management – Support Mechanism Project
TA	technical assistance
TAC	Total Allowable Catch
T-Bonds	Treasury Bonds
UAV	unmanned aerial vehicle
UfM	Union for the Mediterranean
UNEP-MAP	United Nations Environment Program - Mediterranean Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VC	venture capital
VOLY	Value Of a Life-Year
VSL	value of statistical life
WB	World Bank
WEFE Nexus	Water Food Energy Ecosystems Nexus
WES	Water & Environment Support

SUMMARY

The purpose of this Assessment is to provide an overview on private sector engagement for climate change adaptation in the Mediterranean, with an emphasis on the coastal area and developing countries of the region, assisting in shaping recommendations for enhancing related private action and investments. The Assessment was elaborated by the EU Project ‘Water & Environment Support (WES) in the ENI Southern Neighbourhood region’¹ in synergy with the UNEP/MAP SCCF Project ‘Enhancing regional climate change adaptation in the Mediterranean Marine and Coastal Areas’ that is part of the GEF MedProgramme².

The Mediterranean region faces significant climate change impacts, with temperatures rising by 0.9–5.6°C and average precipitation decreasing by up to 22%. This will lead to more extreme weather events, exacerbating droughts and floods, rising sea level, increasing land loss and agricultural damage. Risks are higher in the low-lying coastal areas, hosting a significant part of the Mediterranean countries’ population, economic activities as well as ecosystems and the services they provide. Key economic sectors affected include tourism, agriculture, water, fisheries, transport, manufacturing, forestry, and energy, with varying impacts such as shrinking water supplies, reduced crop yields, declining fish catches, and increased forest fires.

The private sector can engage in climate adaptation through four main strategies: companies of all sizes can climate-proof their operations; larger companies can invest upstream throughout their supply chain; responsible businesses can support climate adaptation actions for community resilience and ecosystems conservation; and private capital can finance investments that contribute to climate resilience transitions.

Though there is a long way to go, there has never been more momentum for companies to become more sustainable. However, there are still several barriers restricting the scaling up of private sector engagement in climate action. For example, companies need more accurate climate data and climate risk information, improved financial incentives, better enabling environments, and more insights on emerging business opportunities aligned with national priorities. By overcoming these barriers private funding for climate action could be dramatically increased.

While businesses, including those operating in or having an interest in the coastal areas of the Mediterranean, are beginning to engage in climate adaptation, their actions and contributions are often not explicitly labelled as such; instead, they may focus on resilience and broader sustainability efforts. Many businesses underestimate climate risks, highlighting the need for Climate Risk Assessments and Cost-Benefit Analyses to inform their adaptation strategies. A major challenge is the perception of adaptation investments as risky and the fragmentation of stakeholders, complicating coordinated actions within their areas of operations. Also, access to financing remains a significant hurdle, particularly for Small and Medium Enterprises (SMEs).

New forms of collaboration are essential to mobilize private actors and financing for climate adaptation, necessitating cooperation among the public and private sectors, local communities, civil

¹ EU WES Project: <https://www.wes-med.eu/>

² GEF UNEP/MAP MedProgramme & SCCF Project: <https://www.unep.org/uneppmap/what-we-do/projects/MedProgramme>

society, and international organizations. This collective action, if well-coordinated and honest, can address disparities and inefficiencies, creating opportunities for sustainable initiatives. . For example, community-based Marine Protected Areas (MPAs) are grassroots initiatives with the involvement of local communities, fishing cooperatives, NGOs, and government entities. These MPA initiatives help preserve marine ecosystems and replenish fish stocks, which are vital for maintaining an ecological balance and enhancing local livelihoods. By engaging local fishermen and private tourism operators, these initiatives create new sustainable tourism and fishing opportunities.

Different actors have different roles to play. Businesses must pivot climate risks into profit-generating opportunities and embrace entrepreneurship that adapts to changing conditions throughout their value chains. SMEs, constituting the larger part of businesses in the Mediterranean, play a crucial role in adaptation financing. Their abilities to use their retained earnings and access commercial credit lines are essential for mobilizing funds for financing climate adaptation investments. Financial institutions need to focus on offering tailored products, such as climate adaptation bonds and green loans, while leveraging public funds to attract private capital through blended finance. To support SMEs, national banks can establish "Green Financing Programs" and offer sustainability credits for climate-resilient projects. Philanthropy can play a complementary role by financing initiatives that initially lack private or public investment, and fund capacity-building programs for local entrepreneurs and other competent stakeholders.

Governments must create enabling environments with supportive policies, regulations and financial incentives, while civil society should raise awareness and mobilize support for private investments in climate resilience. Academia can promote thought leadership, science to policy, applied innovation while, fundamentally, preparing a new generation of managers that can respond to challenges through solutions. International organizations can foster regional policy making, capacity-building, piloting through demos, networking and knowledge sharing to enhance adaptive capacity and encouraging private sector involvement in climate adaptation efforts.

Public-Private Partnerships (PPPs) are vital for attracting private sector engagement in climate adaptation infrastructure in the Mediterranean coastal areas. These partnerships facilitate the construction and operation of climate adaptation assets while sharing risks, costs, and expertise between public and private sectors. Numerous relevant PPP projects are currently underway in the Mediterranean, enhancing the feasibility of climate adaptation efforts by leveraging technological know-how and lessons learned on political factors, risk allocation, and stakeholder engagement.

Green and blue economy entrepreneurship also plays a crucial role in climate adaptation, focusing on environmentally sustainable practices in agriculture, fisheries, water management, and tourism, thereby fostering a climate-resilient coastal economy. Although projects addressing the Water-Energy- Food-Ecosystems (WEFE) Nexus are often seen as too risky for private entities given their complexity, SMEs as well as other type of businesses can contribute significantly through innovative efforts in energy and water efficiency, sustainable food production, land and ecosystem's restoration, and achieve climate adaptation and mitigation co-benefits. Engagement of private sector partners in

existing Communities of Practice, like the PRIMA WEFE4Med³, will enrich interaction, experience sharing and will foster joint initiatives.

Technological advancements such as Internet of Things (IoT), Big Data, and Artificial Intelligence (AI) are transforming climate adaptation strategies, enabling more informed decisions in agriculture, fisheries, energy, and water management using and/or promoting climate-resilient infrastructure and early warning systems. A digital transformation process is on-going in the region, with a different pace of its development in different parts of the region, including with an emerging WEFE Nexus content. While the use of Nature-based Solutions (NbS) for climate adaptation is still nascent in the Mediterranean, activities such as coastal wetland restoration and wastewater treatment through constructed wetlands, already present profitable opportunities for businesses.

Furthermore, initiatives driven by Environmental, Social, and Governance (ESG) and Corporate Social Responsibility (CSR) play a pivotal role for integrating climate adaptation into business strategies. By emphasizing sustainable supply chains, socio-economic benefits to local communities, water replenishment, energy efficiency and stakeholder collaboration, such initiatives create grassroots solutions that enhance climate resilience and adaptation efforts at the local level across the region.

Private finance for climate adaptation in the Mediterranean, other from risk-reduction investments to business operations, remains limited. Most actions are funded through public means, which fall short of the financing needs defined for implementing the Nationally Determined Contributions (NDCs). Philanthropy and ESG/CSR currently represent a significant portion of private financing of climate adaptation for public benefits in the developing countries of the Mediterranean region. However, there are ample opportunities to further mobilize investments in climate adaptation, including with mitigation co-benefits, in coastal tourism, agriculture, fisheries and water management through private equity, venture capital, bonds, and insurance products. Catalytic public finance and support can stimulate private investments by supporting innovation, entrepreneurship, and capacity building within these sectors.

Blended finance instruments can de-risk adaptation projects with low financial viability by combining public funds with private capital, making projects more appealing to investors. PPPs can be instrumental in co-investing in climate-resilient infrastructure while sharing associated risks. Green bonds and sustainability bonds have potential in attracting institutional investors for climate adaptation projects, though current issuance remains modest.

Innovative approaches like "water trading", "payment for ecosystem services" and "catch shares" could mobilize private finance for adaptation strategies. Venture capital is key for scaling innovative climate solutions, while international funding mechanisms, such as the Green Climate Fund (GCF) and Global Environment Facility (GEF), provide critical support to catalyse private finance. Risk transfer mechanisms like catastrophe bonds, risk-pooling and climate risk insurance are essential in mitigating financial losses due to climate events but currently have a low market presence in the region. Overall, a multifaceted approach involving various financing mechanisms, stakeholder engagement, and supportive policies is needed to mobilize private funding for climate adaptation in the Mediterranean.

³ PRIMA WEFE4Med Community of Practice: <https://wefe4med.eu/wefe/home>

To enhance climate adaptation and mobilize private sector engagement in the coastal areas of the developing Mediterranean countries, several key recommendations are put forward for consideration. These concern actions that can be implemented at local or national level, while building new actions or supporting existing related regional coordination initiatives, will be of added value:

A. ADVANCING CLIMATE ADAPTATION ACTION

1. **Wastewater Treatment Capacity:** Implement programs at local level for wastewater treatment and reuse, where possible in a WEFEE Nexus approach, utilizing blended finance and public-private partnerships to build infrastructure and enhance local water re-use for farmers, businesses and communities while increasing energy efficiency, and utilising treatment's bi-products, etc.
2. **Desalination Solutions:** Accelerate at local level the upgrade of existing and, where decided, the building of new desalination plants powered by renewable energy and handling produced brine in a sustainable manner, including through innovative approaches like dilution before diffusion, use of brine to sequestrate CO₂, and utilising biproducts.
3. **Water Loss Reduction:** Implement programs at local level with performance-based contracts in small to medium sized municipalities to reduce water loss and engage private investment through blended finance, including possibly through a regional initiative.
4. **Sustainable fish farming and natural fisheries:** Support climate-smart aquaculture businesses to promote sustainable fish farming and protect natural fisheries, including the use of Marine Protected Areas (MPAs) and catch shares.
5. **Climate-resilient tourism:** Continue promoting green hotels, restaurants, and catering (HORECA) through water and energy efficiency, protection of adjacent ecosystems, sustainable supply chains, etc., focusing on related SMEs that are mostly family owned, thus enlarging the green critical mass of this top 'industry' in the region.
6. **Climate-resilient ports:** Promote seaports' water and energy efficiency including for minimizing environmental impact during the whole cycle (construction-maintenance-operation), safeguard resilience of infrastructure to climate risks and hazards, reduce and properly manage waste, contribute to sustainable interrelated hinterlands infrastructure like towards low-emission transport connections in coordination with competent authorities, etc.
7. **Climate-resilient manufacturing:** Accelerate industries' natural resources efficiency, with due consideration of supply chain partners, safeguard production plants from climate risks and hazards, and contribute to ecosystems and habitats protection in the plants vicinity.
8. **Digital Climate Information Services:** Promote digital climate information tools that assist businesses to predict and respond to impacts of climate change and make informed decisions to create infrastructure and agriculture resilience, food security, energy efficiency, etc.

B. DEVELOPING AN ENABLING ENVIRONMENT AND CAPACITY BUILDING

9. **Update climate policies:** Incorporate into existing national climate policies and strategies as well as in Integrated Coastal Zone Management (ICZM) strategies and plans clear definitions

of why, what, how and when enhanced private sector participation in climate adaptation is sought.

10. **Create regulatory frameworks:** Promote those national and local regulations that accelerate uptake of climate-smart practices and technologies, such as efficiency standards, building codes, and mandating businesses climate risks reporting.
11. **Establish standard business models** for private sector contract and dispute settlement terms that meet international investor expectations, transparent and well-paced procurement processes, clear technical requirements, financing models that allow securitization of payment streams, risk allocation to the parties best able to hold them, and price levels that compensate for these risks.
12. **Develop institutional frameworks:** Stimulate dialogue and cooperation on climate adaptation among governments, businesses, civil society, communities and academia, and establish inter-ministerial coordination and sector specific support mechanisms, including PPPs units, to incorporate climate adaptation actions and investments as well as to build a related monitoring and reporting system to document and evaluate their impacts.
13. **Accelerate Agricultural Innovation:** Focus on national programs for climate-adaptive practices, partnering with farmer associations and employing technology transfer. Funding can come from national resources, development assistance, philanthropic efforts, and corporate social responsibility budgets.
14. **Tourism and HORECA upgrades:** Develop a climate change adaptation training programme for tourism and HORECA providers to improve climate resilience by reducing energy and water use and enhancing properties and services.
15. **Develop Capacity Building Initiatives:** Create these initiatives to help private sector actors understand and contribute to designing and implementing effective adaptation strategies focused on specific sectors. This could build on creating inter-sectoral groupings and prioritised content such as information on accessing climate adaptation finance from national or international sources. Furthermore, capacitate and directly support the public sector to address and synergize with the private sector and manage related investments, including in PPP formations, and improve access to domestic funding sources as well as to international financing that requires direct public engagement, like GCF.
16. **Monitoring and Evaluation:** Develop and actively use a framework for monitoring, reporting and evaluating the implementation of actions and investments, including as provided in these recommendations, to track progress and impact, identify gaps and challenges, and further mobilize private sector actors and finance.

C. ATTRACTING PRIVATE FINANCING

17. **Green Financing Programs:** Collaborate with national banks to develop programs offering sustainability credit to SMEs, funded through green bonds targeting climate-adaptive efforts.
18. **Market-Based Financing:** Establish mechanisms such as water trading and payment for ecosystem services, involving local stakeholders in the development of these mechanisms.

19. **Debt for Nature & Climate Swaps:** Investigate opportunities for climate adaptation through sovereign national debt restructuring using Debt for Nature & Climate Swap mechanisms to fund restoration of critical ecosystems.
20. **Corporate Engagement:** Collaborate with companies on national and local climate adaptation projects, integrating adaptation strategies into their ESG and CSR initiatives for community development and building climate resilience.
21. **AI Grand Challenge:** Launch a regional initiative to harness AI for climate adaptation innovations, supporting projects with seed funding and follow-up grants.
22. **Venture Capital Mobilization:** Set up a regional "lion's den" for entrepreneurs to pitch climate adaptation solutions to investors, fostering innovative projects.
23. **Finance Lab:** Create a regional platform to develop and implement innovative financial solutions for climate adaptation across sectors like tourism, agriculture, water, etc..
24. **Climate Risk Transfer Initiative:** Develop a dedicated programme focused on catastrophe bonds, risk-pooling, and climate risk insurance products to help mitigate climate-related losses, encouraging collaboration between the public and private sectors.

These recommendations aim to create a supportive ecosystem that engages the private sector and mobilizes private financial resources for climate adaptation, including across the coastal areas of the Mediterranean, particularly in the developing states of the region.

1 INTRODUCTION

The EU-funded Water and the Environment (WES) project in the ENI Southern Neighbourhood region addresses climate change adaptation as a core theme, responding to the interconnected challenges these countries face while aligning with EU strategies. A holistic approach is essential for climate adaptation in Mediterranean, including in the fragile coastal areas, integrating environmental, social, and governance considerations. Involving various stakeholders, including governments, the private sector, and civil society, is critical for effective planning and implementation.

The UNEP/MAP SCCF Project ‘Enhancing regional climate change adaptation in the Mediterranean Marine and Coastal Areas’, that is part of the GEF MedProgramme, aims to enhance countries capacities to adapt to climate change, influencing wider development processes in the region. SCCF Project’s Component 3, managed by the Global Water Partnership-Mediterranean (GWP-Med), aims at facilitating access to international climate change adaptation financing.

The purpose of this Assessment is to provide an overview on private sector engagement for climate change adaptation in the Mediterranean, with an emphasis on the coastal area and developing countries of the region and assisting in shaping recommendations for enhancing related private action and investments. The report focuses on factors influencing private sector engagement, identifying enhancement opportunities tailored to the developing countries in the Mediterranean, and examining the roles of stakeholders and financing mechanisms. It also elaborates on the value of climate risk assessments and cost-benefit analyses to minimize financial losses. Furthermore, successful case studies of private sector initiatives are documented.

The Assessment was elaborated by the EU WES Project in synergy with the UNEP/MAP SCCF Project. The report is intended to function as background material for a dedicated Mediterranean Roundtable, and its follow ups, to discuss challenges, opportunities and financing mechanisms, leading to recommendations and possibly creating a community of practice mechanism focused on mobilizing private engagement in climate adaptation in the Mediterranean, including with an emphasis on the coastal areas of the region. The Mediterranean region faces significant climate change impacts, rendering it a global hot-spot. These are expected to lead to more extreme weather events, exacerbating droughts and floods, rising sea level, increasing land loss, and agricultural damage. Risks are higher in the coastal areas, including on health and well-being of people given that a significant part of the Mediterranean countries’ population, economic activities as well as ecosystems are hosted in or near coastal areas.

Financing for climate adaptation primarily comes from a mix of public and private resources, but there is no single definition of "climate finance." The private sector is vital due to its economic contributions and vulnerability to climate risks; however, mobilizing private investment has been challenging, despite efforts for many years particularly in developing countries. According to Methodological Guidelines on Preparing a Financial Plan for Climate Change Adaptation in Mediterranean Coastal

Areas⁴, prepared within the SCCF Project by GWP-Med, limited private funding has been directed toward coastal adaptation projects, primarily in middle-income countries.

Private sector investment in climate adaptation can help mitigate risks such as business interruptions, supply chain disruptions, and rising costs due to climate change impacts. Promising opportunities exist in investing in resilient infrastructure, sustainable tourism, and sustainable water management initiatives. However, challenges, including lack of supportive regulatory and institutional frameworks, information asymmetries, and inadequate access to financing, hinder engagement.

To overcome these barriers, concerted efforts are needed from governments and financial institutions to create favourable policies, improve financing access, and foster stakeholder collaboration. Initiatives like Public-Private Partnerships (PPPs), green finance mobilization, and Environmental, Social, and Governance (ESG) practices can catalyse private investments in climate adaptation. Ultimately, enhancing private sector involvement is crucial for building resilience in Mediterranean, including in the coastal areas, necessitating clarity on roles, responsibilities, and financing mechanisms.

One of the major challenges in mobilizing private sector investment for adaptation and climate related investment, in general, is the incompatibility of the timescales involved. Companies' policies and strategies have, in the vast majority, short- and medium-term horizons. They are guided by the need to secure returns for their shareholders in the foreseeable future. In contrast, the benefits from most of the measures promoted through the international efforts, agreements, and convention will only become visible in the next decades or generation(s). This apparent incompatibility is at the heart of reactions, inertia or hesitations, not only within the business sector but also in political parties. They tend to prioritize investment on immediate national or local issues deviating from the globally agreed policies that are needed to tackle climate change.

For some, investing in adaptation to climate change should not be viewed as an entirely "productive" economic activity. This is because the investment will not generate a short to medium term profit that can be readily "shared". Such investment, however, can be seen as a long term investment for the resilience of the business itself and the resources on which it depends. Also, one can argue that such investment needs to be based on a "value" system that is based on ethics, equity, equality, justice and rights as climate change will affect everybody in the different way similar to a global pandemic affects people's health and lives world-wide. In this sense, one can argue, a "re-interpretation" may be needed of what CSR and ESG costs are, since these may in fact be considered as longer-term voluntary investments and not philanthropy.

⁴GWP-Med, 2024. Methodological Guidelines on Preparing a Financial Plan for Climate Change Adaptation in Mediterranean Coastal Areas, with a focus on Albania, Algeria, Libya, Montenegro, Morocco, Tunisia. UNEP/MAP SCCF Project, part of the GEF MedProgramme

2 CLIMATE CHANGE AND ECONOMIC IMPACTS IN THE COASTAL AREAS OF THE MEDITERRANEAN

This chapter briefly reviews the main climate change impacts in the coastal areas of the Mediterranean. It also provides a short overview of the documented and projected impacts on the main economic activities in the Mediterranean and the key private actors in these economic sectors.

2.1 KEY CLIMATE CHANGE IMPACTS IN THE COASTAL AREAS OF THE MEDITERRANEAN

Over the last decades, climate change has clearly started to manifest itself throughout the Mediterranean region. According to the IPCC⁵, the surface temperature in the Mediterranean region has crossed 1.5°C above the pre-industrial level with an increase in heat-wave events. While the precipitation trends are variable across the region, there is a tendency that droughts have become more frequent, especially in the northern part of the Mediterranean. Surface sea waters have warmed by 0.6°C – 1.3°C since the 1980s with stronger trends in the eastern Mediterranean. Sea level has risen by 2.8 mm per year over the period 1993–2018 while ocean acidity has increased.

Extreme events of sea warming, which were virtually unknown in the past, tend to become relatively frequent phenomena. In the Western Mediterranean in the summer 2006, within 14 days, the temperature of the sea surface increased by 8°C (from 22 to 30°C), causing high mortality to marine species. A similar event was noticed in July 2023. Also, in the Eastern Mediterranean a similar event occurred in June 2021⁶.

The IPCC projects that during the 21st century, climate change is to intensify throughout the region⁷. Average air temperature is expected to rise by 0.9–5.6°C towards the end of the century. Precipitation is likely to decrease by up to 22% in most regions causing likely increase in droughts across the region⁸. Yet at the same time, more extreme rainfall events are likely, especially in the northern part of the Mediterranean. These high rainfall events may lead to severe and sudden flooding, affecting property, infrastructure, and agriculture. The disastrous September 2023 floods, caused by the Mediterranean hurricane (medicane) Daniel, are a case in point: in Libya, causing more than 11,500 casualties and devastating destruction of major infrastructure in Al Bayda, Al Marj and in the coastal city of Derna after two dams collapsed as well as in Greece, causing 17 casualties and damages of more than 2 billion euros in Thessaly, after the country's major agriculture area was severely flooded.

Furthermore, the Mediterranean Sea is projected to rise by 0.33 m by 2050 and possibly up to 1.1 m by 2100. This will lead to an increase in flooding of low-lying areas along 37% of the Mediterranean

⁵ Ali, E., W. Cramer, J. Carnicer, E. Georgopoulou, N.J.M. Hilmi, G. Le Cozannet, and P. Lionello, 2022: Cross-Chapter Paper 4: Mediterranean Region. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Lösckke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2233–2272, doi:10.1017/9781009325844.021.

⁶ Denaxa and HCMR Poseidon Team, 2021

⁷ *ibid.*

⁸ *ibid.*

coastline, especially forecasted in Egypt, Libya, Morocco, and Tunisia. In the Nile Delta, between 1,500 and 2,600 km² of land are projected to be exposed to flooding by 2100.

The impacts of climate change will vary across the region. Flooding of low-lying areas will lead to loss of land and property, saltwater intrusion, and damage to agriculture production. Reduced rainfall will lead to a reduced availability of water, with a potential reduction in annual runoff by 5-70%, impacting water supplies, downstream ecosystems, and hydropower generation. Increasing droughts and variability in rainfall is projected to reduce the production of rainfed crops, in some areas up to 60%⁹. Longer, hotter summers will result in increased use of air conditioning, which will put added stress on, often outdated, power supply and transmission systems¹⁰. Global temperatures in both July and August 2023 and 2024 were well above anything recorded before¹¹.

At present, the details of the cascading impacts of sea temperature rise and acidification on marine ecosystems and fish populations are uncertain, although recent reports from the European Institute of the Mediterranean (IEMed) state that climate change impacts affect the spatial distribution of marine species, alter marine biodiversity, and contribute to reduced productivity in marine fisheries¹². The intrusion of fish species from the Indian Ocean and the Red Sea into the Mediterranean, where they find suitable conditions and no enemies, has led to large scale pressures on indigenous fish stocks. For example, the non-edible/toxic fish *Lagocephalus sceleratus*, in Southern Crete, has fully dominated in the marine fauna and virtually destroyed local fisheries¹³.

Climate change will also lead to an increase in forest fires (96 – 187%), as was illustrated by the severe damage during 2023 (Figure 2-1). In the south and southeast Mediterranean climate change is expected to also lead to further desertification, particularly affecting in-land areas. Furthermore, protected areas, such as Nature2000 protected areas and sites, are projected to be significantly impacted by climate change with up to 30% potentially to be lost.

FIGURE 2-1: FOREST FIRES IN THE CENTRAL PART OF THE MEDITERRANEAN IN JULY 2023



⁹ *ibid.*

¹⁰ <https://www.reuters.com/world/europe/power-cuts-malta-put-government-hot-water-2023-07-25/>

¹¹ <https://wmo.int/media/news/record-breaking-temperatures-continue-august>

¹² <https://www.iemed.org/publication/changing-seas-adaptation-of-the-fisheries-in-the-mediterranean-basin-2/#:>

¹³ (<https://www.youtube.com/watch?v=mWgc0epeEzs>)

Table 2-1 presents a brief overview of the various phenomena related to climate change and their known 1st order expected impacts on natural conditions that underpin economic activities in the Mediterranean region.

TABLE 2-1: KEY CLIMATE CHANGE PHENOMENA AND EXPECTED IMPACTS

Climate Change Phenomena	Expected Impacts
Temperature increases	<ul style="list-style-type: none"> ▪ Higher average temperatures ▪ More frequent heatwaves ▪ Shifts in growing season ▪ Increase in pest outbreaks ▪ Human health problems
Changing precipitation patterns	<ul style="list-style-type: none"> ▪ Irregular rainfall ▪ Prolonged droughts
Increase in extreme weather events	<ul style="list-style-type: none"> ▪ More intense and frequent storms ▪ Increase in riverine flooding
Reduced runoff and groundwater recharge	<ul style="list-style-type: none"> ▪ Increased water scarcity ▪ Reduced freshwater availability ▪ Increased saltwater intrusion
Sea-level rise	<ul style="list-style-type: none"> ▪ Increased coastal flooding ▪ More coastal erosion ▪ Accelerated saltwater intrusion ▪ Loss of land and property
Ocean warming and acidification	<ul style="list-style-type: none"> ▪ Increased stress on marine ecosystems and species ▪ Change in fish species suitable for fisheries ▪ Increase in alien (invasive) species
Combined increase in temperature and changes and rainfall patterns	<ul style="list-style-type: none"> ▪ Biodiversity loss ▪ Habitat destruction ▪ Species migration ▪ Changes in species populations (e.g., fish, wildlife) ▪ Increase in alien (invasive) species ▪ Increase of forest fires

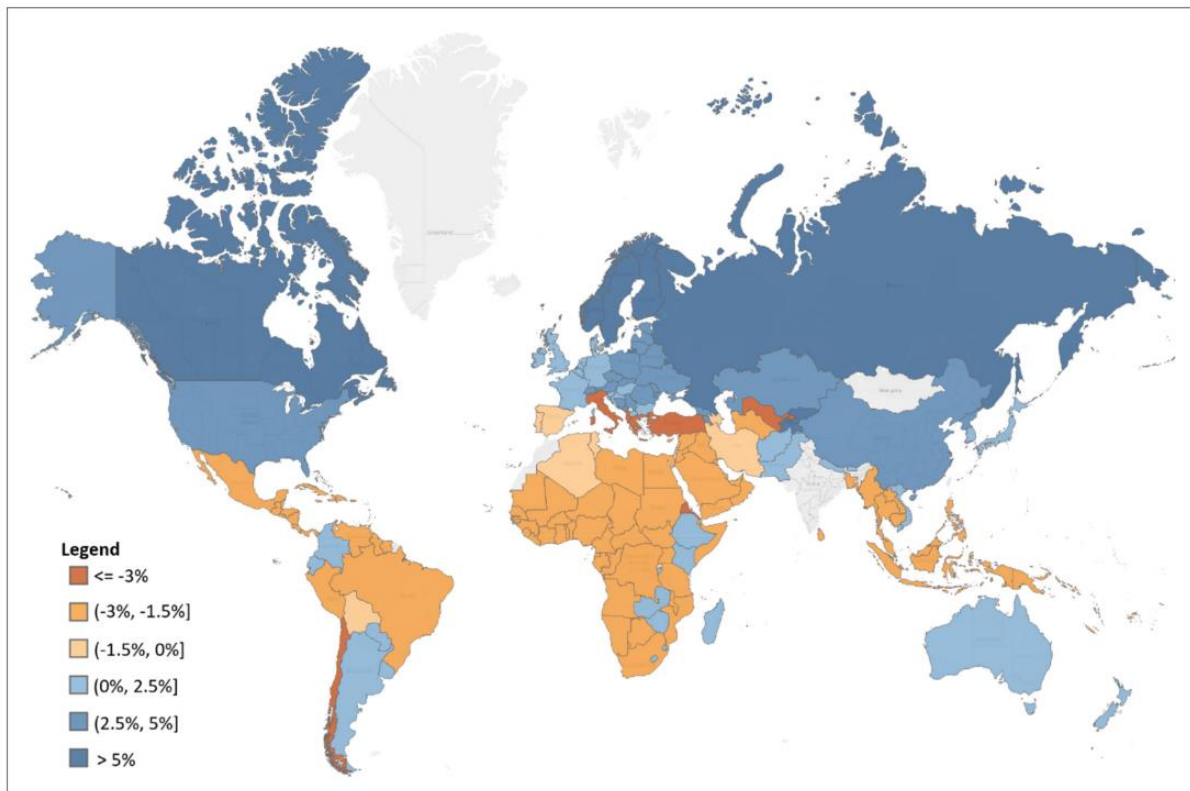
2.2 IMPACTS ON THE MAIN ECONOMIC ACTIVITIES

2.2.1 IMPACTS AND KEY PRIVATE SECTOR ACTORS

In the Mediterranean region, climate change is imposing significant challenges to the main economic activities: tourism, agriculture, water, fisheries, and shipping & transport. The tourism sector is likely to be impacted by higher summer temperatures and heatwaves leading to a possible reduction in coastal tourism in the high season, though this may mean a spread to traditionally lower seasons, while winter tourism maybe be hit harder. The above, have already “shifted” adaptation for summer tourism (e.g. in cooling/air-conditioning) and winter tourism (e.g. by using snow canons for ski centres) to

higher energy consumption, negatively impacting mitigation efforts. Also, more frequent wildfires will affect tourism operations and threaten related infrastructure. This became evident in July 2023, when Greece, Italy, Algeria and Tunisia combined lost more than 1,350 Km² of forest areas to blazes that affected 120,000 people and faced tourism cancelations¹⁴. Further impacts on tourism will arise from an increase in storm surges and sea level rise disrupting operations of low-depth small harbours, common in the Mediterranean. Also, sea level rise may enhance sandy beach erosion and thereby impact recreation and tourism activities. Global sea level increased to a new high in 2023 since the beginning of the satellite altimetry measurement in 1993, at 110mm¹⁵. A recent meta-analysis of the relationship between climate change and tourism demand, suggests that tourism in the Mediterranean region will decline by 1.5% in northern Africa to more than 3% in southern Europe by 2050¹⁶ (Figure 2-2).

FIGURE 2-2: CHANGES IN TOURISM DEMAND DUE TO CLIMATE CHANGE WITH SIGNIFICANT DECREASES THROUGHOUT THE MEDITERRANEAN



Agriculture, especially in the by 70% rain-fed agriculture in the Middle East and North Africa (MENA) countries, is very vulnerable to warming and reduced rainfall. Cropping systems in MENA countries, including the Nile Valley and the western parts of North Africa, are classified as particularly vulnerable in this regard¹⁷. For example, in a 2°C average global warming scenario, freshwater availability in the

¹⁴ <https://www.euronews.com/travel/2023/08/07/vital-tourism-income-has-been-lost-due-to-mediterranean-summer-of-wildfires-and-extreme-heat>

¹⁵ <https://wmo.int/topics/climate-change>

¹⁶ <https://doi.org/10.1080/09669582.2024.2354882>

¹⁷ ESCWA, 2017: Arab Climate Change Assessment Report – Main Report. United Nations Economic and Social Commission for Western Asia (ESCWA), Beirut, Lebanon, https://www.unescwa.org/sites/default/files/pubs/pdf/riccar-mainreport-2017-english_0.pdf

region could drop between 15 and 45%, with a resulting reduction in GDP between 6 and 14% by 2050. This link between climate variability and agricultural production across MENA countries has been demonstrated to be significant across studies, with a one percent increase in winter temperature resulting in a 1.12 percent decrease in agricultural production across 20 MENA countries¹⁸. In addition, irrigation needs could increase by 25% in northern and two-fold in southeastern Mediterranean areas with arid southern areas at risk of insufficient water resources by 2100¹⁹.

Overall, reduced water availability and water scarcity are likely to impact a wider group of private sector actors throughout the Mediterranean, including utilities focusing on urban water supplies, manufacturing firms, hydropower companies, and hotels and resorts.

In many MENA areas, but also on some Mediterranean islands, the dominant land use change concerns forest degradation caused by land overexploitation. From the 1980's to the 1990's, deforestation has increased by 160%. An increase in wildfires, and hence burnt area, is projected in Mediterranean Europe under most of the global warming scenarios. Burnt area could increase across the region by up to 40% for 1.5°C warming and up to 100% from current levels for 3°C warming at the end of the 21st century²⁰.

Total landings from Mediterranean fisheries have declined by 28% from 1994 to 2017. Climate change is projected to heavily affect marine resources in the coming decades. Warming, acidification and water pollution are likely to reduce marine productivity, affect species distribution and trigger local extinction of more than 20% of exploited fish and marine invertebrates by 2050²¹. Fisheries and aquaculture revenues are expected to decrease by up to 15–30% by 2050²². This is mainly due to overfishing and a change in fish species composition with an increase in warm-water species. However, a decline in shellfish aquaculture and high losses of clawed lobster production are expected by the end of the century²³.

Climate Change has influenced fisheries unequally in different countries in the region. In fact, the influence of climate change on fisheries in countries has been intricately tied to their adaptive capacity. The adaptive capacity of fisheries refers to the ability to modify exposure to climate change risks, cope with its impacts, and capitalize on new opportunities during the adaptation process. Figure 3-2 illustrates that Northern Mediterranean countries exhibit greater strength in dealing with climate change impacts on the fisheries sector, while North African countries face coping challenges.

¹⁸ Mohamed Alboghdady Salah E. El-Hendawy (2016). Economic impacts of climate change and variability on agricultural production in the Middle East and North Africa region International Journal of Climate Change Strategies and Management, Vol. 8 Iss 3, pp. 463–472

¹⁹ Ali, E., W. Cramer, J. Carnicer, E. Georgopoulou, N.J.M. Hilmi, G. Le Cozannet, and P. Lionello, 2022: Cross-Chapter Paper 4: Mediterranean Region. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2233–2272, doi:10.1017/9781009325844.021.

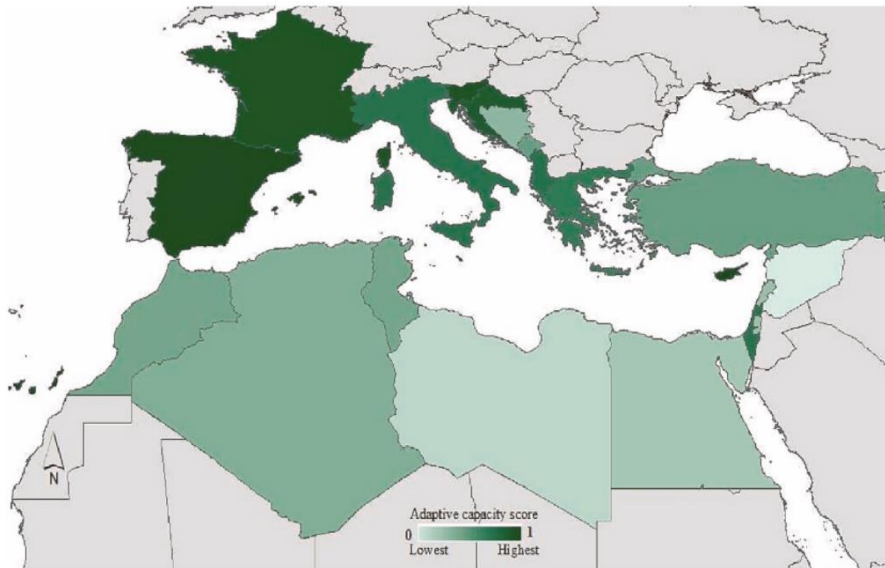
²⁰ MedECC 2020 Summary for Policymakers. In: Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report [Cramer W, Guiot J, Marini K (eds.)] Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, pp 11-40, doi:10.5281/zenodo.5513887.

²¹ MedECC 2020 Summary for Policymakers. In: Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report [Cramer W, Guiot J, Marini K (eds.)] Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, pp 11-40, doi:10.5281/zenodo.5513887.

²² ibid

²³ ibid

FIGURE 2-3: THE ADAPTIVE CAPACITY OF MEDITERRANEAN COUNTRIES FOR FISHERIES²⁴



Fisheries especially small-scale fish landing sites may be impacted by sea level rise. This is also one of the main impacts on marine transport and shipping, especially for smaller scale ferry services using low-depth small harbours.

Sea level rise and more frequent major storms, flash floods, prolonged heatwaves and droughts may also affect port infrastructure and may require significant investment to continue to provide the required protection. Even if infrastructures are designed to cope with various stresses along their life, the increase of frequency and severity of extreme weather events will increase their deterioration pace and increase possibility of accidents that may become more frequent due to adverse weather conditions.

Without action, the growing demand for cooling — both refrigeration and air conditioning — will drive the MENA region’s energy demand to increase by 50% by 2040. Due to the fact that the electricity generation in most countries is mainly based on fossil fuels, a rise in energy demand will lead to a rise in greenhouse gas (GHG) emissions at a time when nations should be making meaningful progress towards net-zero²⁵.

Climate change impacts will affect different actors in the key economic sectors in the Mediterranean in different ways. Table 2-2 provides a brief overview of the main climate change impacts for the most impacted economic sectors in the Mediterranean. It also provides an overview of the main private sectors actors that are impacted by climate change and that will need to adapt to climate change.

TABLE 2-2: MAIN ECONOMIC SECTORS IMPACTED BY CLIMATE CHANGE AND KEY PRIVATE SECTOR ACTORS

²⁴ Hilmi and Farahmand - CHANGING SEAS: Adaptation of the Fisheries in the Mediterranean Basin, Med dialogues, Jan 2024 and Hilmi, N., Farahmand, S., Cinar, M., Safa, A., Lam, V. W., Djoundourian, S., ... & Raybaud, V. (2023). Climate change impacts on Mediterranean fisheries: A sensitivity and vulnerability analysis for main commercial species. *Ecological Economics*, 211, 107889. <https://doi.org/10.1016/j.ecolecon.2023.107889>

²⁵ <https://www.coolupprogramme.org/knowledge-base/reports/mena-region-cooling-status-report-issue-2/>

Economic Sector	Climate Change Phenomena & Impacts	Private Sector Actors
Tourism	<ul style="list-style-type: none"> changing weather patterns sea-level rise extreme weather events <p>Impact on tourism activities and infrastructure</p>	<ul style="list-style-type: none"> hospitality services (i.e., hotels, restaurants, bars, entertainment events) tour operators travel agencies cruise operators transportation services diving companies
Agriculture	<ul style="list-style-type: none"> water scarcity shifts in growing seasons increased pest outbreaks <p>Impact on agriculture production quantity and quality</p>	<ul style="list-style-type: none"> private farmers (esp. rainfed agriculture, vineyards, orchards, olive groves) agricultural businesses food supply chain actors restaurants
Water	<ul style="list-style-type: none"> water scarcity droughts floods saltwater intrusion <p>Impact on water supply reliability and infrastructure maintenance costs</p>	<ul style="list-style-type: none"> private (and public) water utilities wastewater treatment plants desalination plants irrigation supply and management companies bottled water plants, breweries, beverage companies
Fisheries and Aquaculture	<ul style="list-style-type: none"> extreme weather events ocean acidification altered fish populations <p>Impact on catch, productivity, and profits</p>	<ul style="list-style-type: none"> private fishing companies aquaculture farms seafood processors supply chain actors
Transport and Shipping	<ul style="list-style-type: none"> sea-level rise extreme weather events <p>Impact on coastal transport routes, maintenance costs (harbours, ports), and maritime operations (ports, movement)</p>	<ul style="list-style-type: none"> private transportation companies public and private port and harbour authorities shipping companies
Manufacturing	<ul style="list-style-type: none"> floods and droughts changing weather patterns <p>Impact on water availability, supply chain reliability and energy costs</p>	<ul style="list-style-type: none"> private manufacturing industries, including tech partners, data centers supply chain actors
Forestry	<ul style="list-style-type: none"> temperature rise altered precipitation patterns extreme weather events <p>Impact on wildfires, pest outbreaks, and forest ecosystems change</p>	<ul style="list-style-type: none"> private forestry companies timber producers pulp and paper manufacturers conservation organisations
Energy Production	<ul style="list-style-type: none"> extreme weather events (heatwaves, storms) sea-level rise 	<ul style="list-style-type: none"> fossil fuel extraction companies power generation companies (renewable and non-renewable)

Economic Sector	Climate Change Phenomena & Impacts	Private Sector Actors
	<p>Impact on energy infrastructure and operations, especially cooling, hydropower, and transmission lines</p>	<ul style="list-style-type: none"> energy distribution companies

Given socio-political instability in some parts of the region, climate change may act as a push factor in migration between countries as well as within a country from rural to urban areas. It is likely to be driving forced displacement and increasing the risk of conflict, economic deprivation and food crises²⁶. Given that climate change impacts are likely to magnify over time based on even beyond scenarios, immediate action, that will involve the private sector, towards scaling up and accelerating adaptation action is key to address challenges.

2.2.2 ACTIONS BY PRIVATE SECTOR ACTORS ON CLIMATE ADAPTATION

In the various sectors of Mediterranean economies impacted by climate change, private sector actors are becoming aware of the need to adapt to climate change. Some actions related to climate adaptation have been initiated by private sector actors in related economic sectors. They are often supported by a number of private advisory, technology and engineering firms offering specialized knowledge and know-how on climate adaptation actions in own businesses. They often partner with international and civil society organisations to design, implement and monitor climate adaptation contributions of ESG/CSR contents that benefit local communities and ecosystems.

The private sector can engage in financing climate adaptation actions in the Mediterranean region through a variety of categories of engagement. First and foremost, businesses can invest in their own company to ensure that its operations are resilient to climate change. For example, hotel owners can invest in water efficiency e.g. by controlling leakages, treating and reusing toilet flush and shower water. They can also invest in energy efficiency e.g. by using led-lighting system. Farmers can invest in irrigation efficiency to reduce their dependency on water resources impacted by climate change. Manufacturing, beverage, paper production companies as well as ports can invest in water and energy efficiency, and protect their infrastructure from flood and droughts risks.

Secondly, larger corporations can invest not only in their own production facilities, but also invest upstream throughout the supply chain. For example, agrifood or beverage businesses by supporting farmers in gaining irrigation water efficiency and by doing so making their supply chain more climate resilient.

Thirdly, they can also finance climate adaptation actions through their ESG/CSR and philanthropic activities such as those focused on communities or conservation. They can also invest in research and development of new technologies and solutions that enable climate adaptation, such as climate-resilient crops or water efficient infrastructure. Another option is to engage in carbon pricing mechanisms or invest in carbon or biodiversity offset projects that support adaptation measures, such as reforestation or wetland restoration or *Posidonia oceanica* meadows protection.

²⁶ World Bank (2022). Middle East & North Africa Climate Roadmap 2021-2025. World Bank Group, Washington, DC, USA. Available at: [worldbank.org/en/region/mena/publication/middle-east-north-africa-climate-roadmap](https://www.worldbank.org/en/region/mena/publication/middle-east-north-africa-climate-roadmap)

Fourthly, the private sector can engage in financing climate adaptation through buying green bonds for projects that address climate adaptation. Companies can also set-up or buy into dedicated funds that target climate adaptation projects or allocate capital to impact investments focused on projects and companies that prioritize climate adaptation alongside financial returns. Companies can also collaborate with governments to co-finance projects that improve climate resilience through PPPs.

The degree to which actions have been taken varies between countries, sectors and between private sector actors. Actions undertaken are often not framed explicitly as ‘climate adaptation’ activities. More often, they are presented as addressing extreme weather events, building resilience, or presented as part of a broader set of sustainability initiatives. Below is an overview of the main economic sectors impacted by climate change together with examples of activities carried out by private sector actors, including those that provide support to adapt to climate change.

Tourism

Tourism is among Mediterranean’s ‘heavy industries’, particularly in the coastal area. For example, in 2019, tourism accounted for 8.5% of Egypt’s GDP, 7.8% in Morocco and 7% in Lebanon. The sector is an important driver for jobs; in 2019, in Egypt, Morocco, and Lebanon, the tourism sector generated 9.3, 12.4 and 32.6% of total jobs, respectively²⁷. In the face of climate change, a Do-Nothing-Scenario reveals that international tourism arrivals could start falling by the mid-2030s due to climate change, leading to losses of up to 28% in arrivals in Egypt and Lebanon, and up to 19% in Morocco by 2040. Based on these, it is projected that the hospitality sector faces the greatest decline in job losses, with an estimated average loss of 12.5% to 36.7% across all three countries²⁸.

Travel and hospitality businesses in the Mediterranean are adopting climate-resilient practices as part of their eco-friendly tourism efforts. Resorts and hotel owners are implementing measures such as off-the-grid energy solutions, energy-smart equipment installation, water conservation, and waste management systems. Restaurants are promoting farm-to-fork initiatives by using local produce. Tour operators and travel agencies are incorporating climate considerations into destination planning, offering climate-resilient travel itineraries, and supporting projects that promote environmental stewardship. Industry associations are collaborating with stakeholders to develop and disseminate best practices and advocate for climate-conscious tourism. Additionally, private advisory services are providing training and coaching to enhance environmental stewardship and build climate resilience in tourism operations. These efforts aim to promote sustainable travel behaviours and increase climate resilience across the industry.

In general, however, the tourism sector is in an early stage when it comes to engaging on climate adaptation through creating more climate-resilient tourism experiences. A 2011 study of tourism policy and planning in 44 countries by OECD found that only 12 countries considered adaptation strategies and that two regarded them as unnecessary²⁹. Air-conditioning is an important adaptation to tourism heat risk. Analysis of over 240,000 hotel properties worldwide found 76% have air-

²⁷ World Travel and Tourism Council WTTTC, 2023. Economic Impact Reports. <https://wtcc.org/research/economic-impact>

²⁸ World Bank, 2024. Transition towards sustainable and climate smart tourism in MENA: Recommendations for the Tourism Sector in Egypt, Lebanon and Morocco.

²⁹ Tourism Panel on Climate Change, 2023

conditioning. The growing need for air-conditioning in most of the top 100 city destinations represents an important increase in operating costs. It also contributes to the tourism sector's GHG emissions challenge with most electricity still being produced by non-renewable energy sources.³⁰

To assist response, for example, Morocco carried out a study of the carbon footprint of accommodation and developed a Nationally Appropriate Mitigation Action (NAMA) for a climate-friendly accommodation sector through energy efficiency and renewable energy. It sets an ambitious goal to eliminate emissions from the accommodation subsector, which in 2015 included 10% from tourism. Morocco has adopted several climate-smart measures for adaptation, mitigation and their co-benefits within the tourism sector, including SME incentives, the Moroccan Sustainable Tourism Award, ICZM Plans at national and local levels, Blue Economy, guides and regulations for energy efficiency, and the use of renewable energies.³¹

Agriculture

Private sector actors in the agriculture sector in the Mediterranean region are increasingly engaging in climate adaptation actions to build climate-resilient farming systems and enhance food security. Private farmers and agribusinesses are adopting climate-smart agricultural technologies, such as efficient irrigation, soil conservation, and crop diversification, including introducing new, more climate-resilient crops. WEF Nexus solutions for climate benefits, including application NbS, are piloted, for example, focusing on using constructed wetlands for tertiary treatment of wastewater enabling its re-use in irrigation. This is combined with using with pumping powered by renewable solar energy, and climate-resilient crops. The initiative (the MENA Water Matchmaker 2 Project, by GWP-Med with UfM/Sida support) is implemented in Jordan and Palestine and offers farmers capacitation³². Private agricultural cooperatives, extension services, and advisory services are collaborating with farmers to share knowledge, build capacity, and promote the adoption of climate-resilient farming practices, including the expansion of greenhouses. For example, in Jordan, the Smart DESERT project, implemented by IUCN ROWA and supported by several development partners, is training 15,000 farmers and young entrepreneurs interested in agriculture. They focus on reducing production costs through efficient use of energy, solar power, and water management systems. A smart phone application will provide early-warnings for natural disasters and AI will extrapolate information and help protect farmers and their crops against floods, locusts, frost, and other risks³³.

Agriculture technology firms are offering innovations like precision farming technologies and data analytics solutions to assist farmers in monitoring weather patterns, optimizing field operations, and implementing climate-smart technologies. For example, the PRIMA ACQUAOUNT project, coordinated by CMCC, works with farmers and regional authorities in Jordan, Lebanon, Sardinia and Tunisia, and uses pilots focused on IWRM and sustainable irrigation to improve practices by deploying innovative tools, smart water services and solutions, for public and private use, while contributing to climate resilience³⁴. Private suppliers of seeds, fertilizers, and agricultural inputs are developing climate-

³⁰ Ibid

³¹ ibid

³² <https://www.gwp.org/en/GWP-Mediterranean/WE-ACT/News-List-Page/20232/Matchmaker-II-Inaguration/>

³³ <https://www.smartdesertproject.com/about-sd/>

³⁴ ACQUAOUNT Project: Adapting to Climate change by Quantifying optimal Allocation of water resources and socio-economic interlinkages, coordinated by the Euro-Med Center for Climate Change (CMCC). <https://www.acquaount.eu/>

resilient crop varieties and integrated pest management solutions to address climate risks and improve yields. For example, RDI in Morocco is a pioneer in field-testing the latest agricultural products, including innovations in irrigation, new crop varieties, and water productivity. Their Climate Smart Agriculture approach has resulted in 50% water use reduction and up to 30 percent increase in crop yield³⁵.

Water

Both private and public sector actors in water management are actively developing climate adaptation actions to create more resilient water supplies and address issues related to floods and droughts. Private and public water utilities are investing in climate-resilient infrastructure, implementing water conservation measures, and utilizing monitoring systems to track and predict water quantity, quality, and availability. Desalination and wastewater reuse facilities are being enhanced on numbers as well as used resources efficiency to increase water availability amidst water scarcity challenges and control GHG emissions. For example, in Egypt, where the government is planning a major expansion of the desalination capacity by engaging the private sector through PPPs³⁶. Similarly in Morocco, where USD 188 million have been secured by development partners for constructing three new desalination plants with a total capacity of 110 MCM/year to support two cities as well as the operations of the Moroccan fertilisers company³⁷. In addition, construction works were launched for building a desalination plant to cover the needs of Casablanca through a PPP, with a capacity of 300 MCM/year. This is the largest such infrastructure in Africa³⁸.

Irrigation companies, both private and public, are implementing water-efficient irrigation systems and water conservation initiatives to minimize usage, reduce losses, and boost crop resilience against water stress and droughts. For example, expanding the use of drip irrigation is one of the main aims of Morocco's National Programme of Water Savings in Irrigation (PNEEI, 2017-2024, supported by AfDB), which aims to modernise irrigation on 550,000 hectares of agricultural land³⁹. Water technology and service firms are advancing smart water and irrigation systems, as well as improving water treatment technologies, filtration systems, and wastewater recycling solutions. Such schemes are attracting private investment, for example, in 2023 UAE-based infrastructure companies signed an agreement to develop an irrigation project using desalinated water powered by renewable energy in Morocco⁴⁰. Additionally, engineering companies and consultancies are providing technical expertise for designing water-efficiency projects, flood protection measures, and sustainable water infrastructure. These initiatives are crucial for upgrading water management and building climate resilience in the Mediterranean, with the private sector playing a pivotal role in these adaptation activities.

Fisheries and Aquaculture

Private sector actors in the fishing and aquaculture industry in the Mediterranean are increasingly engaging in climate adaptation actions to address the impacts of climate change and enhance

³⁵ <https://rdimaroc.org/en/climate-smart-agriculture-in-morocco-a-sustainable-path-forward/>

³⁶ <https://www.reuters.com/markets/commodities/egypt-build-21-desalination-plants-phase-1-scheme-sovereign-fund-2022-12-01/>

³⁷ <https://www.agbi.com/food-drink/2024/02/morocco-gets-188m-to-build-three-desalination-plants/>

³⁸ <https://www.agbi.com/analysis/infrastructure/2024/07/morocco-struggles-to-solve-its-water-crisis/>

³⁹ *ibid*

⁴⁰ <https://www.agbi.com/agriculture/2023/12/uae-companies-to-develop-irrigation-project-in-morocco/#:~:text=Dubai%2Dbased%20Metito%20Utilities%20and,using%20desalinated%20water%20in%20Morocco.>

resilience. Private fishing firms are adjusting their practices, diversifying target species, and employing sustainable harvesting techniques to mitigate the effects of changing conditions on fish stocks and marine biodiversity.

Aquaculture businesses are adopting climate-smart practices, eco-friendly technologies, and sustainable farming methods to minimize environmental impacts and ensure the long-term viability of seafood production. For example, the WestMED Initiative established a technical group on sustainable aquaculture, AquaWest, to support the adoption of innovative, eco-compatible sustainable and restorative aquaculture practices, and the needs and opportunities of the Southern Mediterranean countries to benefit from existing innovative practices. Showcasing results, the EU funded project “NewTechAqua”⁴¹ catalysed 14 innovations and 9 breeding protocols covering a range of aquaculture species. They also pioneered the use of novel ingredients for aquafeeds and the valorisation of fish co-products into innovative ingredients with several of their innovations already being on the market and used on a commercial scale⁴².

Industry organizations and fishery cooperatives are supporting the development of climate adaptation strategies and the sharing of best practices. Companies are offering fisheries monitoring tools and aquaculture automation solutions to enhance the efficiency and resilience of seafood operations, while the use of AI is expected to increase as such technology grows. For example, advancements in sensor technology and data collection techniques have made it easier to collect and share high-quality data. Additionally, the progress in machine learning and deep learning algorithms allow for more sophisticated analysis of large datasets. Among others, there is a need to develop low-cost AI systems that will be accessible to smaller-scale aquaculture operations, to help improve their efficiency and sustainability⁴³.

Additionally, fishing industry organizations are advocating for the establishment of marine protected areas to boost the resilience and adaptive capacity of ecosystems, supporting healthy fish stocks. The development of marine protected areas and other fish-exclusion zones helps support the spawning and growth of commercial fish species. For example, these have been documented by the increase in fish catches near Columbretes Islands Marine Reserve in Spain, Carry-le Rouet in France and Gulf of Castellammare in Italy. As such MPAs can generate additional income, especially when combined with implementing a brand or quality certification for products linked to the MPA, as demonstrated in 66 MPAs in the Northeast Atlantic (England, France, Spain and Portugal)⁴⁴. These examples reflect the industry's growing awareness of climate change impacts and the necessity to build resilience in fishing and aquaculture operations.

Transport and shipping

Private companies in the transport and shipping sector, including ports facilities, are beginning to address climate change adaptation, often within the broader context of sustainable maritime operations, with a focus on fuel efficiency and reducing GHG emissions. Specific climate adaptation

⁴¹ <https://www.newtechaqua.eu/>

⁴² <https://westmed-initiative.ec.europa.eu/westmed-success-story-sustainable-aquaculture-meet-newtechaqua-the-european-aquaculture-innovators/>

⁴³ Mohd Ashraf Rather, et al, 2024. Exploring opportunities of Artificial Intelligence in aquaculture to meet increasing food demand, Elsevier, Food Chemistry: X, Volume 22. <https://www.sciencedirect.com/science/article/pii/S2590157524001962>

⁴⁴ <https://oceanogami.com/marine-protected-areas-mpas-improving-marine-conservation-through-private-sector-collaboration/>

actions include private port operators and terminal management companies investing in climate-resilient infrastructure and developing adaptation plans to address risks from sea-level rise and extreme weather events. For example, the East Port Said in Egypt has strengthened sea walls and barriers, along with dredging to manage silt build-up and improve water flow during extreme weather events and advanced energy resilience with solar panel installations, efficient lighting, and the shift towards electric equipment and vehicles. In a similar approach, the Tanger Med Port in Morocco has reinforced breakwaters and seawalls to buffer against waves and prevent erosion. It also has enhanced its drainage infrastructure to quickly redirect stormwater preventing flooding that could disrupt port operations. In addition, it has implemented advanced waste and water management systems to control pollution and manage stormwater runoff thereby protecting surrounding marine ecosystems. Furthermore, it has deployed real-time monitoring systems to track changes in sea levels, weather patterns and wave heights, and adapted renewable energy sources and energy-efficient lighting⁴⁵. Additionally, marinas are being planned and redesigned to accommodate sea-level rise, erosion, and increased storm surges.

Private cruise operators are implementing sustainability initiatives by investing in energy and water-efficient vessels and improving waste management practices to promote eco-friendly tourism. For example, the charter for sustainable cruising in the Mediterranean, signed between the French Government and the main cruise players, aims to reduce the environmental impact of cruising while promoting innovative technological solutions in the realm of sustainable development. In 2023, 12 audited vessels from members of the Cruise Lines International Association (CLIA) were given a certificate of conformity with the commitments of the Charter⁴⁶. Private ferry operators are enhancing onboard waste management systems and passenger safety protocols to manage extreme weather risks and maintain operational continuity. Overall, while most such initiatives focus on sustainability, specific actions for climate adaptation are still in the early stages, often as part of broader sustainability efforts.

Manufacturing and automotive industry

Companies in the manufacturing sector, including those in food and beverage, consumables, tech products, and data centres, are increasingly engaging in climate adaptation actions. These efforts are largely driven by the need to maintain a reliable supply of water and raw materials while minimizing their local environmental footprint. Furthermore, companies contribute to local climate adaptation through their CSR/ESG strategies. For example, the Coca-Cola Foundation and the Coca-Cola Company partnered with the Municipality of Trikala-Greece and GWP-Med for the 'Resilient Thessaly' project that implemented stormwater management works through a holistic intervention aimed to strengthen the city's climate resilience in response to the devastating floods caused by storm Daniel, in September 2023⁴⁷. More than 120 field interventions aiming to contribute to the local water budget thus bringing benefits to local communities, including as means to climate adaptation, have been implemented since 2008 in Greece, Cyprus and Malta through the tripartite synergy of the Coca-Cola system (including the Foundation, Company, bottlers in respective countries), local municipalities and national

⁴⁵ <https://www.afrik21.africa/en/morocco-ecoports-2020-tangier-med-port-wins-award-for-sustainable-development/>

⁴⁶ https://europe.cruising.org/knowledge_hub/sustainable-cruise-charter-in-the-mediterranean-celebrating-first-anniversary/

⁴⁷ <https://www.gwp.org/en/GWP-Mediterranean/WE-ACT/News-List-Page/2024/new-flood-prevention-project-delivered-to-Trikala-Greece/>

authorities (like the Energy & Water Agency of Malta) and GWP-Med.⁴⁸ Growing interest has been also documented by packaging companies, like Crown SA, with developing a portfolio of local interventions for water replenishment according to local priorities, like in Corinth Municipality-Greece.

Industrial firms, data centre, and production facilities are enhancing water efficiency, targeting water neutrality and reusing wastewater to boost operational resilience against climate risks. For example, major international companies operating data centres in the Mediterranean region have committed to water neutrality, including Microsoft, Google and Amazon^{49, 50}. However, realizing their commitment is proving harder than expected as the sharp increase in the use of generative AI has increased water use significantly⁵¹.

Also, suppliers of raw materials are partnering with manufacturers to promote climate-resilient sourcing practices and supply chain management. Industry organizations are developing climate adaptation strategies and best practices, while scientific research institutions and technology hubs are conducting studies on climate impacts and resilience strategies across industries. In instances where mechanical cooling is necessary, companies are transitioning to natural refrigerants, improving efficiency, and utilizing sustainable energy sources to reduce environmental impact.

Overall, private sector actors in the manufacturing industry are focusing on on-site water management measures and building a climate-resilient supply chain to adapt to changing climate conditions, while there seems to be a growing interest by companies, particularly of larger scale and global operations, on engaging in ESG/CSR contributions aiming for benefits to local communities and ecosystems.

Forestry

Companies in the forestry sector are engaging in climate adaptation efforts by promoting sustainable forestry practices to enhance forest resilience and mitigate climate risks. Timber production and forest management companies are implementing reforestation, restoration, fire protection, and selective logging practices to reduce pest outbreaks, decrease the risk of forest fires, and enhance forest ecosystem resilience to the impacts of climate change. Furthermore, other companies like the OCP Group that operates on phosphate mining in Morocco, supports through the OCP Foundation reforestation projects in the country as well as in Senegal.⁵²

Companies involved in pulp and paper production are building climate-resilient supply chains, reducing deforestation impacts, and utilizing forest products certification to ensure sourcing from sustainably managed forests. For example, Spain's Saica and Turkey's Kartonsan are prioritizing sustainable forestry practices, increasingly aligning with the EU's Deforestation Regulation⁵³, which mandates transparency and deforestation-free supply chains for products entering the European market. This push requires pulp and paper producers to adopt strict sustainability measures, including sourcing from certified forests, investing in traceability technologies, and using recycled materials when

⁴⁸ <https://www.gwp.org/en/NCWR/>

⁴⁹ <https://dgtlinfra.com/microsoft-azure-data-center-locations/>, <https://www.datacenterdynamics.com/en/news/microsoft-plans-4bn-data-center-investment-in-france/>

⁵⁰ <https://sustainability.aboutamazon.com/natural-resources/water>

⁵¹ <https://www.datacenterdynamics.com/en/news/microsofts-water-consumption-jumps-34-percent-amid-ai-boom/>

⁵² <https://www.1t.org/pledges/ocps-tree-pledge>

⁵³ https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

possible. Forestry industry organizations are playing a vital role in facilitating knowledge-sharing and exchanging best practices among forestry stakeholders to promote climate change resilience action.

Additionally, firms are offering research and forestry monitoring tools, including remote sensing technologies and data analytics solutions, to assist forest managers in assessing and implementing adaptive measures. While many of these sustainable forest management practices are not explicitly labelled as climate change adaptation measures, they contribute significantly to building climate resilience across the Mediterranean forestry sector.

Energy

Private actors in the energy sector are indeed focusing on climate resilience alongside their contributions to the energy transition. While these activities often fall under the umbrella of broader mitigation efforts, specific adaptation actions are being implemented to enhance resilience, while adaptation-mitigation co-benefits are increasingly in the scope, including within a WEFE Nexus approach.

Power plant operators are improving the resilience of plants to extreme weather events, such as ensuring cooling water systems can operate effectively under higher temperatures, integrating energy storage solutions for reliable electricity supply and securing transmission lines to maintain grid stability during periods of high demand, like heatwaves. For example, in Egypt, the Renewable Energy Authority has encouraged private companies to participate in adaptation initiatives, including enhanced cooling systems and infrastructure designed to endure extreme heat, a growing concern in the region. In Morocco, the Noor Ouarzazate Solar Complex, the largest solar complex of its kind in the world with 580MW capacity, while state-driven, involves private operators for its maintenance and resilience planning, ensuring the solar infrastructure can withstand extreme heat and sandstorms typical of the region.

Private firms specializing in energy technology are helping energy providers enhance operational efficiency and manage peak demand during extreme weather conditions. The sector is also focused on repairing and fortifying power distribution infrastructure vulnerable to prolonged high temperatures. Furthermore, advisory firms are supporting companies, policymakers, regulators, and other stakeholders in developing climate-resilient energy strategies and investment proposals. Furthermore, regional organisations, like the Regional Center for Renewable Energy and Energy Efficiency (RCREEE), assists MENA stakeholders including private sector in advancing understanding through science-based assessment, documenting and sharing good practices, and implementing pilots in its domain⁵⁴.

While these adaptation actions are often integrated into broader energy transition activities, they play a crucial role in building resilience against the impacts of climate change in the energy sector.

Financial Institutions

Banks, private investment firms, and development finance institutions are playing a crucial role in facilitating climate adaptation efforts by financing projects that enhance climate resilience in various sectors. They are mobilizing funds for climate-resilient water management projects, which include investments in water conservation initiatives, flood defences, water storage, stormwater management systems, and wastewater treatment facilities. Private banks are financing agricultural innovations

⁵⁴ <https://rcreee.org/>

aimed at creating resilient and sustainable food and fibre production through projects focused on water and energy efficiency, on-site water storage, and farm-level technological advancements. For example, in Morocco, the Bank of Africa (BMCE) contributes to projects through green bonds and other financial products aimed at sustainable agriculture development and water management, supporting adaptation in vulnerable areas. In Egypt, the National Bank of Egypt finances small farmers to advance solar irrigation, while the Banque Misr supports through its ESG/CSR climate-smart agriculture using greenhouses and drip irrigation aiming at creating employment opportunities for youth and women-led households⁵⁵.

Furthermore, private finance institutions are providing funding for climate-resilient fisheries and aquaculture projects, supporting sustainable seafood production, aquaculture innovation, and marine conservation efforts. Additionally, financial institutions are investing in climate-resilient forestry projects, which include sustainable forest management initiatives, carbon offset programs, and eco-friendly forestry certifications.

Among recently launched regional financing initiatives (December 2022), the Blue Mediterranean Partnership (BMP) aims to tackle the Mediterranean Sea's severe environmental threats by coordinating financing of sustainable blue economy investments in the region. Through a new multi-donor fund, managed by the European Bank for Reconstruction and Development (EBRD), BMP seeks to secure additional funding from sovereign donors for project preparation and blended finance, including aimed for engaging the private sector. So far, contributions by developing partners for such services have reached 21 mil Euros and additional donations are expected⁵⁶. BMP has identified more than 15 sustainable blue economy projects in Morocco, Egypt, and Jordan, for a total investment cost of more than €2.5bn, a substantial part of which will directly contribute to climate adaptation objectives in the coastal area⁵⁷.

Together, private and public sector financial actors are developing innovative financing mechanisms that support key economic sectors in the Mediterranean region that are most impacted by climate change, thus playing an increasingly important role in building climate resilience.

Insurance

Insurance companies are playing a vital role in promoting climate adaptation by offering specialized products and services that help businesses and individuals manage climate-related risks. They are developing new and innovative insurance products that mitigate risks associated with extreme weather events, floods, and droughts. Insurers are employing advanced risk assessment and modelling techniques to better understand the impacts of climate change, allowing them to offer tailored solutions that help clients adapt and minimize vulnerabilities. For example, Allianz has developed insurance products, like the parametric insurance⁵⁸, specifically for properties exposed to coastal and fire risks. AXA has committed to financing climate-resilient infrastructure and partners with local governments to provide insurance solutions that encourage climate adaptation measures, such as

⁵⁵ UNEP FI, 2022, Scaling Private Sector Climate Finance in the MENA Region: Case studies of climate action from UNEP FI member banks

⁵⁶ <https://ufmsecretariat.org/gathering-blue-med-partnership/>

⁵⁷ <https://south.euneighbours.eu/news/blue-med-partnership-moves-to-identify-and-approve-funding-for-sustainable-blue-economy-initiatives/>

⁵⁸ <https://www.allianz.com/en/mediacenter/news/articles/241002-empowering-vulnerable-populations-allianz-parametric-insurance.html>

flood defence or fire prevention systems⁵⁹. Swiss Re, meanwhile, focuses on "resilience bonds" to support municipalities and regions in adapting to extreme weather⁶⁰. Though such insurance options are not necessarily available in developing countries of the Mediterranean, models have been created and may be transferred according to needs and related risks.

Insurance companies are also encouraging and incentivizing policyholders to adopt sustainable business practices that reduce their exposure and build resilience against climate impacts. Additionally, firms in the insurance industry are partnering with institutional multilateral donors, government agencies, research institutions, and non-profit organizations to co-develop climate adaptation strategies and initiatives. For example, Allianz participates in the Emerging Markets Climate Action strategy, a fund developed alongside the European Investment Bank (EIB) to finance projects in developing regions including the Middle East⁶¹. These projects emphasize climate adaptation through investments in renewable energy and climate-resilient infrastructure.

Through these efforts, private sector actors in the insurance industry in the Mediterranean should become able to provide crucial financial protection and support for climate adaptation.

Engineering and Consulting

Firms specializing in engineering, architecture, and environmental consulting are essential in designing and implementing climate adaptation strategies, collaborating with governments, businesses, and communities to reduce vulnerability to climate impacts. Engineering companies are involved in designing climate-resilient infrastructure projects, including flood protection systems, coastal defences, and water management facilities. Environmental advisories conduct climate impact and risk assessments, develop adaptation strategies, and provide technical expertise on climate adaptation and resilience.

Also, urban planning consultants assist local governments, developers, and communities in designing climate-smart cities and resilient infrastructure solutions. Infrastructure consulting firms focus on designing climate-resilient water supply systems, desalination plants, wastewater reuse facilities, transport networks, and energy infrastructure. Additionally, companies offer climate risk management services, insurance solutions, and disaster preparedness planning to help identify climate risks, assess vulnerabilities, and develop risk mitigation strategies. The engineering and consulting industry holds a crucial role in providing expert knowledge in climate adaptation and plays a significant part in preparing the groundwork necessary to mobilize financing for these initiatives.

⁵⁹ <https://climate.axa/building-climate-resilience-infrastructure/>

⁶⁰ <file:///C:/Users/VangelisConstantiano/Downloads/2023-06-21-sri-sigma-restoring-resilience.pdf>

⁶¹ <https://emcaf.allianzgi.com/>

3 CLIMATE RISK ASSESSMENT AND COST-BENEFIT ANALYSIS: CRUCIAL TOOLS FOR MEDITERRANEAN COASTAL BUSINESSES

This chapter describes the elements of and elaborates (also with examples) on the added value of climate risk assessment and related cost-benefit analysis for businesses.

3.1 UNDERSTANDING THE THREATS

As indicated above and in accordance with observations and studies referenced in the recent IPCC Fifth Assessment Report (AR5)⁶² and in IPCC's SREX Report⁶³, climate change is already impacting the Mediterranean region. In recent decades, summer heat waves' intensity, number, and length have increased alongside extreme precipitation. Major increases have been observed in warm temperature extremes. The shallow waters of the Mediterranean Sea have already warmed by almost 1°C since the 1980s. Trends of decreasing precipitation and discharge indicate a trend toward increased freshwater deficits.⁶⁴

3.1.1 CLIMATE CHANGE PROJECTIONS

The IPCC considers the Mediterranean Region as “highly vulnerable to climate change” and states that it “will suffer multiple stresses and systemic failures due to climate changes”¹². The sub-regions of the Mediterranean will witness different changes to their climate. On average however changes for the whole Region, include an increase in mean air temperature of 2-4°C, 10-20% decreases in mean annual precipitation, and an increased risk of desertification⁶⁵. In addition, there is a likely increase in the duration and intensity of droughts, summer heatwaves and heavy precipitation events. These are expected to lead to further soil degradation, changes in species' composition, increases in alien (invasive) species, habitat losses and agricultural and forests production losses.

Sea level rise in the Mediterranean Sea is influenced by a mix of both local and global factors. This complexity leads to greater uncertainty in predicting regional sea level changes over multiple decades compared to the global ocean as a whole. The Mediterranean Sea is projected to rise by 0.33 m by 2050 and possibly up to 1.1 m towards the end of the century according to the IPCC⁶⁶. The effect of sea level rise due to global warming is more important in most of the Mediterranean Sea where, due to the small tidal range, coastal infrastructure and coastal communities being located closer to mean sea level. In addition, local factors such as vertical land movements caused by tectonic as well as other causes pose additional risks for such low-lying areas. Figure 3-1 highlights areas less than 2 metres

⁶² Working Group I Contribution to the 5th IPCC Assessment Report, Climate Change 2013 - The Physical Science Basis, <http://www.ipcc.ch/report/ar5/wg1/>

⁶³ IPCC, 2012: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change.

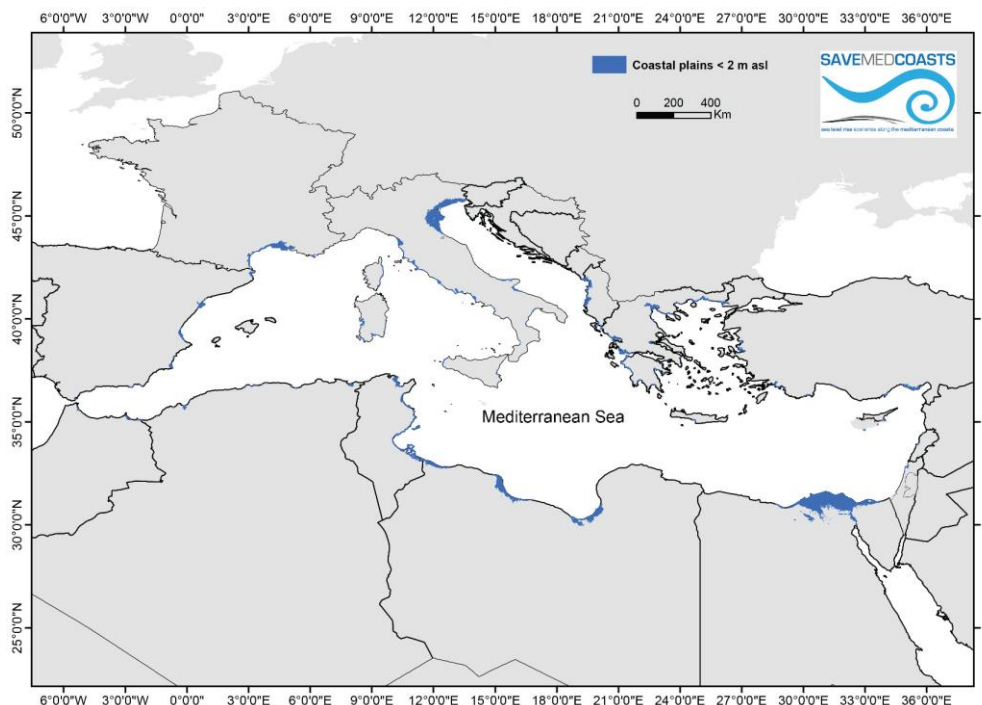
⁶⁴ European Environment Agency, Global and European sea-level rise (CLIM 012) - Assessment published Sep 2014, <http://www.eea.europa.eu/data-and-maps/indicators/sea-level-rise-2/assessment>

⁶⁵ Note: Estimates mentioned in the IPCC AR5 for the medium-low emissions scenario (RCP 4.5) and for the period 2081-2100 compared to 1986-2005.

⁶⁶ Ali, E., W. Cramer, J. Carnicer, E. Georgopoulou, N.J.M. Hilmi, G. Le Cozannet, and P. Lionello, 2022: Cross-Chapter Paper 4: Mediterranean Region. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2233–2272, doi:10.1017/9781009325844.021.

above sea level, which are considered at threat from sea level rise. This will affect notably the Nile River Delta and low-lying areas in Libya and Tunisia, but also some smaller areas in Algeria and Israel⁶⁷.

FIGURE 3-1: AREAS LESS THAN 2 METRES ABOVE SEA LEVEL THREATENED BY SEA LEVEL RISE



3.1.2 THREATS TO BUSINESSES SECTORS

Climate change is expected to apply additional stress on key economic sectors in the Mediterranean region. In low-income countries of the Mediterranean Region, a 1.1-point reduction of gross domestic product (GDP) could occur as a consequence of 1°C rise warming. In Morocco, GDP impacts of climate change could be -3% to +0.4% by 2050 relative to 2003. In the MENA countries, approximately 10–13% of loss in GDP is projected for an increase in global mean temperature of 4.8°C by 2100. In Southern Europe, mean labour productivity would shrink by approximately 2% under 2°C warming, along with a GDP loss of 0.1% by the 2030s, reaching 0.4% by the 2080s⁶⁸.

The Mediterranean region's key industries are increasingly vulnerable to climate change impacts the main risks include:

1. **Tourism Industry:** Faces significant climate-related risks, such as changing weather patterns, water scarcity, sea-level rise, and increased natural disasters. These factors threaten destinations, infrastructure, and visitor experiences.
2. **Agriculture and Farming:** Climate change threatens agricultural productivity through extreme weather events, shifting rainfall patterns, rising temperatures, and changing growing seasons, impacting farm profitability and rural livelihoods.

⁶⁷ <https://www.savemedcoasts.eu/index.php/maps?>

⁶⁸ Szewczyk, W., J.C. Ciscar, I. Mongelli and A. Soria, 2018: JRC PESETA III Project: Economic Integration and Spillover Analysis. Publications Office of the European Union, Luxembourg. 49 pp.

3. **Food and Beverage Industry:** Climate impacts agricultural raw material availability and supply chains. Altered weather patterns, water scarcity, and regulatory changes affect production processes and market dynamics.
4. **Water Industry:** Challenges include drought, changing hydrological patterns, floods, sea-level rise, and extreme weather, which strain water availability and infrastructure, with direct effects on other industries.
5. **Fisheries and Aquaculture:** Risks include overfishing, productivity changes, extreme weather, temperature shifts, habitat degradation, and ocean acidification, impacting marine biodiversity and fishery yields.
6. **Transport and Logistics:** Extreme weather events, sea-level rise, and changing precipitation patterns disrupt infrastructure and supply chains, leading to logistical challenges and increased operational costs.
7. **Manufacturing & Technology:** Faces water scarcity, extreme weather events, and supply chain disruptions, which can impact operations and increase costs, particularly in energy-intensive processes.
8. **Forestry Industry:** Climate change leads to increased wildfires, pests, drought, and extreme weather, affecting forest ecosystems, biodiversity, and timber resources.
9. **Energy Production:** Water scarcity, extreme weather, wildfires, and sea-level rise pose threats to energy infrastructure, affecting production capacity and operational reliability.

Furthermore, the overall human health effects of a changing climate in the Mediterranean are likely to be negative and could trigger economic and social instability within the countries, and by extent increasing operational costs for businesses in the region. Throughout the Mediterranean region, climate change can place additional pressure on locally scarce resources (e.g. water). This pressure can reinforce other societal issues such as unemployment, poverty, and inequality, leading to the overstretching of societies' adaptive capacities and causing political instability. For businesses in the Mediterranean region this provides an additional overall risk and uncertainty that could impact their operations and business' success.

Many businesses in the Mediterranean still tend to underestimate their exposure to climate risks, which reflects a narrow view of climate risks and related impacts on supply chains and the broader market. Many private climate adaptation strategies tend to be reactive and insufficient⁶⁹. This misperception stands in the way of broader private-sector adaptation. The consequences of such type of inactiveness and lack of adaptive capacity on businesses has recently been demonstrated by the COVID-19 pandemic, cybersecurity threats, and geopolitical conflicts. These events have demonstrated the vulnerabilities of business' supply chains: from raw materials' sourcing and processing to components' manufacturing and assembly, and goods' transportation. Increasingly vulnerability to climate change has to be seen in this context, and businesses throughout the Mediterranean region will have to become more active in defining the climate hazards, exposure and vulnerabilities that are most relevant to them and act on these.

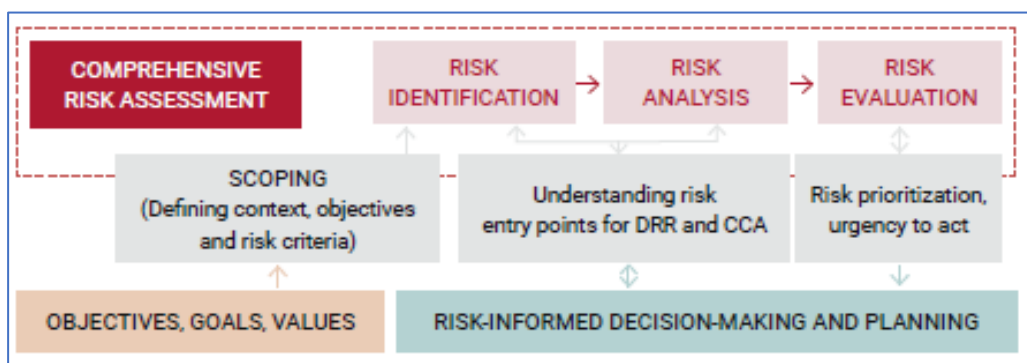
⁶⁹ Goldstein, S. M. (2018). Are We Prepared? Increased Drought Vulnerability Due to Climate Change and State Drought Plan Preparedness (Doctoral dissertation, University of Colorado at Boulder).

3.2 CLIMATE RISK ASSESSMENT

Climate change adaptation focuses on predicting future climate-related challenges, taking proactive measures to reduce vulnerability of communities and systems and building resilience to future climate change impacts. Thus, climate change adaptation anticipates climate change impacts, takes early actions to prevent/minimise losses and damage and enables quicker recovery. Actual or expected climate change impacts pose both risks and opportunities to businesses. Understanding and responding to these impacts well in advance is essential for businesses to plan and be pro-active.

Private adaptation refers to “the process of adjustment by companies to actual or expected climate change and its effects through changes in business strategies, operations, practices, and/or investment decisions”. The process of adaptation engages private-sector decision-makers to identify the most appropriate approaches to moderate harm while exploiting beneficial opportunities. Central to this process of climate change adaptation and business adaptation are climate risk assessments that uses the more general ‘comprehensive risk assessment’ approach (Figure 3-1).

FIGURE 3-1: COMPREHENSIVE RIKS ASSESSMENT PROCESS OVERVIEW



CCA: Climate Change Adaptation, DRR: Disaster Risk Reduction

Climate risk assessments identify the risk of the climate-change impacts resulting from the interaction between vulnerability, exposure, and hazard, and address those risks by modification of business strategies and models within which:

- **Hazard** refers to the possible future occurrence of natural or human-induced physical events that may have adverse effects on vulnerable and exposed elements,
- **Exposure** refers to the inventory of elements in an area in which hazard events may occur,
- **Vulnerability** consists in the tendency of exposed elements, including businesses and assets, to suffer adverse effects when impacted by hazard events.

Climate risk assessment is the process of identifying, analysing, and evaluating the potential impacts of climate change on a business, its assets, and its operations. It involves assessing the physical risks associated with climate change, such as extreme weather events, sea level rise, and temperature changes, as well as the transition risks related to the shift to a low-carbon economy.

It is possible for a business to be exposed, but not vulnerable. For instance, businesses that are in flood-prone areas can adjust their facilities and behaviour to mitigate potential losses, therefore rendering themselves less vulnerable. While individual businesses are ineffective in the face of climate related hazards and limited in their responses to exposure, reducing their vulnerability is the key to and core of adaptation.

Physical risks to business stem from the exposure of businesses, including their production site, employees, supply and distribution chains and customers to climate-related hazards such as increases in temperatures and extreme weather events. At the same time, businesses need to adjust their activities to the risks of the transition to a lower-carbon economy, such as the risk of policy changes and reputational risks. Without early action, various industries are expected to suffer significant impacts from climate-related risks. While impacts affect businesses of all sizes, Small and Medium Enterprises (SMEs) are often ill-equipped, and lack the necessary resources, knowledge, and infrastructure to adapt and thereby reduce their vulnerability. Understanding the climate related risks and vulnerabilities throughout the Mediterranean region is the first step towards reducing the risk of supply-chain disruptions and of production facilities being severely affected.

A comprehensive climate risk assessment helps businesses to identify and manage climate-related risks and opportunities with the aim to build resilience, enhance reputation, and create long-term value for the company and its stakeholders.

$$\textit{Climate Risk} = \textit{SUM (hazard, exposure, vulnerability)}$$

The core of risk, by definition, considers the hazards, the exposure, and the vulnerability level of assets and operations (as shown in the equation above). The typical approach for conducting a climate risk assessment for companies in the Mediterranean region uses the following steps: hazard assessment, supply chain/ exposure mapping, vulnerability assessment, financial impact assessment, adaptation and risk management strategies, collaboration and stakeholder engagement, and continuous monitoring and review. Annex 1 provides a further elaboration on climate risk assessment and how it can be conducted.

3.3 COST-BENEFIT ANALYSIS: IMPORTANCE IN ADAPTATION INVESTMENTS

Adapting to climate change will require significant investments. With limited financial resources available, it is important to understand the costs and benefits of climate adaptation interventions. It is also important to be able to compare these with the costs of failing to act, thus considering the full cost of no action.

Adaptation interventions for businesses are measures and activities that aim to reduce a business' vulnerability to climate change exposure. By focusing on vulnerability, businesses can increase their resilience to those climate hazards to which they are exposed. By doing so they can deploy a focused approach to reducing the potential severity of impacts on their business. It is important to distinguish between:

- a. Structural measures reinforcing or strengthening the resilience of a specific asset (i.e. production site, infrastructure), and
- b. Non-structural measures improving the way in which a business is operated and organized. A business has the option to choose interventions to be preventive, preparatory, response or recovery measures.

Cost-benefit analysis (CBA) of adaptation/resilience options helps stakeholders understand the economic efficiency of different adaptation strategies. It provides a systematic approach to evaluate the trade-offs between the costs of implementing adaptation measures and the benefits of avoiding

climate-related damages. Most importantly, CBAs support informed decision-making, ensuring that limited resources are allocated to the most impactful and cost-effective adaptation interventions. Table 3-1 provides examples of cost benefit analysis for adaptation measures. Annex 1 provides a further description of key elements of a cost benefit analysis and the added value of CRA and CBA for businesses.

TABLE 3-11: EXAMPLES OF ASSESSING THE COSTS AND BENEFITS OF ADAPTATION MEASURES AT THE SUB-NATIONAL LEVEL⁷⁰

Early warning systems

Heatwave-warning systems have emerged as one of the most cost-efficient ways to address how heat puts human lives at risk. At the scale of European capital cities (Madrid, London, and Prague), the value of statistical life (VSL)⁷¹ and the value of a life-year (VOLY)⁷² were used to arrive at benefit-cost ratios (BCRs) of a heatwave-warning system ranging between 11 and 3,700 — depending on the valuation method used, the time period considered and the climate scenario^{73, 74}. Regarding river flooding, the benefits from the continental-scale European Flood Awareness System are estimated to amount to EUR 400 for every euro invested, with higher BCRs under lower existing flood protection level scenarios⁷⁵.

Green and grey infrastructure in flood management

In Sandomierz, Poland, a hybrid approach of green and grey infrastructure measures (re-naturalising reservoirs and restoring wetland; expanding, reconstructing, and modernising river embankments; restoring dike functionality; and reconstructing water pumping stations and water discharge channels) was applied to reduce the risk of river flooding. The total cost of these measures was about EUR 217 million. The cost of avoided flood damage to buildings was estimated to be about EUR 445 million in constant values, so the BCR was estimated at over 2 for the built environment alone⁷⁶.

In Prague, after severe river flooding in 2002, fixed and mobile barriers and safety valves in the canal network along the Vltava River were implemented at a cost of EUR 146 million. The estimated benefits were calculated for a once-in-500-years flood event. Avoided costs included those of damage to residential buildings (up to EUR 1,971 million), infrastructure and industrial buildings (up to EUR 613 million), equipment (up to EUR 254 million); environmental and cultural assets (up to EUR 57 million), and the costs of evacuating citizens, cleaning, and other costs, estimated at EUR 74 million⁷⁷.

Floating Offices against sea-level rise

When the Global Centre on Adaptation started planning for its new headquarters in Rotterdam, the Netherlands, a major concern was the area's high flood risk. To adapt to these conditions, it commissioned architecture firm Powerhouse Company and real estate developer Red Company to design and build a three-story office building that floats — making it more resilient against rising sea levels. The low-emissions structure, opened in 2021, also features solar panels and a green roof that absorbs rainwater runoff. Made with a lightweight wood frame, the building can be relocated easily⁷⁸

⁷⁰ EEA, 2020b, Urban adaptation in Europe: how cities and towns respond to climate change, EEA Report No 12/2020, European Environment Agency (<https://www.eea.europa.eu/publications/urban-adaptation-in-europe>).

⁷¹ Value of Statistical Life (VSL): An economic measure used to quantify the benefit of reducing the risk of death. It represents the amount people are willing to pay for small reductions in their risks of dying.

⁷² Value of a Life-Year (VOLY): Similar to VSL but focuses on the value of extending life by one year. This measure is useful when considering the quality and length of life saved.

⁷³ Hunt, A., et al., 2017, 'Climate and weather service provision: Economic appraisal of adaptation to health impacts'. *Climate Services* 7, pp. 78-86 (DOI: 10.1016/j.cliser.2016.10.004).

⁷⁴ Chiabai, A., et al., 2018, 'Valuing deaths or years of life lost? Economic benefits of avoided mortality from early heat warning systems', *Mitigation and Adaptation Strategies for Global Change* 23(7), pp. 1159-1176 (DOI: 10.1007/s11027-017-9778-4).

⁷⁵ Pappenberger, F., et al., 2015, 'The monetary benefit of early flood warnings in Europe', *Environmental Science & Policy* 51, pp. 278-291 (DOI: 10.1016/j.envsci.2015.04.016).

⁷⁶ Climate-ADAPT, 2018c, 'Flood protection in the Upper Vistula river basin: grey and green measures implemented in the Sandomierz area' (<https://climate-adapt.eea.europa.eu/metadata/case-studies/flood-protection-in-the-upper-vistula-river-basin-grey-and-green-measures-implemented-in-the-sandomierz-area>)

⁷⁷ Climate-ADAPT, 2016g, 'Realisation of flood protection measures for the city of Prague' (<https://climate-adapt.eea.europa.eu/metadata/case-studies/realisation-of-flood-protection-measures-for-the-city-of-prague>)

⁷⁸ www.gca.org and Takahashi, A., Lin, F. Y., & Yoshida, I. (2023). Challenges and Success Factors of Realizing Floating Projects—From the Perspectives of Dutch Experts in Floating City Development. In *World Conference on Floating Solutions* (pp. 101-120). Singapore: Springer Nature Singapore

4 ELEVATING PRIVATE SECTOR ENGAGEMENT IN CLIMATE CHANGE ADAPTATION: CHALLENGES, OPPORTUNITIES, AND ENABLING MECHANISMS

Climate change adaptation in the Mediterranean region presents a complex challenge due to its unique environmental, social, and economic characteristics. The region is highly vulnerable to climate impacts such as rising sea levels, increased frequency of extreme weather events, and severe droughts. Addressing the impact of these vulnerabilities across economic sectors requires substantial investments, making the engagement of the private sector pivotal. This chapter explores the challenges and opportunities, roles and responsibilities, financing mechanisms and tools, needed capacities, and enabling environment essential for elevating private sector engagement in catalyzing financing for climate change adaptation in the Mediterranean region.

4.1 CHALLENGES

Investing in climate adaptation is often perceived as risky, with uncertain returns and long payback periods. This in contrast to climate mitigation investments, such as in renewable energy infrastructure, which have received more interest from private financier because they are perceived as more easily ‘investable’⁷⁹. Such investments typically use project finance with predictable cash-flows from which private investors get paid a return on their investment. On the other hand, adaptation investments, for example to address extreme weather events or modernise irrigation systems, are typically considered less well-suited for private sector financing as the generation of predictable cash-flows is less clear.

The perception of climate adaptation investments in the Mediterranean region to be less attractive for private investors is also due to the fluctuating economic conditions and a volatile political landscape in some countries. This is exacerbated by the absence of clear national strategies, regulatory frameworks and incentives for climate adaptation and attracting private finance for adaptation measures. On top of that, there are many inconsistent and often contradictory policies and frameworks across the region that discourage private sector engagement to address climate change adaptation at a more regional scale.

An additional challenge is that many private sector entities in the Mediterranean region lack a comprehensive understanding of the risks posed by climate change and the potential benefits of investing in adaptation measures. This knowledge gap and the inability to translate known risks into investment opportunities often leads to the financing of climate adaptation being a low priority. Moreover, small and medium-sized enterprises (SMEs), which constitute a significant portion of the private sector in the Mediterranean, frequently struggle to access affordable financing, including for adaptation projects. Also, more general sustainability efforts, often lack a specific focus on climate change. For example, in the tourism sector, while certification for sustainability issues is becoming a

⁷⁹ <https://www.lse.ac.uk/granthaminstitute/news/private-investment-for-climate-change-adaptation-difficult-to-finance-or-difficult-to-see-the-finance/>

common “badge of honour”, many of the sustainability schemes do not include climate mitigation actions, and none look at the effects of climate change and potential adaptation measures.

Additionally, the fragmented nature of stakeholders and the diverse impacts of climate change across the region add another layer of complexity, making coordinated action across the region quite challenging. The fragmentation of stakeholders and related interests brings the risk of inefficiencies and duplicated efforts to address climate adaptation needs at local, national and regional levels.

4.2 OPPORTUNITIES

As discussed previously, key sectors such as tourism, agriculture, and water management are highly sensitive to climate impacts. These sectors provide opportunities for focussing private investment in climate adaptation. For example, investments in water efficiency, crop diversification, or soil conservation provide opportunities in the agriculture sector for private investments that can directly contribute to climate adaptation. Similarly, in the water sector, investments in leakage reduction, wastewater reuse and desalination can be profitable investments on which the private sector can engage and simultaneously contribute to climate adaptation. Also, in the tourism sector, opportunities exist to enhance existing sustainability programmes. For example, in Egypt the Green Star Hotel program is a national green certification and capacity-building program managed by the Egyptian Hotel Association under the patronage of the Egyptian Ministry of Tourism⁸⁰. The Green Star Hotel programme offers an opportunity for hotels operating in Egypt to be internationally recognized for raising their environmental performance and social standards while reducing their operational costs. The Green Star Hotel programme has an opportunity to expand its scope and include climate adaptation in training and information support sessions and field audits.

Cooling is another opportunity for countries to in the Mediterranean to show leadership, as is the case in Jordan. In an effort to reduce its energy consumption and GHG emissions, as well as to improve its Refrigeration and Air Conditioning sector, Jordan is looking for solar thermal cooling as an energy-efficient and climate-friendly alternative to conventional cooling technologies. The solar thermal cooling system, which was installed in March 2023 at the Chamber of Commerce office building in Aqaba, Jordan, is part of an EU-funded pilot project. The project aims to demonstrate how solar thermal systems can be used to help reduce cooling-related energy consumption and GHG emissions from office buildings in the Mediterranean region⁸¹.

To turn private financing of adaptation into an opportunity, it is important to accept that climate adaptation finance is likely to look different from climate mitigation finance. Climate change adaptation finance is often understood to take the form of project finance. This is typically a finance modality that is used for public development finance, in particular infrastructure investments. In reality, however, most financing flowing to the private sector does not go to distinct projects but is part of the general financing of businesses. The private financing of climate adaptation is therefore to some extent dependent on the capacity of business to access finance in general.

Hence, for farmers or hoteliers to invest in climate adaptation, they might use existing funds from credit lines at local banks or from their retained earnings. To do so, however, they need a clear business

⁸⁰ <https://www.greenstarhotel.org/>

⁸¹ <https://jordanewe.com/2023/project/jocc-solar-thermal-cooling-system-pilot-project>

motive and see that the investment is relevant to their continued ability to be profitable and serve the market. Thus, if the need for climate adaptation stimulates markets for new products and services, then businesses can develop and market these and create new revenue streams. It is important to note that often such investments are not categorized as climate adaptation finance. For the hospitality industry, for example, adapting to climate change may include reducing their carbon footprint, so mitigation and adaptation are interlinked. As one of the key issues for accommodation providers in the Mediterranean will be to deal with longer periods of extremely high temperatures, the need to reduce the cost of energy is paramount. Installing off-the-grid energy systems, improving insulation and re-fitting out-of-date construction may be funded through mitigation finance, but it will help with adaptation to the new normal.

When it comes to the financing of larger infrastructure developments to adapt to climate change, such as dams or seawalls, private finance is rarely the only source of investment. Many local businesses would not consider themselves responsible for such investments but look at public infrastructure investments to protect their businesses and livelihoods from large-scale catastrophic events such as floods or Mediterranean hurricanes. In some instances, the use of Public Private Partnerships (PPPs) could be the right instrument to attract private finance to invest in these measures by using a ‘project finance’ approach. In other cases, the opportunity for private investment in these measures could be realized through the issuance of green treasury bonds or using other financing instruments.

Beyond PPPs, broader collaboration and partnerships provide another significant opportunity to enhance the financing of climate adaptation strategies. By fostering collaborations between the public and private sectors, local communities, NGOs, as well as international organizations, resources and expertise can be pooled to amplify the impact of adaptation efforts. These synergies could enable the creation of comprehensive and effective solutions to adapt to climate change, building on collective action-oriented initiatives that help to overcome inefficiencies and duplications. Re-greening urban spaces as part of climate friendly tourism development, and at the same time improvement of local living conditions are a case in point of such collaborative actions

Furthermore, technological innovations will play a crucial role in climate adaptation efforts throughout the Mediterranean. Investments in these could be a significant opportunity to mobilize private finance as these can be both profitable and beneficial. Indeed, innovations such as climate-resilient infrastructure, early warning systems, renewable energy and water-efficient technologies offer promising opportunities for private sector investment. For example, choosing drought-resistant crops will protect, and ideally enhance, agricultural yields and income for farmers in the short term. Yet in 10 years from now, weather patterns may have shifted significantly, and agricultural technologies evolved. To remain profitable and being able to adapt, farmers will need to have access to these technologies on a continuous basis. Thus, the best option for agri-businesses is to embrace new technologies, not only to enhance yield and profitability, but also to strengthen sustainability and resilience against climate-related risks in the future.

Finally, the increasing awareness related to Environmental, Social, and Governance and Corporate Social Responsibility (CSR) is leading to new initiatives introduced by corporations at smaller and larger scales. For example, in the hospitality industry certification for sustainability is becoming more and

more common⁸². Such initiatives are often financed by dedicated budget lines within corporations or through (grant) financing provided by corporate foundations. The increased awareness and emerging initiatives provide further opportunities to integrate climate adaptation into core business strategies. It also enhances reputation and competitive advantage and helps engaging pro-actively with local communities and other stakeholders to build climate resilience together.

4.3 ROLES AND RESPONSIBILITIES

4.3.1 PRIVATE SECTOR

The private sector has a critical role and several responsibilities in supporting the attraction of private finance to address climate adaptation in the southern countries of the Mediterranean. The primary role of the private sector is to conduct its business in such a way that it is profitable today and resilient in the face of an uncertain future so that it can attract business financing. This means displaying a form of entrepreneurship that seeks new opportunities to serve clients and pro-actively adapts to changing conditions throughout the entire value chain. One of these changing conditions is climate, but businesses face many uncertainties in the short, medium and long term. Hence, turning climate risks into business opportunities forms a pivotal responsibility of the private sector to contribute to attracting private financing for climate adaptation.

To do so, the private sector has an important role in developing climate-smart products and services that specifically address climate adaptation needs. This requires businesses to invest in research and development to create new climate-resilient products, services, and processes. For instance, agricultural companies can create drought-resistant seeds, technology firms can develop smart water systems, hotels can become more energy-smart and construction companies can build climate-resilient infrastructure. By developing, investing in and promoting climate-resilient products, services and processes, the private sector can create and expand markets for climate adaptation solutions. This can drive demand and stimulate further private investment.

Furthermore, the private sector has a responsibility to actively invest in projects and businesses that enhance climate resilience throughout the Mediterranean region. This includes financing innovations that enhance climate resilience such as sustainable tourism, agriculture modernization, smart water management, low-carbon transport and green infrastructure. The private sector can also pioneer financial innovations such as green bonds, climate adaptation funds, blended finance and innovative insurance that combine public and private investment with innovative risk management. These financial instruments can lower the barrier to entry for private investments in climate.

Corporations operating throughout the Mediterranean region, have a responsibility to integrate climate adaptation into corporate social responsibility (CSR) initiatives and environmental, social, and governance (ESG) criteria. By adopting, using, and actively promoting ESG standards, companies can attract investors who are increasingly looking for sustainable investment opportunities. This implies, however, that corporations take their responsibility to report on their ESG performance, including climate adaptation, seriously. It is only by demonstrating the financial, social and environmental returns of these investments that they can build confidence and attract more private finance.

⁸² <https://www.gstccouncil.org/gstc-criteria/>

Corporates can also be guided by sector specific commitments to address climate change. For example, private actors in the tourism sector can draw inspiration from the Glasgow Declaration on Climate Action in Tourism⁸³. It encourages the acceleration of climate action in the tourism sector by securing commitments to reduce sector emissions by at least 50% over the next decade (2030) and achieve net zero as soon as possible before 2050. Signatories also commit to supporting affected and at-risk communities in climate adaptation and disaster response, align actions with the latest scientific recommendations and prioritize a just and inclusive transformation of tourism⁸⁴.

Finally, the private sector has an important role to play in various forms of partnerships. Businesses can engage in public-private partnerships to leverage both public and private resources for climate adaptation projects. These partnerships can pool finances, share risks, and combine expertise to scale up adaptation efforts. Also, companies have a responsibility to engage with local communities to ensure that adaptation measures and their financing are in sync with the needs of those most affected by climate change. In addition, through various forms of collaboration, corporations in the Mediterranean region can share knowledge, expertise, and help build capacities of SMEs and communities to understand, implement and attract financing for effective climate adaptation actions. By taking on the above roles and responsibilities, the private sector can significantly contribute to attracting and mobilizing private finance for climate adaptation in the southern countries of the Mediterranean, facilitating sustainable and resilient development in the region.

Small and Medium-sized Enterprises have a particularly important role to play, as they form the bulk of the private sector in Northern Africa. For example, most of Egypt's businesses are small-sized, with 97 percent employing fewer than ten workers. Medium-sized enterprises with 10 to 50 employees account for around 2.7% of total businesses, ranging from small stalls to big enterprises. Big businesses with over 50 employees account for 0.4% of all enterprises nationwide⁸⁵.

4.3.2 FINANCE INSTITUTIONS

Finance institutions bear significant responsibilities in attracting private finance for climate adaptation in the Mediterranean region. One of the most important contributions of finance institutions is to support private sector actors with commercial financing of climate adaptation related investments (e.g. water efficiency, renovation & insulation, new products & services related to climate adaptation). In addition, financing institutions can develop and offer tailored financial products such as climate adaptation bonds, green loans, and insurance products designed specifically to support climate adaptation projects. These tailored financial products can make it easier for private investors to participate in funding such initiatives.

Another important role for finance institutions is de-risking of investments. By using financial instruments like guarantees and credit enhancements, finance institutions can mitigate the risks associated with climate adaptation projects. Using such mechanisms can make projects more attractive and financially viable which can encourage additional private investments. Also, finance institutions have a role to play in leveraging public funds to mobilize private capital through blended

⁸³ <https://www.oneplanetnetwork.org/programmes/sustainable-tourism/glasgow-declaration#>

⁸⁴ Tourism and Climate Change Stocktake 2023. <https://tpcc.info/downloads/>

⁸⁵ <https://aaeafrica.org/regional/smes-in-north-africa-opportunities-and-challenges/>

finance approaches. By combining concessional funds from public sources with private investment, they can create a more favourable investment environment for climate adaptation projects.

Furthermore, private insurers and financial institutions can develop and offer innovative risk management and insurance solutions that protect investments from climate-related risks. These tools can make climate adaptation projects more financially viable and attractive to investors. Companies need to integrate climate risk assessment into their business strategies. This involves identifying climate-related risks and implementing measures to mitigate them. It also involves ensuring transparency and accountability based on robust monitoring and evaluation frameworks to track both the incorporation of climate risk mitigation in business strategies and the effective use of supplied capital to for addressing climate adaptation. Based on these, finance institutions can help in showcasing successful projects and demonstrating the financial returns and resilience benefits, to stimulate further appetite among private investors.

Finally, finance institutions have a responsibility to engage with all stakeholders and build innovative partnerships. For example, partnering with governments, finance institutions can help establish policies and regulatory frameworks that support climate adaptation. Finance institutions can also work with local businesses and communities and offer technical assistance and expertise in project preparation and help improving the quality and feasibility of climate adaptation projects. Also, finance institutions can foster collaboration among various stakeholders to raise awareness and promote dialogue to enhance the effectiveness of climate adaptation finance.

By taking on the above roles and responsibilities, finance institutions can take a leadership role in attracting private finance for climate adaptation in the Mediterranean region.

4.3.3 PUBLIC SECTOR

Governments play a crucial role in creating an enabling environment that incentivizes private sector participation in climate change adaptation efforts in the Mediterranean region. One aspect of this is establishing conducive policies, legislation and regulation that encourage private sector investment in climate adaptation. Government also has an important role in creating regulatory incentives, setting standards and enforcing compliance with environmental regulations that stimulate private sector actors to invest in climate adaptation. For example, the Malta Tourism Strategy 2030 is guided by the principle of aspiring for 'Climate Friendly Travel' through implementing a set of local and international actions with the objective of 'Establishing Malta as a Centre for Climate Friendly Travel'⁸⁶.

Furthermore, the public sector has a responsibility to offer financial incentives such as tax breaks to encourage private sector participation in climate change adaptation. In addition, by providing grants, loans, or subsidies, governments can help mobilize additional private financing for climate adaptation measures. For example, governments can offer specific grants or affordable loans to SMEs to encourage investments in climate resilience measures such as water efficiency. Governments can also help reduce the perceived risks associated with climate change adaptation projects by providing guarantees, insurance mechanisms, or creating public-private partnerships (PPPs). PPPs can be an effective mechanism to share risks and leverage private sector investment and expertise to co-finance

⁸⁶ <https://tourism.gov.mt/wp-content/uploads/2023/04/National-Tourism-Strategy-2021-2030.pdf>

and co-develop climate adaptation projects. Also, to support joint initiatives, governments can facilitate access to climate finance and funding from dedicated national and international sources.

For climate adaptation to materialize, new technologies and innovative solutions will be needed. Government has a key role to stimulate innovation and drive Research and Development (R&D) collaboration with the private sector to create cutting-edge solutions for adaptation. It also has a role in setting-up and (co)financing training of private sector actors to enhance their understanding of climate change risks and opportunities, as well as build their technical expertise in implementing climate adaptation measures. This can involve providing training, technical assistance, or knowledge sharing to enhance skills and expertise. Greater knowledge and know-how amongst private sector actors will help to grow their ability to invest in and manage adaptation projects

Finally, the public sector plays an important role in facilitating the sharing of climate data, research findings, and best practices to inform private sector decision-making and encourage investments in climate resiliency. It also plays a key role in establishing mechanisms to monitor and evaluate the effectiveness of adaptation initiatives, ensuring transparency and accountability. By partnering with the private sector in these ways, governments can leverage the expertise, resources, and innovation of businesses to enhance climate resilience and sustainability in the Mediterranean region. A good example is the Regional Center for Renewable Energy and Energy Efficiency (RCREEE) in Cairo; an intergovernmental organization with diplomatic status that aims to enable and increase the adoption of renewable energy and energy efficiency practices across Pan-Arab countries, including many of the target countries of this report⁸⁷.

4.3.4 CIVIL SOCIETY

Civil society in the Mediterranean region plays an important supportive role in mobilizing private finance for climate change adaptation. By advocating for policies and initiatives that promote climate-resilient investments, civil society groups can influence private and public actors to engage more pro-actively in climate adaptation and its financing. Civil society groups also have a role to play in raising awareness of the importance of climate change adaptation and practical ways in which adaptation can be achieved. By engaging in public education campaigns and mobilizing public support, they can create a supportive environment for private sector investment in climate resilience.

Civil society groups often work closely with local communities to build awareness and capacity on a broad range of topics. Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs) have a key role to play in helping communities to ensure that adaptation initiatives are socially inclusive and environmentally sustainable. The training and support they provide can help create community resilience and strengthen communities in being actively involved in the design, decision making process, and implementation of adaptation initiatives. A good example is a new initiative initiated in Tunisia to support tourism start-ups to become more sustainable⁸⁸.

Furthermore, civil society organizations can play a crucial role in monitoring private sector activities related to climate change adaptation. By ensuring transparency, accountability, and adherence to environmental standards, civil society can help drive sustainable practices and responsible investments

⁸⁷ <https://rcreee.org/>

⁸⁸ <https://www.thd.tn/specificity-programme-dacceleration-dedie-aux-startups-specialisees-dans-le-tourisme-durable/>

in climate adaptation measures. Civil society groups can also collaborate with private sector entities to leverage resources, expertise, and networks and facilitate knowledge sharing, capacity building, and innovation to enhance the effectiveness of adaptation initiatives.

By advocating for sustainable practices, raising awareness, involving communities and promoting collaborative efforts, civil society organisations can take on an important supportive role in mobilizing private finance for climate adaptation in the Mediterranean region.

4.3.5 ACADEMIA

Through research, innovation, and knowledge sharing, academia in the Mediterranean region can contribute to attracting private finance for climate change adaptation in a number of ways. First and foremost, academia can conduct research to generate data, analyse trends, and assess climate change impacts in the Mediterranean region. By producing scientific evidence, insight and foresight, academia can inform private sector decision-making and investment strategies for climate adaptation projects. By synthesizing information and insights, it can create valuable lessons learned and create the underpinning of much needed capacity building programmes focused on the most impacted economic sectors such as tourism, agriculture and water management.

Furthermore, research and engineering institutions can be a driver of innovation and the development of new technologies, tools and solutions for climate change adaptation. Creating ‘climate innovation hubs’ allows these institutions to stimulate collaboration with the private sector, facilitate technology transfer, initiate pilot projects, and set-up demonstration initiatives showcasing the feasibility and effectiveness of climate-resilient innovations.

Advanced education centres and engineering schools can also provide dedicated training programs, workshops, and educational resources to build the capacity of stakeholders. For example, with dedicated course offerings on risk assessment, resilience planning, adaptive management, knowledge and training institutions can enhance the skills and knowledge of businesses and other stakeholders to engage in adaptation efforts. Academia can also establish partnerships with private sector entities, research institutes, civil society organizations, and government agencies to foster collaboration, facilitate knowledge exchange, create applied research projects, and mobilize private finance.

Finally, academia can contribute know-how and expertise to policy and strategy development within public and private entities. Providing policy analysis, scenario planning and evidence-based recommendations can help develop effective policy and regulation that promotes private sector investments in climate resilience.

Overall, knowledge and education centres can play an important supportive role in mobilizing private finance for climate resilience through research, innovation, and collaborative partnerships throughout the Mediterranean region.

4.3.6 INTERNATIONAL ORGANIZATIONS

International organizations can play a supportive role in stimulating the private sector engaging in climate adaptation in the Mediterranean region. A role that is best suited for these organisations is the facilitation of partnerships between the public sector, private sector, civil society, and academia to enhance climate adaptation efforts. By fostering multi-stakeholder dialogue and cooperation, these

organizations can help in effective sharing of knowledge, expertise, and resources. Also, international organizations can offer technical assistance and training to help build the adaptive capacity of businesses. This could include, for example, carrying out climate risk assessments, advising on adaptation strategy and planning, supporting implementation of climate-resilient practices, and providing access to information and tools critical for building climate resilience.

Furthermore, international organisations can help mobilize finance and facilitate access to funding mechanisms for climate adaptation projects throughout the Mediterranean region. This includes, for example, providing financial support, setting-up risk-sharing mechanisms, and creating access to private investment or blended finance funds and platforms that support private sector engagement in climate-resilient initiatives. Also, international organizations can promote the transfer of innovations, technology and know-how that help businesses leverage cutting-edge solutions to address climate risks effectively.

International organizations can support the development of supportive policy frameworks and regulations that incentivize and promote climate adaptation investments by the private sector. Through highlighting the urgency of climate adaptation and the importance of private sector involvement, these organisations can mobilize a broad range of stakeholders to raise business interest in investing in climate resilience. Finally, international organizations can monitor, evaluate, and report on the progress and impact of climate adaptation initiatives in which the private sector is collaborating in the Mediterranean region. By tracking outcomes, sharing best practices, and assessing the effectiveness of adaptation measures, they have a key role in coordinating and bringing all stakeholders along in the climate adaptation journey.

4.4 NEEDED CAPACITIES

Engaging effectively in climate change adaptation and accessing related financing opportunities requires private sector actors and other stakeholders to master a multi-faceted skill set, know-how and expertise. Within the developing countries of the Mediterranean regions these are not widely available. To grow climate resilience, capacity-building across several sectors will be needed.

4.4.1 TECHNICAL EXPERTISE

First and foremost, it is important for tourism operators, farmers, water managers or fisherfolk to understand the projections available on climate change, their exposure, vulnerabilities and risks. This includes, for example, understanding the impacts of climate change on tourism infrastructure and visitor patterns, or on crop productivity and fish populations. Each sector will have to focus on developing the specific technical expertise required to build resilience.

For the agriculture sector, this means upskilling of farmers in using drought-resistant and climate-resilient crop varieties, or advanced efficient irrigation systems. Farmers could also receive training to update their skills in practices such as crop rotation, cover cropping, and organic farming to maintain and improve soil health and its water holding capacity. For example, ICARDA works with the Kingdom of Morocco on groundbreaking initiatives to create sustainable and resilient livelihoods for farming

households and contribute to natural resource conservation⁸⁹. For the water sector, skill development could focus on a variety of practices such as rainwater harvesting, aquifer recharge, water distribution & use efficiency, re-use and recycling. In the fisheries sector, the main thrust for training could be on increasing the know-how on innovative techniques, technologies and practices to ensure sustainable fishing, such as through 'catch-shares'^{90,91}, fishing gear modifications, and habitat conservation. In the tourism industry, training can focus on energy friendly air-conditioning and climate friendly travel. For example, the Institute of Tourism Studies in Malta is providing a diploma course in Climate Friendly Travel, helping representatives from the hospitality industry to better understand the risks, challenges and opportunities of climate action⁹².

Throughout the Mediterranean a key area of expertise for climate adaptation is information and communication technology (ICT) and Artificial Intelligence (AI). For the tourism sector this includes, for example, installing Internet of Things (IoT) technology to optimize energy and water use within tourism facilities. Developing the skills in the agriculture sector could include, for example, training to combine satellite imagery, unmanned aerial vehicle (UAV) surveillance, GIS modelling, Deep Learning and IoT, to create the real-time monitoring and early warning systems required for highly innovative precision agriculture. For the fisheries and aquaculture sector, training on ICT could focus on acquiring skills using the latest technology to monitor fish stocks, such as 'bioacoustics'^{93,94}, water quality, and the health of marine ecosystems in support of adaptive fisheries' management.

4.4.2 INNOVATION AND PROJECT MANAGEMENT KNOW-HOW

Beyond technical expertise, private sector actors will need to acquire capacities to be able to innovate, mobilize financing and manage projects and businesses sustainably. It includes project planning and management to reduce carbon footprints, enhancing resource-use efficiency, and improving overall sustainability. In the agriculture sector, for example, this could entail farmers receiving training to implement soil conservation, water-saving irrigation or integrated pest management. For water managers, training could focus on the design and execution of water infrastructure projects aimed at improving storage, irrigation efficiency, and overall water security.

For all business in all sectors, skills to mobilize financing are important. Hence, some private sector actors might need to learn how to write and manage grants and loan applications to financial institutions. Others might need to gain further insight in cost-benefit analysis (CBA) and financial planning for long-term projects and mobilizing the required investment from public and private sources. For all businesses it will be important to know how to effectively manage financial and other resources within a rapidly changing environment.

⁸⁹ <https://www.icarda.org/research/country/morocco>

⁹⁰ <https://www.fisheries.noaa.gov/national/laws-and-policies/catch-shares#>

⁹¹ See Page 73: Catch shares are a type of fisheries management system that allocates a specific portion of the total allowable catch (TAC) of a fishery to individual fishers, cooperatives, or communities. The goal of catch shares is to promote sustainable fishing practices, improve the economic efficiency of fisheries, and prevent overfishing. Under a catch share system, participants have a secure right to a portion of the TAC, which they can harvest, trade, or lease, providing them with an incentive to fish responsibly and maintain the health of the fishery

⁹² https://its.edu.mt/course?course_code=D-CFT

⁹³ <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/bioacoustics#:~:text=Biological%20oceanographers%20use%20active%20sonars,sound%20themselves%20in%20the%20ocean.>

⁹⁴ <https://www.atstrack.com/animal-class/fish.aspx>

4.4.3 RISK MANAGEMENT CAPABILITIES

Doing business inherently comes with taking risks and business people are familiar with this. Climate change, however, poses a different kind of risk, that many might not be that acquainted with (yet). It is therefore important for private sector actors to develop their capacity to assess the risks of climate change for their business and develop strategies and action plans to build climate resilience. Especially for farmers it is important to have the know-how to utilize climate data and forecast models to plan agricultural activities and mitigate risks originating from extreme weather events. For water managers also, it is important they are familiar with advanced hydrological modelling and scenario analysis to develop the capacity to better manage risks associated with more frequent storms, floods, and droughts. For port authorities it is important to understand impacts of unplanned development, sea level rise, erosion and siltation is crucial to better address the sustainability of port operations as shown for Alexandria (Egypt) and Tangier (Morocco)⁹⁵. The risk of damage from climate change is exacerbated by a low public awareness of these growing threats.

Finally, for all private sector actors it will be important to understand when and how to utilize climate insurance products to mitigate financial losses from climate-related disruptions. This includes, for example, farmers taking out an insurance policy to manage financial risks from extreme weather conditions affecting crop yields.

4.4.4 STAKEHOLDER ENGAGEMENT ABILITIES

You cannot adapt to climate change alone. Hence businesses need to engage with a range of stakeholders to effectively develop and implement their climate resilience strategies. First and foremost, they should have the capacity to engage with their clients on their approach and practices related to climate adaptation. For example, in the tourism sector this could include educating hospitality managers and tourists on climate resilience and sustainability practices to encourage their responsible behaviour such as, for example, through a Climate Friendly Travel Diploma as developed by Sun-X⁹⁶. Similar engagement skills are needed to engage financing and government institutions to mobilize (climate) finance, influence policy and regulations, and develop win-win partnership.

Companies and their employees also need to have the skills to build and maintain excellent relationships with local communities and bring them along in an inclusive climate adaptation journey. Activities to undertake could include conducting workshops and training for farmers on climate-smart agricultural practices or engaging local communities in water management practices and decision-making. Activities could also focus on helping agriculture or fisheries cooperatives and co-developing the skill needed to ensure fair distribution of resources and collective bargaining power in times of increasing climate distress. Finally, private sector actors need to develop the know-how to collaborate with research and engineering institutions to be at the forefront of innovations for climate resilience.

In summary, private sector actors throughout the Mediterranean region need a blend of specialized technical expertise, robust risk management capabilities, strong project management skills, proactive

⁹⁵ <https://www.nature.com/articles/s41598-023-40135-3>

⁹⁶ https://www.thesunprogram.com/climate-friendly-travel-diploma?gad_source=1&gclid=Cj0KCCQjwkd00BhDxARIsANkNcrrGnNqoqVuNurzHkOJSDMJqIN4n6uL_Q2mtSN-tSOMUR8tvdaxeAcEaAirmEALw_wcB

stakeholder engagement, and the know-how to leverage modern technology. These competencies are essential for effective climate change adaptation and to access related financing opportunities across critical sectors such as tourism, agriculture, water, and fisheries.

4.5 ENABLING ENVIRONMENT

Creating an enabling environment for private sector engagement in climate change adaptation in the Mediterranean regions involves establishing robust policy, regulatory, and institutional frameworks. These frameworks should encourage private investment, reduce risks, and boost investor confidence. It also includes providing financial incentives and risk transfer mechanism that de-risk private sector investments in climate resilience. The enabling environment also entails mechanisms for capacity building, stakeholder engagement and regional and international cooperation. It is important to understand that some elements of an enabling environment could be taken at a (sub) regional scale, however, a tailored approach considering the specific context of each country in the Mediterranean is important. Below an overview is presented with some examples from various countries in the Mediterranean region.

4.5.1 POLICY FRAMEWORKS

To attract private sector engagement and finance for climate adaptation, it is important that Governments have developed national climate change adaptation policies, strategies and plans that outline the clear direction, goals, priorities, and actions needed to adapt to climate change. Within these, a government needs to clearly define why, how and what private sector participation is sought. Throughout the development of these policies and strategies it is important to seek input from the private sector and their sector specific apex organisations, to ensure the plans address business needs and opportunities.

The development of national climate resilience policies should be fully aligned with broader national development strategies and the Nationally Determined Contributions as committed under the UNFCCC Paris Agreement⁹⁷. In the Mediterranean region, countries are at different stages of the elaboration and updating of their Nationally Determined Contributions (NDC) and specific climate plans and financing strategies. National climate strategies should thus provide a roadmap and investment envelope for building climate resiliency and clearly indicate how the private sector can be involved. The Moroccan 2021 updated NDC provides a clear example in case. This NDC contains an investment strategy that lists a series of climate mitigation and adaptation projects with their investment needs. For instance, it lists seven large climate adaptation projects in the agriculture sector with a financing requirement of EUR 11 billion between 2020 and 2030. It also names two PPP projects to mobilize private sector expertise and investments up to EUR 320 million⁹⁸. Providing such clarity in Government strategies and plans helps to motivate and mobilize private actors to engage in climate adaptation activities.

⁹⁷ https://unfccc.int/NDCREG?gad_source=1&gclid=CjwKCAjw7NmzBhBLEiwAxrHQ-ck9yyisF75DgWcgk-lvF1cmCeyay0q8eE_fnYTBrDO9faKu7K266BoCP2EQAvD_BwE

⁹⁸ https://www.4c.ma/_files/ugd/3c9136_7069eaaa6c7b407f819a8faa3701b8f8.pdf?index=true

Beyond the national development and climate strategies, there is a need to incorporate climate resiliency plans in sector-specific policies and initiatives. In these, the contributions of private sector actors in each sector can be further elaborated. Also, in some countries, regions and cities have developed their own climate policies and strategies and in some of these, the contribution of the private sector is indicated. The advantage of these sector-specific and sub-national strategies is that a broader set of stakeholders can be consulted during its development and be mobilized for its implementation.

Finally, the Governments in the Mediterranean region can introduce green procurement policies that prioritize the sourcing of goods and services from climate-resilient businesses. This can create market incentives for companies to invest in climate adaptation and innovation.

4.5.2 REGULATORY FRAMEWORKS

To promote private sector participation in climate adaptation, Governments can enact a number of regulatory reforms. One such set of reforms can focus on creating a supportive environment for private sector involvement in climate adaptation, such as streamlining permitting processes for climate resiliency projects by creating fast-track pathways for projects that meet climate resilience criteria.

Another set of reforms can focus on establishing regulatory frameworks that promote climate-smart practices and technologies. This can include setting irrigation water efficiency standards or building codes and infrastructure standards that incorporate climate resilience. The implementation of these standards would require a mandatory compliance by companies for new constructions and retrofitting of existing infrastructure with these new standards and norms.

A third set of regulatory reforms could focus on Climate Risk Assessment (CRA) standards. This would entail developing and implementing standardized CRA protocols that companies must adhere to. These CRA standards can also be made mandatory for certain projects. These standards can help businesses identify and manage climate risks effectively in their operations and investments and support them to become more resilient. Another option is to update the Environmental Impact Assessments (EIAs) regulation and ensure that a standardized CRA is fully integrated in any EIA. The EIA update also needs to mandate that EIAs (incl. CRAs) are mandatory for certain projects, including climate adaptation initiatives.

Finally, there is an opportunity for Governments to develop regulations that mandate businesses to report and disclose their climate risks and their materiality⁹⁹. This involves reporting on double materiality: the impact of the business on climate and the impact of climate change on the business. Such regulation will also require firms to disclose information on their climate adaptation strategies, actions, and performance in their annual reports. This promotes transparency, accountability, and the integration of climate risks and adaptation into business decision-making. Countries could consider following the recently enacted European Corporate Sustainability Reporting Directive in this regard¹⁰⁰.

⁹⁹ Materiality refers to the significance of a risk or impact in the context of a business's operations, financial performance, or overall strategy. A risk is considered material if it has the potential to influence the decisions of investors, stakeholders, or management.

¹⁰⁰ https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#:~:text=EU%20law%20requires%20all%20large,on%20people%20and%20the%20environment.

4.5.3 INSTITUTIONAL FRAMEWORKS

As climate adaptation runs across sectors, it is important for Government to establish inter-ministerial coordination mechanisms. This would allow the development and implementation of a coherent approach across Government departments for engaging private sector actors in climate adaptation. Within Ministries, one can also consider the establishment of dedicated climate adaptation departments, agencies or units that develop the competency on specific aspects of climate resilience (i.e. coastal zones, water systems or crop – climate resilience). These departments can coordinate efforts, develop strategies, and engage with the private sector to drive adaptation initiatives. It will be important to ensure these units have the authority and resources to implement policies and can connect with the private sector for expertise, know-how and seeking engagement.

To mobilize private finance for climate resilience initiatives, it will be important to establish a dedicated unit focused on Public-Private Partnerships (PPPs) and incorporate climate adaptation actions in their work programmes. A number of countries in the Mediterranean region already have set-up PPP units, including Morocco, Tunisia, Egypt and Jordan (see section 5.1.1 for more details). PPP units bring together government agencies, companies, and financial institutions to develop and implement projects of public interest with a mix of private and public finance.

Furthermore, for climate adaptation to become mainstream, it will be important to establish platforms for dialogue and collaboration among governments, businesses, NGOs, communities and academia. With the organization of regular forums and workshops, new relationships can be established and cooperation with the private sector can be encouraged. The establishment of climate innovation hubs can further promote the cooperation between the private sector, academia and Government and mobilize financing for the deployment of innovative solutions for climate resilience.

4.5.4 FINANCING INCENTIVES AND RISK TRANSFER

For encouraging private sector participation in climate adaptation initiatives, it will be important to develop a broad set of financial incentives and risk transfer mechanisms. To promote engagement, the Government can create regulatory incentives such as tax breaks, rebates, subsidies and grants for climate-resilient investments in infrastructure or production facilities. Best would be to target specific sectors and technologies with the highest potential to attract private sector investment and achieve the identified adaptation potential, such as tourism facilities, water efficiency, crop improvements or desalination. To be successful in this regard, it will be important to simplify application processes, provide financial incentives, and streamline regulations related to the use of provided climate adaptation co-finance

To support businesses to attract green finance for their adaptation projects, it will be important to have policies in place that support companies in issuing green bonds and gaining access to international climate funds and green Foreign Direct Investments (FDI). This could include providing guarantees or partial risk-sharing mechanisms to lower the risk for green bond investors. Also, by issuance of sovereign green bonds, the Government can set the scene for subsequent private issuance of sustainability related bonds. Governments can also promote the use of blended finance models combining public and private investments. In such case, the role of public funds would be to de-risk private investments through grants, concessional loans, or equity stakes.

Finally, it will be important to introduce and promote climate (and extreme weather) risk insurance schemes to protect private sector investments from climate-and extreme weather related risks and uncertainties. They can help mitigate financial risks associated with extreme weather and climate-related disasters and provide some level of financial security to encourage businesses to engage in adaptation activities.

4.5.5 CAPACITY BUILDING AND TECHNOLOGY TRANSFER

As climate adaptation know-how and expertise is not widely available, it will be important to enhance the capacity of both public and private sector actors through training programs, workshops, and knowledge-sharing initiatives. Sector specific technical assistance programmes can help boost the capacity of the workforce to design and implement adaptation measures. Tailored and targeted subsidies or grants for technical training and capacity-building initiatives could help accelerate the engagement of the private sector. To be effective, it will be important to work closely with sector specific training institutions, research centres and engineering schools and to introduce/integrate such discipline into academic courses and programs.

Creating climate resilience depends partly on the ability to effectively use new technology. For SMEs to adopt new technologies, the transfer of these technologies needs to be facilitated. For enhancing the capacity of local businesses to learn about, understand, accept and adopt new technologies, local training by specialized consultants and sectors trainers is key. Furthermore, new technologies will need to be developed and adapted to local conditions. Research and Development (R&D) tax credits and grants can stimulate the private sector to invest in this technology development and its transfer to the local level.

4.5.6 STAKEHOLDER ENGAGEMENT AND COMMUNITY INVOLVEMENT

For many private sector actors, climate adaptation is relatively unknown and not considered a factor in daily business, especially so for most SMEs in the Mediterranean region. Therefore, public awareness campaigns on the importance of creating resilience against extreme weather events and climate change is critical. Within these, the important role that the private sector plays, including SMEs, needs to be clearly communicated. Examples include a recognition and awards programme for businesses leading in climate resilience, or a national campaign highlighting successful private sector-led adaptation projects.

As climate adaptation is a local affair, mobilizing local communities and their SMEs will help to realize actions and achieve results on the ground faster. This can be done by promoting community-based adaptation projects that involve local businesses and residents. Local government and business can offer grants and subsidies for community-led initiatives.

Furthermore, engaging stakeholders on climate adaptation can be done effectively through public-private-people dialogue platforms where public sector officials, private sector representatives, and civil society organizations can discuss, debate, share insights, collaborate, and co-design climate adaptation projects. Such dialogue mechanisms can facilitate the alignment of strategies, actions and resources and create exciting new opportunities to engage the private sector and co-create climate adaptation projects, leveraging the expertise and resources of civil society, private sector and public sector actors.

Engaging with a wide range of stakeholders, including local communities, civil society, and the private sector, can build trust and support for climate adaptation initiatives. This inclusive approach can help raise awareness, address concerns, mitigate risks, and create a positive investment climate. The lack of such an approach can compromise the creation of climate resilience. For example, a recent study in Alexandria (Egypt) found that there is limited awareness amongst the local residents of Alexandria's coastal vulnerabilities. The lack of public interest hampers building out the city's resilience to coastal hazards from climate change and aggravates the ecological and coastal degradation. The study suggests an adaptive plan focused on the regeneration of waterways to restore their roles in addressing climatic challenges and improving public connectivity to the historic marine identity of the city¹⁰¹.

4.5.7 REGIONAL AND INTERNATIONAL COLLABORATION

To accelerate climate adaptation and the involvement of the private sector, engagement in international partnerships, networks, and funding mechanisms is key. These provide access to regional and global expertise and opportunities to mobilize additional resources for climate adaptation projects. By participating in global climate and business forums, the government can facilitate cooperation with the private sector on adaptation efforts.

Engaging at the regional and international levels, also enables technology transfer and access to knowledge and expertise on climate adaptation that is available within research institutions, engineering schools and the private sector around the world. Without promoting all stakeholders to engage at the regional and global levels, innovative ideas, scientific knowledge and new engineering solutions might not become easily available in a country.

International cooperation also allows to access international development and climate financing mechanisms and stimulate FDI. By highlighting the market opportunities and demand for climate resilient services in specific sectors, private investors can be attracted to participate in projects or businesses dedicated to creating climate resilience.

By embracing these policy frameworks and tailoring them to the unique socio-economic and environmental conditions of each country in the southern and eastern Mediterranean region, governments can create an enabling environment for private sector engagement in catalysing financing for climate change adaptation. This approach can foster sustainable development, resilience, and innovation in the face of a changing climate.

¹⁰¹ <https://www.sciencedirect.com/science/article/pii/S026427512300238X>

5 IMPLEMENTATION CASES AND LESSONS LEARNED OF PRIVATE SECTOR ENGAGEMENT IN CLIMATE CHANGE ADAPTATION IN THE MEDITERRANEAN

In this chapter, the various mechanisms that are available to attract private financing for climate adaptation are documented. For each of these, case studies are provided that highlight the key actors involved and the successes achieved. Also, the potential of using the mechanisms for climate adaptation in the Mediterranean is further elaborated.

5.1 PUBLIC-PRIVATE PARTNERSHIPS (PPPs)

Public Private Partnerships (PPPs) allow for the sharing of risks, costs, and expertise between the public and private sectors to deliver effective and sustainable solutions. PPPs are commonly used for attracting (co)financing for the construction and operation of infrastructure assets. Around the world there is a wide experience with the application of PPPs. An important resource is provided by the World Bank's Public-Private Partnership Legal Resource Center¹⁰². It provides access to an array of sample legal materials which can assist in the planning, design and legal structuring of a project which involves a public-private partnership. It also provides information on the overall policy and legal framework that needs to be in place to be able to set-up PPPs.

PPPs could provide means to mobilize private expertise, know-how and financing for climate adaptation related projects, but several pros and cons are to be considered. On the positive side, PPPs enable the mobilization of private sector investment, reducing the burden on public finances and enabling the development of large-scale infrastructure projects without solely relying on government funding. Private sector partners often bring superior technical expertise, innovative technologies, and efficient management practices. PPPs help sharing risks associated with construction, operation, and maintenance with private sector actors' involvement leading to more efficient project delivery, with project delivery being on time and within budget. PPP contracts typically include performance-based measures that ensure high standards in construction and operation, which can lead to better quality and more reliable service delivery. The long-term nature of PPP contracts encourages both public and private partners to focus on sustainable and resilient project designs that account for future climate and environmental challenges.

On the negative side, PPPs contracts require a stable and well established PPP framework creating trust with those private sector actors that are willing to engage. Such frameworks take time and political will to establish. Furthermore, PPPs are known to be complex and time-consuming to negotiate, often requiring significant legal, financial, and technical expertise, which can delay project initiation. The process of setting up and managing a PPP can incur higher transaction costs, including legal fees, consultancy charges, and administrative expenses. As private companies seek to achieve a return on their investments, a PPP model could lead to higher (water) tariffs for consumers, making the service less affordable, particularly for vulnerable populations. Also, disputes between the public and private partners over contract terms, performance standards, or financial arrangements can arise,

¹⁰² <https://ppp.worldbank.org/public-private-partnership/tools>

potentially leading to project delays or increased costs. In addition, PPPs can face criticism over the perceived lack of public control and oversight and the long-term commitments can limit the public sector's flexibility to adjust terms or take over the project if circumstances change or if the private partner fails to meet expectations.

With respect to climate adaptation in the Mediterranean, PPPs are most relevant for two main economic sectors: water and transport. In the water sector, PPPs are used for infrastructure projects focused on bulk water treatment, desalination, water distribution (urban & irrigation), sewerage systems and wastewater treatment plants. In the transport sector, PPPs are mostly used for roads, light-rail and ports. Depending on the type of PPP contract, projects can entail the involvement of the private sector in different ways, including in construction, rehabilitation or operation of new or existing infrastructure. PPP contracts can vary from relatively short duration < 1 year to long-term engagement of up to 30 years.

TABLE 5-1: PPP UNITS IN DEVELOPING COUNTRIES IN THE MEDITERRANEAN REGION

Country	Unit name	Hosting Agency	Function
Algeria ¹⁰³	No PPP unit	Ministry of Finance	Regulatory Authority for Public Procurement and Public Service Delegations is responsible for PPPs.
Egypt ¹⁰⁴	PPP Central Unit	Ministry of Finance	The PPP Unit is in charge of the study, application, implementation as well as coordination with line Ministries and with the Private Sector.
Israel ¹⁰⁵	PPP Projects Unit & Accountant General Department	Inbal (Government Company) & Ministry of Finance	PPP Projects Unit located at the governmental company Inbal. However, PPP projects in Israel are promoted by several governmental authorities
Jordan ¹⁰⁶	PPP Directorate	Prime Minister's Office	PPP Directorate oversees the development of PPP projects across Jordan.
Lebanon ¹⁰⁷	Higher Council for Privatization	Council for Development and Reconstruction	The Higher Council for Privatization and Partnerships (HCPP) is the authority in charge of planning and implementing privatization programs.
Libya	No PPP unit		
Morocco ¹⁰⁸	Department of Public Enterprises and Privatisation	Ministry of Economy and Finance	PPP unit is set up under the Ministry of Economy and Finance to identify new projects. In 2020, a "National Public-Private Partnership Commission" with the Head of Government was set-up.
Palestine	No PPP unit		
Syria ¹⁰⁹	PPP Bureau	Office of the Deputy Prime, Minister of Economic Affairs	n/a
Tunisia ¹¹⁰	« Instance générale de partenariat public privé »	Ministry of Finance	PPP and Concession contracts are both governed by the same Unit: l'Instance nationale des PPP.

To promote, facilitate or assess PPPs, many of the developing countries in the Mediterranean region have set-up a PPP unit within or outside a Ministry. These units can be government departments,

¹⁰³ <https://www.mf.gov.dz/index.php/fr/>

¹⁰⁴ <http://pppcentralunit.mof.gov.eg/Home/>

¹⁰⁵ <https://israel-trade.net/wp-content/uploads/2021/02/PPP-Projects-in-Israel-Jan-2021.pdf>

¹⁰⁶ <https://www.invest.jo/public-private-partnership-ppp>

¹⁰⁷ <https://www.cdr.gov.lb/en-US/>

¹⁰⁸ https://www.finances.gov.ma/en/The_Ministry/Pages/Department-of-Public-Enterprises-and-Privatisation.aspx

¹⁰⁹ https://syrecon.gov.sy/?page=category&category_id=11&lang=ar

¹¹⁰ <https://igppp.tn/fr/organisation-0>

agencies, or semi-independent organizations created with full or partial central government control. Table 5-1 provides an overview of the PPP units of nations in the southern and eastern Mediterranean region. With respect to climate adaptation, existing PPP units could be further strengthened to better support specific adaptation projects and identify, assess, and manage risks associated with these. It will also be important for PPP units to incorporate CRA into the development of all projects in the PPP unit's portfolio.

5.1.1 PPP EXAMPLES IN THE MEDITERRANEAN REGION

Throughout the Mediterranean region, a range of PPP projects have been carried out and are currently ongoing in the water sector that are relevant for climate adaptation. Some examples of these projects are provided below.

Jordan – Urban water loss reduction PPP

Most recently, the Government of Jordan has initiated the preparation of a PPP in the water sector focused on water loss reduction by Miyahouna LLC, the main water utility in Jordan. The company was established in 2007 and supplies potable water to 98% of the 6 million residents of Greater Amman. Miyahuna is 100% publicly owned by the Water Authority of Jordan. Urban water loss reduction in the area is to be achieved through implementing projects to replace and enhance water networks and improve their performance. Supported by the International Finance Corporation (IFC) the preparation of technical and financial feasibility studies as well as all legal and financial documents have been initiated. Once completed, Miyahuna and the Public-Private Partnership Unit of the Ministry of Investment will then be able to attract specialised private companies to implement the project based on a performance-based contract.

Lebanon – Bulk water conveyer PPP

The project is providing water from "Qaraoun lake" and conveying it starting from Markaba plant through a system of civil structures and pipelines for domestic use¹¹¹. Phase 1 consists of conveying the water through a 73 km long main conveyer and 20 terminal reservoirs with a total storage capacity of 160,000 cubic metre serving around 100 villages. The finalization of the project is delayed as the project was originally planned to be completed in 2022. This is partly due to insufficient funds being available for financing the expropriation of lands. This led to the refusal by some residents to allow construction works to take place on their property¹¹². The private consortium constructing the project involves contractors from Turkey (Guris, Vezirogly) and Kuwait (Kharafi Construction) which are supported by international consultations (Lahmeyer Int. GmbH / JBG-Gauff Ingenieur / Dar Al-Handasah Shair & Partners). The total project costs are USD 413 million with financing provided by the Arab Fund for Economic and Social Development (USD 179 million) and the Kuwait Fund for Arab Economic Development (USD 134 million). The Lebanese Council for Development & Reconstruction is to provide financing of USD 88 million.

Israel – Desalination facilities PPPs

¹¹¹ <https://www.cdr.gov.lb/Projects/ProjectDetail.aspx?contractId=12112>

¹¹² <https://www.cdr.gov.lb/Projects/ProjectDetail.aspx?contractId=12112>

Since 2003, Israel has developed six PPP projects focused on developing its desalination capacity (Table 5-2)¹¹³. The total installed capacity is 795 million m³ per year based on an investment of EUR 2,300 billion over 20 year period. Currently, one more PPP project for a desalination facility is under development. This ‘Western Galilea Desalination Facility’ is to produce between 100 million m³ per year and is currently being constructed with financial support from the European Investment Bank (EIB) (EUR 150 million of the total of EUR 425 million). The completion of the project will bring Israel’s desalination capacity to close to 900 million m³ per year covering the water demand of 85-90% of household and industrial water consumers¹¹⁴.

TABLE 5-2: PPP PROJECTS FOCUSED ON DESALINATION IN ISRAEL

Project	Capacity (million m ³ /year)	Construction cost (million EUR)	Start and End of Concession	Concessioner	Shareholders in the Concessioner	Main Finance Providers
Ashkelon Desalination Facility	118	275	2005 - 2027	VID	Keystone; Odem-Veridis	Leumi
Palmahim Desalination Facility	90	250	2007 - 2029	GESM	Generation, migdal	Hapoalim
Hadera Desalination Facility	137	425	2009 - 2023	H2ID	Shikun & Binui; IDE	Hapoalim; EIB; Clal Group
Sorek A Desalination Facility	150	425	2013 - 2037	SDL	Dan Capital	Hapoalim; EIB
Ashdod Desalination Facility	100	375	2015 -2038	ADL	Mekorot	EIB; Hapoalim
Sorek B Desalination Facility	200	550	2024 (predicted) - 2048	S.M.S IDE	IDE	Leumi; KFW; EIB
Total	795	2,300				

Morocco – Desalination facility PPP

The project in the Chtouka Aït Baha Plain in the Souss-Massa region includes the construction and operation of a desalination facility (167,000 m³/day) and irrigation scheme (18,000 ha) for an estimated investment costs of ca. EUR 315 million¹¹⁵. The project was commissioned in March 2020 and constructed by Aman El Baraka, a subsidiary of Abengoa (Spain) under a public-private partnership (PPP). The company is responsible for co-financing, designing, building, operating and managing the desalination and the irrigation infrastructure for a period of 20 years. The project will increase the resilience of 1,000 farmers in an arid region threatened by changes in rainfall patterns. The project will avoid economic losses due to drought and preserve the Chtouka water table on which the Souss-Massa Natural Park is also depending¹¹⁶.

Egypt – Desalination PPP

Egypt’s government promotes PPPs to finance large-scale projects such as desalination plants. Egypt’s water desalination program entails the launch of several projects covering a total planned capacity of 8.85 million m³/day by 2050 of which 3.35 million m³/day is planned by 2025 as the (“First Phase”). The program, let by the Sovereign Fund of Egypt with technical assistance from the Ministry of Finance’s PPP Central Unit, has prequalified 17 consortia to be invited to the tendering process to

¹¹³ <https://israel-trade.net/wp-content/uploads/2021/02/PPP-Projects-in-Israel-Jan-2021.pdf>

¹¹⁴ <https://www.eib.org/en/press/all/2023-245-eur-150-million-eib-backing-for-western-galilee-water-desalination-project>

¹¹⁵ https://www.4c.ma/_files/ugd/3c9136_7069eaaa6c7b407f819a8faa3701b8f8.pdf?index=true

¹¹⁶ <https://www.afrik21.africa/en/morocco-after-3-years-of-work-the-ghtouka-desalination-plant-is-now-operational/>

attract foreign and local strategic private investors. The key objectives are developing, constructing and operating the plants, powering them with renewable energy sources, transferring technology and localizing the manufacturing of key desalination components¹¹⁷.

Egypt – Renewable power generation PPP

Dubai-based AMEA Power is one of the fastest growing renewable energy companies in the region with a clean energy pipeline of over 6 Giga Watt (GW) across 20 countries. Located in Kom Ombo, within the Aswan Governorate of Egypt, AMEA Power will build, own and operate a 500 Mega Watt (MW) solar Photo Voltaic (PV) power plant through its subsidiary Abydos Solar Power Company. AMEA Power has signed power purchase agreements with the Egyptian Electricity Transmission Company, and Usufruct Agreements with the New and Renewable Energy Authority, having completed feasibility studies for the project¹¹⁸. (Source:)

Jordan – Solar power plant PPP

Al Husainiyah Solar Power Plant project located in Ma'an Jordan with a total capacity of 66 Mega Watt peak (MWp) is one of the largest solar power plants in the region. Philadelphia Solar (PS) has been developing the project since 2014 and signed a strategic partnership with AMEA Power in 2017, to reach commercial operation in September of 2021. PS has collaborated to supply 200,000 high-quality Jordanian-origin PV modules, as well as to provide Engineering, Procurement, and Construction (EPC) services. The project created jobs for Jordanians from the Southern Badia, helping to improve the economic situation to achieve comprehensive and sustainable national development, and now benefits 50,000 families with clean energy from the Al-Husainiyah plant project¹¹⁹.

5.1.2 LESSONS LEARNED FROM PPP'S

Overall, PPPs provide an option for attracting private finance for large scale infrastructure projects that form part of building climate resilience in the Mediterranean region. These projects can address urgent climate adaptation needs, such as addressing water scarcity, while leveraging private sector investment and expertise. However, careful planning, transparent processes, and strong regulatory frameworks are essential to navigate the complexities and mitigate the potential downsides of such partnerships. To embark on a specific PPP project, it is important to establish clear objectives, robust contract management, and active stakeholder involvement. Based on the many PPP projects that have been carried out across the world, a number of lessons can be learned. Below a short summary is provided of these¹²⁰.

Lesson 1 emphasizes that political factors are often the main cause of disruption in PPP transactions. It is vital to avoid trying to close a PPP transaction close to elections (12 – 18 months) since governments avoid potentially controversial actions close to these. It is also important to assess (top-level) political commitment and identify a project champion early on. Furthermore, one has to identify vested interests, and determine whether provincial or local-level transactions need national-level buy-in.

¹¹⁷ <https://smartwatermagazine.com/news/sovereign-fund-egypt/egypt-prequalifies-17-consortia-its-water-desalination-program>

¹¹⁸ <https://www.ameapower.com/projects/>

¹¹⁹ <https://jordane.com/2023/project/al-husainiyah-solar-power-plant>

¹²⁰ Synthesized from: Marin, P. 2009. Public-private partnerships for urban water utilities: a review of experiences in developing countries, and IFC 2010. IFC Advisory Services in Public-Private Partnerships - Lessons from our work in infrastructure, health and education

Lesson 2 underscores the importance of ensuring project fundamentals are solid, and addressing questions of necessity, affordability, attractiveness, and legality. Early in the process, one has to assess a project's financial viability through conducting financial assessments and checking investor (and lender) interest informally with a few local and international players. One also has to clarify whether the necessary legal and regulatory frameworks are in place that provide the necessary stability and clarity for a PPP project. It is also critical to ensure public interests are safeguarded throughout the process and that the services provided through the PPP project are affordable and equitable.

Lesson 3 stresses the significance of effective team management and planning for successful outcomes, including diverse expertise and early donor funding. This includes a wise selection of technical and sector specialists who can best determine project needs, sizing, and specifications, and transaction lawyers that know the legal framework and can put the project into proper contracts. To accelerate the project development, it is important to compile all relevant data (client, project, stakeholders, legal, financial etc.) and organize a joint kick-off session with the transaction advisor, the consultants, and the government team to get everybody on the same track.

Lesson 4 focuses on making contracts bankable and sustainable by ensuring realistic risk allocation and managing government and investor expectations. Properly allocating risks between public and private partners is essential to the success of a PPP project. Regularly checking the risk allocation matrix with investors and lenders to get their reaction and identify any 'deal breaker' and 'desirable-but-not-essential' elements. Also having potential investors express their ideas and concerns to the government directly can help identify and deal with unrealistic assumptions of both the government and investors.

Lesson 5 highlights the critical role of transparency throughout the transaction process to maintain credibility and trust among stakeholders. A lack of neutrality or transparency, particularly in structuring and implementing prequalification and bidding, can lead to a negative perception and result in negative press and lawsuits. To create neutrality, one could define quantifiable and verifiable technical and financial criteria against which bids are evaluated. Furthermore, to maintain trust it is important to involve all relevant stakeholders early in the PPP process. This can help mitigate conflicts and ensure project viability.

Lesson 6 addresses the importance of robust monitoring and evaluation mechanisms and the ability to be flexible and adaptive. Tracking the progress on the development and implementation of a PPP project is critical for its success and sustainability. As payment clauses often refer to the achievement of certain targets, it is critical that the monitoring is well done and communicated regularly to continue to build a trusted relationship. This trust is key to creating to capacity to be flexible and adaptive to changing circumstances and market conditions, and delivering a sustainable PPP project, including with the same, or even reduced, consumer tariffs.

Lesson 7 emphasizes the importance of building the capacity and sharing knowledge and expertise. Investing in building the capacity of both public and private partners is key to successful implementation and management of PPP projects. This often entails changing senior management and training (young) local staff to deliver management and operational efficiencies. To improve future PPP project design, development and implementation, it is important to share lessons and learn from past PPP experiences, for example through utility-utility partnerships and exchange mechanisms.

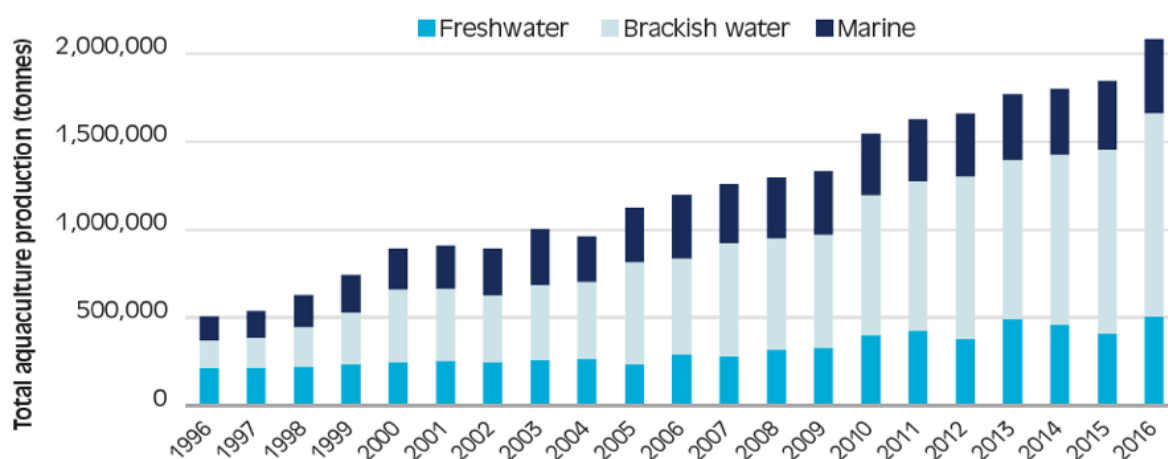
By incorporating the above lessons on political factors, project fundamentals, effective team management, bankability, risk allocation, transparency, stakeholder engagement, and capacity building, PPP projects in various sectors can enhance the financial viability to deliver climate adaptation outcomes.

5.2 GREEN/BLUE ECONOMY ENTREPRENEURSHIP

Investing in green and blue economy entrepreneurship plays a crucial role in financing climate adaptation in the Southern Mediterranean region. Green and Blue businesses focus on commercially viable sustainable practices. These can help combat the adverse effects of climate change while nurturing the resilience of ecosystems. Businesses within the green economy sector prioritize environmental sustainability and efficiency in resource usage, aiming to curb carbon emissions and minimize ecological harm. Concurrently, blue economy entrepreneurship focuses on the sustainable exploitation of marine and coastal resources.

Within the blue economy in the Mediterranean region, aquaculture plays a major role in economic growth and food security while reducing dependence on overexploited wild fish stocks. Aquaculture has developed at a sustained pace over the past 20 years, with an average annual growth rate of 5% between 1994 and 2015. Total production of fish and shellfish from aquaculture amounts to approximately 2.4 million tonnes. (Figure 5-1)¹²¹. This growth poses numerous and complex sustainability challenges and explains why major strategic initiatives of regional cooperation developed over the last few years have addressed the issue of sustainable aquaculture. The last communications of the European Commission, along with the establishment of the new European Maritime, Fisheries and Aquaculture Fund (EMFAF) for the programming period 2021-2027 demonstrates the willingness to move towards sustainable aquaculture at EU and, as a consequence, at Mediterranean level.

FIGURE 5-1: AQUACULTURE PRODUCTION IN THE MEDITERRANEAN COUNTRIES. ALL SPECIES AND ENVIRONMENTS ARE INCLUDED¹²²



Entrepreneurs engaged in green/blue economy endeavours to channel investments into technologies and methodologies that reduce greenhouse gas emissions and help adapt to climate change. In Egypt,

¹²¹ <https://planbleu.org/page-theme/aquaculture/>

¹²² <https://planbleu.org/page-theme/aquaculture/>

for example, Hydrofarms for Agri-solutions, an Egyptian Agri-tech entrepreneur, specializes in the application of smart technology & AI tailored to the regional environmental & market needs¹²³. Plug'n'Grow is another example from Egypt. The technology company develops and commercialises full scale hydroponic, aquaponic, and intensive aquaculture systems, services, and solutions, that specifically cater to the MENA region's geographic, economic, and climatic needs¹²⁴.

In Jordan, various entrepreneurs engage in climate adaptation related business opportunities, such as the Abu Sido family - one of the oldest agricultural families in Jordan. Supported by Royal Brinkman (The Netherlands), the family built a 7,054 m² multi span greenhouse, that includes all the latest technologies such as a 'climate computer': a central system that controls irrigation and fogging to provide the right growing conditions to young tomato plants. Started in 2017, Abu Sido now grows several varieties of tomato that are exported to several countries in the region¹²⁵.

In Tunisia green and blue economy entrepreneurship is also gaining traction. For example, Methania, a Tunisia-based biogas provider, helps small dairy farmers repurpose their manure into useful fertilizer thereby preventing methane emissions and reducing water pollution. Their JallaGaz technology also helps turn agriculture waste into biogas, that can be converted into green electricity. Founded in 2015, Methania now combines the most advanced technologies with expertise in engineering, management and project execution to help farmers increase revenues by 15–20% with earnings from biogas and fertilizer¹²⁶.

Similar as in other countries, green and blue economy entrepreneurship is also emerging in Morocco. Pro Terra Maroc, for example, is developing a complete sustainable fish farm that reduces pressure on coastal resources by establishing a 'polyculture' in which fish-feed (algae, cichlids) are produced on-site in the desert to feed the tilapia fish cultivation that includes a hatchery¹²⁷. By early 2023, Pro Terra Maroc had almost raised EUR 4 million from impact investors, the founding team and the clean & green managers and was seeking to mobilize the remaining 30% needed by crowd funding through the Conda platform^{128,129}.

By focusing on innovative agriculture, smart water management, sustainable tourism and fisheries, green and blue economy entrepreneurship can shape a more sustainable and climate-resilient economy on the ground throughout the Mediterranean.

5.3 BANKING FOR WEFE NEXUS

Water availability is key for energy, agriculture and the environment, yet its availability is heavily impacted by climate change. To overcome looming water scarcity in the Mediterranean region, it is widely recognized that a Water, Energy, Food & Environment (WEFE) nexus approach needs to be adopted more broadly and attract more financing¹³⁰. In some countries, the interest of using a WEFE

¹²³ <https://www.linkedin.com/company/hydrofarms-for-agri-solutions/about/>

¹²⁴ <https://www.linkedin.com/company/plug-n-grow/>

¹²⁵ <https://royalbrinkman.com/international-projects/abu-sido>

¹²⁶ <https://medium.com/usaid-invest/tunisian-company-helps-dairy-farmers-convert-waste-into-revenue-757a9caf845a> and <https://www.linkedin.com/company/methania/>

¹²⁷ <http://protterra.ma/index-fr.html>

¹²⁸ https://cleanandgreen.holdings/en/protterra-maroc/#weglot_switcher

¹²⁹ <https://www.conda.de/uber-conda/>

¹³⁰ UfM 2023. Applying a Water-EnergyFood-Environment nexus approach to water finance and investments. UfM WATER FINANCE SERIES #5. https://south.euneighbours.eu/wp-content/uploads/2024/06/WaterFinance_Report_2023_num5-01_compressed.pdf

approach is growing and increasingly integrated in river basin management plans (France) and the focus of some national platforms (Morocco, Jordan).

However, not enough attention is being paid in many countries to engaging private sector investors in the water sector and in the WEFE nexus approach¹³¹. Domestic commercial finance institutions (commercial banks) are looking for opportunities to lend money to projects with appropriate risk/return profiles, which might not be easily found when focusing on a WEFE nexus approach. However, there are opportunities to blend development finance (including guarantees) and domestic commercial finance to create the appropriate risk/return profiles from WEFE nexus investments. The main barriers for attracting funding are the low quality of project proposals, the little knowledge of funding opportunities, and the low cost-recovery levels disengaging potential international financiers. Yet, to mobilize financial resources for the implementation of WEFE related projects and programmes, business has a key role to play. First and foremost, SMEs can invest in agriculture systems' water and energy efficiencies and smart water management that both reduce energy and water demand within irrigation systems. Companies can also invest in larger infrastructure projects or technologies that enhance water and energy efficiency. Parts of these investments could be financed by the issuance of green bonds by larger energy or agri-businesses. By pooling resources and expertise with government bodies, parties can co-fund WEFE initiatives while sharing risks and benefits. To do so, businesses can also allocate part of their Corporate Social Responsibility (CSR) funds towards WEFE initiatives, demonstrating their commitment to environmental sustainability.

Technological advancements in sensors, communication networks, interconnectivity of devices, remote sensing, Big-Data, IoT and AI are revolutionizing the way we monitor our environment, manage our natural resources and produce our food. The integration of these digital technologies with modelling tools and decision support systems is changing the way farmers, electricity operators, water managers, and consumers make decisions. Private investment in the technological advances to implement the WEFE approach can contribute directly to climate adaptation. For example, mobilizing venture capital¹³² for water saving technologies, renewable energy solutions, or sustainable agriculture practices, can accelerate the implementation of a WEFE approach.

Finally, by adopting a more market-driven approach, using for example 'water trading' or 'payment for ecosystem services' mechanisms, private sector actors can be mobilized to co-finance not only needed investments throughout the WEFE landscape but also including marine and coastal conservation. For setting up 'water trading' mechanisms, however, significant studies need to be completed, and favourable conditions created as indicated by the Australian experience summarized in 'WaterGuide' (Table 5-3). Improving approaches to water management, as outlined in WaterGuide, can provide greater certainty about the nature of the water resource, the diverse demands on that resource, and the dynamic balance between water availability and demand. Most importantly, it enables the valuing of water for multiple uses and promotes decisions that enhance the efficient, equitable and sustainable management of water. It is only when these mechanisms are in place that further private financing can be mobilized through 'water markets' to enhance climate adaptation.

¹³¹ UfM 2019. Ufm Financial Strategy for Water.

https://ufmsecretariat.org/wp-content/uploads/2019/04/UfM-Financial-Strategy-for-Water_for-web-paginas.pdf

¹³² Private equity financing that provides funding to start-ups and early-stage companies with high growth potential.

TABLE 5-3: AUSTRALIA WATER TRADING – REQUIRED FRAMEWORK CONDITIONS¹³³

Australia is very familiar with the impacts of water scarcity and drought, which are now high on the agenda of many government and business leaders. Based on years of experience, the Australian Water Partnership (AWP) developed WaterGuide, that summarizes the framework that is needed before a water market can be developed. The WaterGuide’s framework consists of six elements, each represents a fundamental practical element of improved water management:

1. Confirm a vision for water management and the value of water
2. Understand changing water availability and demand over time
3. Allocate water between different uses
4. Ensure effective water policies and institutions
5. Develop resilient water infrastructure and services
6. Pursue increasingly efficient water management and use



Around the world, a range of ‘payment for watershed services’ schemes have been set-up and analysed^{134, 135}. The payment for watershed services is the most mature in terms of transaction value and geographical distribution: USD 24.7 billion per year in 62 countries (2015) covering 387 programmes of which 153 are financed by private companies (39.5%).

To support stakeholders to set-up watershed payment schemes, guidance material is available to initiate the set-up of such schemes, as for example prepared by IUCN¹³⁶. Critical for mobilizing private investments in watershed ecosystem service, is the development of a clear baseline, intervention strategy, and the engagement of local communities and citizens. Payments by private sector actors into a ‘watershed fund’ could be derived from downstream beneficiaries of watershed improvements, such as local industries, agricultural businesses and utilities. By paying for direct measures they can benefit from more reliable water supplies, a reduction in sediment and siltation and improved water quality. Payments can also be targeted at ‘indirect measures’ that focus on incentivising communities and individual farmers and herders to change their practices, such as installing grazing exclusions zone around waterways or introducing contour ploughing to reduce erosion and siltation. Those payments could be done to communities to improve, e.g. schooling, street lighting etc. that improve the general living conditions in the targeted upper watershed area.

Catch shares are a fishery management tool that allocates a specific percentage or number of fish to individual fishermen, fishing vessels, or groups. The main goal of catch shares is to promote sustainable

¹³³ AWP & AITHER 2017. WaterGuide: Setting a path to improved water resource management and use under scarcity. <https://waterpartnership.org.au/publications/waterguide/#:~:text=WaterGuide%20by%20Huw%20Pohlner%20and,use%20in%20response%20to%20scarcity.>

¹³⁴ Abell, R. Et al. 2017. Beyond the Source: The Environmental, Economic and Community Benefits of Source Water Protection. The Nature Conservancy, Arlington VA. USA. https://www.nature.org/content/dam/tnc/nature/en/documents/BeyondtheSource_ExecSummary_FINAL.pdf

¹³⁵ Salzman j. et al 2018. The global status and trends of Payments for Ecosystem Services. <https://www.nature.com/articles/s41893-018-0033-0>

¹³⁶ Smith, M. et al. 2006. Pay: Establishing Payments for Watershed Services. IUCN, Gland. <https://iucn.org/resources/publication/pay-establishing-payments-watershed-services>

fishing practices, reduce overfishing, and encourage responsible management of fish stocks. Under a catch share system, fisheries are divided into shares that can be allocated to quotas. Fishermen are issued a certain percentage of the total allowable catch (TAC), which they can catch during a fishing season. By giving fisherfolk a stake in the resource, catch shares create economic incentives for them to fish sustainably. The sustainability is achieved because if a stock is overfished, the overall TAC could be reduced, impacting the income of shareholders. With catch shares, fisherfolk have the flexibility to determine when and how much to fish. This can lead to better planning and potentially more efficient fishing operations. By doing so, catch shares can help avoid fleet overcapacity. Since fishermen have exclusive rights to their share of the catch, there's less incentive to compete by overfishing.

In 1995, The North Pacific Fishery Management Council implemented a catch share program for halibut and sablefish, helping to stabilize fish stocks. It now has several catch share programmes operating¹³⁷. Similarly, in British Columbia, catch share program was introduced in the early 2000s for the groundfish fishery¹³⁸. The programme resulted in an increased biomass of target species and significant reductions in bycatch. Fishermen also benefited from increased predictability in income and catch quantities. When implemented thoughtfully, catch shares can be a powerful tool for sustainable fisheries management, balancing ecological health with economic viability for fishing communities.

Implementing a WEFE approach can enhance the quality, relevance, impact, and sustainability of water-related investments. It can also mobilize investments from beyond the water sector and draw in capital from the energy, agriculture and environment sectors. By moving beyond individual projects to encompass broader investment programs, a more balanced distribution of costs and benefits across sectors can be achieved. By doing so, the effective implementation of a WEFE approach can mobilize substantial financing for building resilience and adapting climate change throughout the Mediterranean region.

5.4 NATURE-BASED SOLUTIONS

Nature-based solutions (NbS) encompass a variety of measures and strategies designed to utilize the natural environment to address various challenges and promote sustainability. They include measures to adapt to climate change, such as protecting against natural disasters such as floods and erosion and enhancing ecosystem resilience against droughts. Nature-based solutions can play a role in managing water resources sustainably through practices like wetland restoration, green infrastructure, and watershed management. They can also play a role in sustainable land-use practices such as agroforestry, regenerative agriculture, and sustainable forestry. Overall, nature-based solutions can enhance community resilience to climate change and natural disasters by leveraging the protective functions of ecosystems.

Within the Mediterranean region, a number of NbS are of particular relevance. NbS such as rainwater harvesting, and soil conservation can help restore natural water systems and build resilience to droughts and water scarcity. NbS focused on restoring and conserving forests, wetlands, and coastal areas in the Mediterranean can help maintain and restore healthy ecosystems providing essential services like flood protection, water purification, food & timber production and fish spawning. By

¹³⁷ <https://www.npfmc.org/fisheries-issues/catch-shares-allocations/>

¹³⁸ <https://fisherysolutionscenter.edf.org/british-columbia-integrated-groundfish-program>

integrating nature-based solutions into climate adaptation strategies, all actors in the Mediterranean region can enhance the overall and their individual resilience to climate change.

Throughout the Mediterranean, private sector actors are increasingly engaging in climate adaptation through nature-based solutions. For example, the start-up Sand to Green (Morocco) is focusing on establishing regenerative agriculture farming that turns desert like conditions to highly productive lands by focusing on soil restoration to increase water retention. The company has mobilized an initial investment of USD 30 million from Katapult (Norway) and Catalyst Fund (Kenya)¹³⁹. Commercial viability is expected to be achieved through the sales of agriculture produce and high-quality carbon credits.

In Tunisia, the Sidi Amor Agricultural Development Group, an NGO, has developed a first pilot for the valorisation and promotion of re-using wastewater in agriculture by using constructed wetlands¹⁴⁰. This site is located in the irrigated area of Borj Touil, which represents nearly 45% of the area irrigated by treated wastewater in Tunisia. The pilot uses plant-based phyto-purification facilities, and sand and gravel beds for water purification and filtration.

Throughout the Mediterranean, the role of the private sector in using nature-based solutions for climate adaptation is still modest. However, the private sector could play a more active role in advancing climate resilience and sustainable development by using NbS related approaches and measures. They could be incentivised to engage in NbS measures by focusing on those measures that have a direct positive impact on business operations and that are more cost-effective compared to traditional engineering approaches, such as restoring wetlands for flood protection. Companies could also be stimulated to engage by Governments offering tax breaks, subsidies, or credits for companies that implement nature-based solutions. Additionally, regulatory frameworks might require or encourage the use of sustainable practices, such as green infrastructure for stormwater management. Also, developing and implementing nature-based solutions can stimulate innovation within companies and open up new business opportunities, such as eco-tourism, sustainable agriculture, and green construction.

5.5 CORPORATE SOCIAL RESPONSIBILITY AND WATER STEWARDSHIP

CSR stands for Corporate Social Responsibility. It refers to a business approach that involves integrating social and environmental concerns into a company's operations and interactions with stakeholders. Essentially, CSR goes beyond just making profits; it emphasizes a company's responsibility to operate in a sustainable and ethical manner while considering the impact of its activities on society and the environment. CSR initiatives often revolve around practices that benefit society, such as philanthropy, community development projects, and environmental sustainability. By engaging in CSR activities, companies can enhance their reputation, build trust with stakeholders, and contribute to sustainable development.

Through their CSR programmes, companies in the Mediterranean region can contribute to climate adaptation in several ways. First and foremost, by focusing on establishing sustainable supply chains, CSR initiatives help engaging with suppliers who adhere to environmentally friendly practices that can

¹³⁹ <https://medias24.com/2023/02/07/agriculture-regenerative-from-sand-to-green-annonce-une-levée-de-10-millions-de-dirhams/>

¹⁴⁰ <https://sidiamor.org/activite/eau-usee-traitee/>

support climate resilience. CSR initiatives can also include support for ecosystem conservation and restoration such as marine conservation programs that help build climate resilience. Furthermore, effective CSR strategies usually involve engaging with local communities, authorities, and organizations. By collaborating with stakeholders, companies can leverage local knowledge, build resilience at the grassroots level, and foster collective actions and co-create solutions for climate adaptation in the Mediterranean region.

Also, CSR initiatives can contribute directly to climate adaptation by focusing on water conservation through efficient water management practices, investments in water-saving technologies, and community engagement projects that help build resilience to climate-related water challenges. For example, the Coca Cola company, through their bottling companies Coca Cola HBC (Egypt) and Equatorial Coca Cola Bottling Company (Morocco, Algeria), have prioritized as part of their CSR strategy, the investments in water stewardship. Coca Cola HBC has committed to reduce water used per litre of beverage by 20% by 2025 vs. 2017 and help secure water availability for all our communities in water risk areas¹⁴¹. The Equatorial Coca Cola Bottling Company has committed to improve water use efficiency by 20% by 2030, achieve 100% local replenishment of water used in its beverages by 2030¹⁴².

Overall, CSR mechanisms and Water Stewardship can play a vital role in enhancing climate adaptation in the Mediterranean by promoting sustainable practices, investing in climate-resilient technologies, engaging with stakeholders, and fostering partnerships for collective action towards a more climate-resilient future.

6 PRIVATE SECTOR FINANCING MECHANISMS AND ENGAGEMENTS FOR CLIMATE ADAPTATION IN THE MEDITERRANEAN

6.1 CLIMATE ADAPTATION FINANCING MECHANISMS AVAILABLE FOR COUNTRIES IN THE MEDITERRANEAN REGION.

Global climate finance doubled in the last two years to USD 1.3 trillion annually in 2021–2022 compared to the USD 653 billion tracked on average in 2019–2020¹⁴³. In absolute terms, annual adaptation finance flows in 2021–2022 reached USD 63 billion, a 28% year-on-year increase compared to 2019–2021. To date, climate financing flowing to the developing countries of the Mediterranean (North Africa) remains modest. Mobilizing the climate finance that responds to the country needs and avoids potential sustainable development trade-offs remains challenging for many states in North Africa.

Nevertheless, promising signals exist. A slight increase in climate financial flows to the region has been witnessed since 2018 (Figure 6-1). Especially, Egypt and Morocco have been able to benefit from these (Figure 6-2). As indicated in Figure 6-3, most climate finance flowing to the North African countries has

¹⁴¹ <https://www.coca-colahellenic.com/en/a-more-sustainable-future/mission-2025/water-reduction-and-stewardship>

¹⁴² <https://www.eccbc.com/esg-report/water/>

¹⁴³ https://gca.org/wp-content/uploads/2023/12/State-and-Trends-in-Climate-Adaptation-Finance-2023_WEB.pdf

been through public debt financing. The indicated financial flows fall drastically short of the financing needed to implement the NDCs of respective countries.

In Africa and globally, the private sector has consistently financed less than 3% of adaptation activities from 2019–2022¹⁴⁴. A substantial portion of these funds come from philanthropies. The opportunity for commercial financiers and private enterprises to develop and finance adaptation solutions, products and services is enormous¹⁴⁵.

FIGURE 6-1: CLIMATE FINANCE FLOWS TO NORTH AFRICA BY PURPOSE (2010-2020) (IN MILLION USD)¹⁴⁶

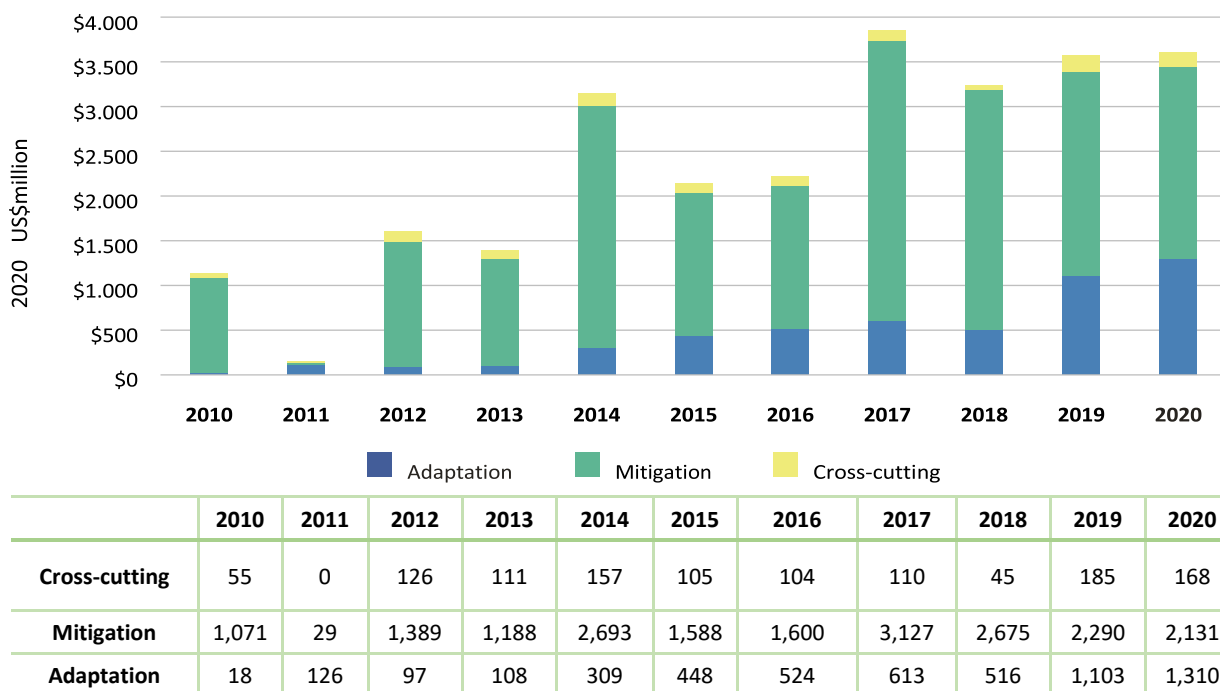
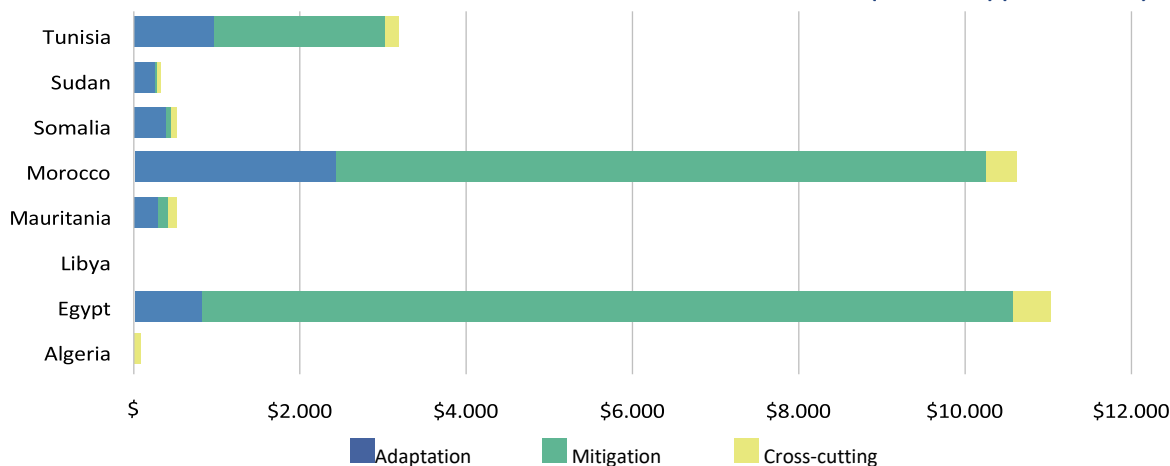


FIGURE 6-2: CLIMATE FINANCE FLOWS TO NORTH AFRICA BY COUNTRY AND PURPOSE (2010–2020) (MILLION USD)¹⁴⁷



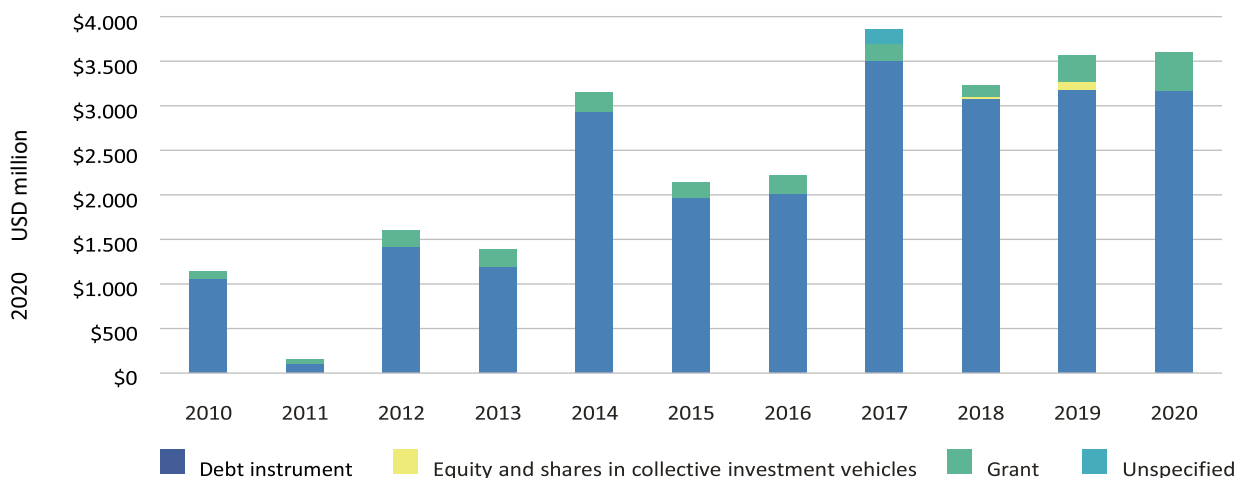
¹⁴⁴ https://gca.org/wp-content/uploads/2023/12/State-and-Trends-in-Climate-Adaptation-Finance-2023_WEB.pdf

¹⁴⁵ https://gca.org/wp-content/uploads/2023/12/State-and-Trends-in-Climate-Adaptation-Finance-2023_WEB.pdf

¹⁴⁶ https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_Financial-Instruments-in-North-Africa.pdf

¹⁴⁷ https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_Financial-Instruments-in-North-Africa.pdf

FIGURE 6-3: CLIMATE FINANCE FLOWS TO NORTH AFRICA BY TYPE OF FINANCIAL INSTRUMENT PER YEAR (PERIOD: 2010–2020) (IN 2020 YEAR USD PRICES)¹⁴⁸



to create climate resilience, robust financing mechanisms and tools are essential, especially for small and medium-sized enterprises (SMEs) that form a significant part of the key economic sectors (tourism, agriculture, water, and fisheries-aquaculture) in the mediterranean region. also, financing is needed for large scale infrastructure projects that are mostly funded through public financing. at present, a range of mechanisms and tools are available for financing climate adaptation measures in the developing countries of the mediterranean region. an indicative overview is presented in Table 6-1.

TABLE 6-1: AN INDICATIVE OVERVIEW OF CLIMATE ADAPTATION FINANCING MECHANISMS AVAILABLE FOR COUNTRIES IN THE MEDITERRANEAN REGION

	International		National	
	Institutions involved	Mechanisms & Tools	Institutions involved	Mechanisms & Tools
Public	Multi and bi-lateral financing institutions (e.g. WB, AfDB, EBRD, EIB, AFD, KfW, DFC)	<ul style="list-style-type: none"> Loans to Government Treasury-Bonds (T-Bonds) Purchase (e.g. Green¹⁵⁰, Blue¹⁵¹, Sustainable Bonds (SB)¹⁵², Sustainability-Linked Bonds (SLB)¹⁵³, Debt for Nature and Climate (D4NC)¹⁵⁴ Guarantees Risk Insurance (e.g. Political Risk Insurance (PRI)) Grants (e.g. Technical Assistance) Internationally Transferred Mitigation Outcomes (ITMOs)¹⁵⁵ 	Treasury Public National Climate Programs Public National Climate Funds	<ul style="list-style-type: none"> Public Budget ((sub)-national) Project Finance (e.g. large infrastructure) Climate Programs Subsidies Tax breaks Guarantees

¹⁴⁸ https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_Financial-Instruments-in-North-Africa.pdf

¹⁴⁹ A category of bonds that are issued to finance projects or activities aligned with specific themes or objectives, often related to sustainability, social impact, or environmental goals.

¹⁵⁰ Green Bonds: Bonds that are specifically issued to finance projects with positive environmental benefits.

¹⁵¹ Blue Bonds: Bonds that are designed to support marine and ocean-based projects, focusing on sustainable water management and ocean conservation.

¹⁵² Sovereign sub-national bonds issued to finance projects that deliver broader sustainability outcomes, which could include a mix of environmental and social benefits, not limited to one specific area like green or blue bonds

¹⁵³ Bonds where the financial terms (such as interest rates) are linked to the issuer's sustainability performance targets.

¹⁵⁴ Financial instruments where a portion of a country's debt is forgiven in exchange for commitments to invest in environmental conservation and climate action (See also Section 6.2.7.2).

¹⁵⁵ These are a mechanism under the Paris Agreement that allows countries to cooperate in achieving their climate targets (known as Nationally Determined Contributions or NDCs) by transferring mitigation outcomes—essentially, reductions in greenhouse gas (GHG) emissions or enhanced carbon sequestration—from one country to another.

	International		National	
	Institutions involved	Mechanisms & Tools	Institutions involved	Mechanisms & Tools
		<ul style="list-style-type: none"> Loans and Corporate Bond purchase 		
Blended	Blended Climate Funds (e.g. CFM, GCF, GEF)	<ul style="list-style-type: none"> Loans to Government Loans to Corporates Grants Equity Financial Risk Reduction (i.e. 1st loss) 	National Banks	<ul style="list-style-type: none"> On-lending to sub-national entities PPP (Pre-)Financing Financial risk reduction (i.e. 1st loss) TA Financing Grant programs to NGOs/CBOs
	Donors & Foundations (e.g. Moore Foundation, Corporate Philanthropy)		Corporates	
			NGOs	
Private	Multi and bi-lateral Financing Institutions (e.g. IFC)	<ul style="list-style-type: none"> Loans to Government Bonds Purchase Loans to Corporates Guarantees Risk Insurance (i.e. parametric insurance) Equity Venture Capital 	National Private Banks	<ul style="list-style-type: none"> Project Finance (e.g. large infra) On-lending international loan to sub-national corporates Green Finance Programmes Resilience Loans PPP (Pre-)Financing Regular Corporate Loans (i.e. operations, maintenance, infrastructure) Micro Finance Technical Assistance (tied to loan/equity)
	International Private Banks		Corporates	
	International Investment Firms & Fonds		Insurance Companies	
	Pension Funds			
	International (Re-) insurance Firms			<ul style="list-style-type: none"> Parametric¹⁵⁶ Insurance Climate Risk Insurance

Below, an introduction to various forms of potential financing mechanism for climate adaptation in the Mediterranean region is provided together with examples of their application.

6.2 PRIVATE SECTOR FINANCING MECHANISMS

6.2.1 PUBLIC FINANCING AS CATALYST

Public-sector funding and support are crucial for mobilizing private sector financing for climate adaptation measures. A key aspect of this is government developing broader sector modernization programs in the tourism, agriculture, water and fisheries sectors. By focusing on innovation, entrepreneurship, strengthening value chains and building capacities, these programmes can be catalytic for attracting private investments in these key economic sectors.

For example, the Green Morocco Plan has enabled the creation of hundreds of cold storages, packaging, crushing, and processing units in all regions of Morocco since 2008. Integration between the upstream agricultural and the downstream industrial and commercial sectors is vital for a resilient agri-food sector. Aggregation and public-private partnership projects have led to consolidating the value chains of the various production sectors. Between 2008 and 2019, the Agricultural Development

¹⁵⁶ A type of insurance policy that provides pay-outs based on the occurrence of a predefined event or condition, rather than the extent of the actual loss incurred by the policyholder (See also Section 6.2.1).

Fund (ADF) has provided 349 million dirhams (EUR 32.6 million) of support which has mobilized 2.9 billion dirhams (EUR 270 million) in private investments. The programme is set to continue under the new agricultural strategy "Generation Green 2020-2030"¹⁵⁷. Similarly in Jordan, the Economic Modernization Vision and the national action plans for green growth (2021-2025) provides the backbone to attracting private sector financing and implementing sustainable natural resources strategies including addressing climate change¹⁵⁸.

The public sector also has other means to mobilize private sector finance for climate adaptation. This includes providing (partial, conditional) grants and subsidies or offering (partial) concessional loans with more generous terms (such as longer repayment periods and lower interest rates). Governments can also focus on co-financing the promotion of innovation related to climate adaptation, for example, through providing partial funding for innovation hubs and accelerators focused on climate adaptation technologies, mobilizing matching grants for R&D initiatives, or investing in public research institutions that can partner with private industry to develop and commercialize new adaptation solutions. Government can also provide resources for training and capacity-building programs to help private sector actors understand and implement effective adaptation strategies. It can also (co-)finance consultancy and advisory services to assist businesses in identifying risks and developing and implementing adaptation investment plans.

To promote private investment, the public sector can also offer tax reductions or credits for businesses that invest in climate adaptation measures. It can also reduce or eliminate tariffs on importing climate-resilient technologies and materials. For example, in 2022 Egypt's Ministry of Finance reduced import duties on fertilizer and seeds, and on agricultural equipment for harvesting and sorting crops, straw, fodder, fruits and eggs from 5% to 2% assisting farmers to invest more in the modernization of their farms¹⁵⁹. Furthermore, the government can develop and implement policies and regulations that favour climate adaptation investments (e.g., water efficiency standards that require investment in leakage reduction and modern irrigation systems). It can also simplify administrative processes and reducing bureaucratic hurdles for climate adaptation projects. Finally, it can also establish new markets mechanisms, for example for carbon pricing (e.g., carbon taxes to encourage the use of cleaner energy, cap-and-trade¹⁶⁰ systems) or ecosystem services (e.g., water trading) to promote sustainable resource management practices and catalyse private investments in climate adaptation action.

Finally, the public sector can also provide other type of stimulus programs. Morocco, for example, as part of its national adaptation planning process, aims to incentivize private sector adaptation investments by setting up business incubators for adaptation, encouraging innovation through an adaptation innovation competition, and developing catastrophe risk insurance programs. A national climate adaptation investment forum involving financial institutions, investment funds, and private sector companies is also planned to facilitate financial engagements through assessing barriers and opportunities for private investments in climate change adaptation activities¹⁶¹.

¹⁵⁷ <https://www.agriculture.gov.ma/fr/programme/valorisation>

¹⁵⁸ <https://invest.jo/en/our-vision.html>

¹⁵⁹ <https://research.hktdc.com/en/article/MTEwMTY1NjMzMg>

¹⁶⁰ A market-based approach to controlling pollution by providing economic incentives for reducing the emissions of pollutants, particularly greenhouse gases (GHGs). An allowance typically permits the participating entities to emit a specific amount of the pollutant. Entities that reduce their emissions below their allocated allowances can sell or trade their excess allowances to other entities that are exceeding their emissions limits for profit.

¹⁶¹ https://hcss.nl/wp-content/uploads/2022/11/GCA_State-and-Trends-in-Adaptation-2022_Fullreport.pdf

6.2.2 PRIVATE FINANCING

Public financing alone is insufficient to meet the enormous funding needs on climate adaptation in the developing countries of the Mediterranean region. Thus, leveraging private sector investments is vital. However, to date, the private sector contribution to climate finance in Africa is low (14% of total climate finance) compared to other regions (an average of 30-40% of total climate finance) and is virtually non-existent for adaptation (3% of adaptation finance)¹⁶².

The vast majority of businesses in the tourism, agriculture, and fisheries sectors are SMEs, and only a small portion of these use formal external financing and credit programmes. For example, in Jordan, the vast majority of transactions by small farmers is cash based with informal supply agreements with central market buyers for the majority of their produce (about 70%). About 90% of these farmers buy at least part of their inputs on credit with a 10 – 20% discount for cash payers. This is technically 11% interest for clients who buy on credit¹⁶³.

The medium and larger SMEs do use formal credit schemes provided by national banks. Local banks in Algeria, Morocco, Tunisia, Egypt, and Jordan are increasingly recognizing the importance of financing climate adaptation projects. These financial institutions offer various mechanisms tailored to support SMEs investing in climate adaptation, particularly in the tourism, agriculture, and water sectors. Below, a number of existing mechanisms is presented along with clear examples of investments, highlighting the amount and type of financing available.

One type of mechanism used is ‘Green Financing Programmes’ or ‘Environmental Investment Loans’ set-up by national banks and focused on providing loans to SMEs. In Algeria, the Banque Nationale d’Algérie offers such green loans to SMEs specifically designed for infrastructure improvements in the agriculture sector including, for example, for a transition to drip irrigation systems. The loans provide financing of up to 300,000,000 DA (EUR 2 million) at a 5.25% interest rate¹⁶⁴ and a maximum maturity of 15 years. In Tunisia, the Banque de l’Habitat offers similar green agriculture loans for agricultural SMEs to finance eco-friendly practices up to EUR 100,000 with competitive interest rates and flexible repayment schedules¹⁶⁵.

In Egypt, the National Bank of Egypt has launched its Green Financing Initiative, offering, through its Al-Ahly business financing programs, specific loans to SMEs, for various financial products, solar irrigation and efficiency irrigation¹⁶⁶. Loans can be up to EGP 5 million (USD 325,000) and are backed by government guarantees supported by IFC. In Jordan, the Ahli Bank offers several green financing programs tailored to support environmentally friendly projects, including: ‘Financing Your Green Needs Program’ which Provides instant financing for sustainable goods and services, including water efficiency projects, and the ‘My Green Project Program. offering financing for purchasing eco-friendly commercial assets, including water and irrigation solutions¹⁶⁷.

¹⁶² <https://gca.org/reports/sta23/>

¹⁶³ https://knowledge4food.net/wp-content/uploads/2020/02/201912_report-palladium-rvo_access-agri-finance-jordan.pdf

¹⁶⁴ <https://www.bna.dz/fr/credit-filaha/>

¹⁶⁵

<https://www.bh.com.tn/profils/entreprise/couvrir%20vos%20besoins%20dexploitation/exploitation/cr%C3%A9dit%20de%20campagne%20agricole>

¹⁶⁶

<https://www.nbe.com.eg/NBE/E/#/EN/ProductCategory?inParams=%7B%22CategoryID%22%3A%22AlAhlyBusinessIndustrialSector%22%7D>

¹⁶⁷ <https://ahli.com/my-green-project-program-en/>

Another type of mechanism used is the ‘Climate Resilience Loan’. Attijariwafa Bank in Morocco offers such loans aimed at enhancing climate resilience in agriculture and water management. For example, loans are available for the installation of solar-powered irrigation systems up Moroccan Dirham (MAD) 100,000 to MAD 500,000 (approximately USD 10,000 to USD 50,000) with a 3% interest rate and a repayment period of up to 7 years¹⁶⁸. These loans could be matched with subsidies from government programs supporting renewable energy use in agriculture¹⁶⁹. In Tunisia, the Banque Centrale Populaire (BCP) provides financing solutions for SMEs in the tourism sector to implement eco-friendly practices including climate resilience. Financing is provided together with Tamwilcom Green Invest requiring a minimum of 20% financing from an SME¹⁷⁰.

While SMEs are dominant players, larger companies in the Mediterranean do play a role in mobilizing investment. For example, Philadelphia Solar is a specialized solar energy company from Jordan with USD 165 million of investments¹⁷¹. As a manufacturer and an engineering, procurement, and construction contractor of photovoltaic systems, the company has successfully accomplished many projects in several Mediterranean countries such as Egypt, Lebanon, Palestine, and locally in Jordan with over 400 MWp references. Another example is AMEA Power from Dubai, one of the fastest growing renewable energy companies in the MENA region with a clean energy pipeline of over 6GW across 20 countries¹⁷². AMEA Power already has more than 1.2GW of clean energy projects either in operation or under construction in Egypt, Jordan, Morocco and other countries.

Small SMEs are unlikely to access formal credit and financing schemes to invest in climate adaptation measures. The medium and larger enterprises do access such financing through national banks. Local banks throughout the Mediterranean are increasingly offering specific financial products to support SMEs in climate adaptation, particularly in the agriculture and water sectors. These mechanisms ensure that SMEs can access the capital needed to implement sustainable practices and technologies, ultimately enhancing their resilience to climate change. By providing favourable terms, technical assistance, and tailored loan products, national financing institutions are pivotal in driving climate adaptation at the SME level across the Mediterranean region.

6.2.3 PHILANTROPYHY

Philanthropy can play an important role in mobilizing private investment in climate adaptation in the Mediterranean region. Philanthropies can provide the type of funding for climate adaptation projects that may not attract immediate private investment due to perceived risks or uncertainties. Grants can help kickstart initiatives, such as water management projects or coastal community resilience actions. For example, the Coca-Cola Foundation - the global philanthropic arm of The Coca-Cola Company - has awarded more than \$1.5 billion in grants to support sustainable community initiatives since 1984 focusing on water and community wellbeing¹⁷³. To mobilize private philanthropy and catalyse action on conservation and climate resilience, the Conservation Collective has launched a number of

¹⁶⁸ <https://www.attijariwafabank.com/fr/rse/environnement-et-rechauffement-climatique>

¹⁶⁹ <https://unimagec.ma/subventions-pour-lenergie-renouvelable-au-maroc-investir-dans-un-avenir-durable/>

¹⁷⁰ https://www.tamwilcom.ma/fr/system/files_force/fiches_produits/green_invest_fr.pdf

¹⁷¹ <https://philadelphia-solar.com/>

¹⁷² <https://www.ameapower.com/>

¹⁷³ <https://www.coca-colacompany.com/about-us/faq/what-is-the-coca-cola-foundation>

foundations throughout the Mediterranean¹⁷⁴. Similar foundations could be founded in neighbouring countries and become catalytic to mobilize philanthropic contributions.

Philanthropic organisations can also attract private investment through offering risk capital or guarantees and reduce uncertainty, making it easier for private investors to step in. They can also take a long-term view on investments, crowding in private investors looking for stable, long-term returns.

Furthermore, philanthropic efforts can fund capacity-building programs that equip farmers and fishers with the knowledge and tools necessary to implement effective climate adaptation strategies. For example, the Walton Family Foundation provides grant financing to build the capacity of fishing communities in the northern Mediterranean to maximize the social and economic benefits that sustainably managed fisheries provide¹⁷⁵. Similarly, the David and Lucile Packard Foundation announced at 'Our Ocean Conference' (Athens, April 2024) it is committing USD 480 million over the next five years to actions for people, the ocean, and climate¹⁷⁶.

The Conservation Collective launched and accelerated 20 global foundations, dispersing millions to grassroots groups in the process¹⁷⁷. Local foundations include organisations in Cyprus, Greece, Malta, Sicily and the Balearic Islands. The nature-based solutions that the foundations support – including reforestation, forest protection and seagrass restoration – will play a key part in adaptation to climate change as they have the potential to provide jobs and alternative livelihoods to millions.

As partnerships will be important to implement climate adaptation, philanthropies can act as intermediaries, fostering new alliances between public, private, and civil society actors. These collaborations can lead to innovative funding models and shared investment strategies that amplify the impact of resources. Furthermore, charities can also finance research and development of new technologies and methods for climate adaptation and be involved with awareness raising among potential private investors.

By leveraging the above roles, philanthropies can be effective partners for effectively mobilizing private investment in climate adaptation and enhance resilience against climate impacts throughout the Mediterranean.

6.2.4 BLENDED FINANCE

6.2.4.1 Blended Finance structures

Blended finance combines concessional funds from public sources or philanthropic organizations with private investment, thereby de-risking projects and making them more attractive to private investors. This approach can be especially beneficial for high-risk adaptation projects in sectors like tourism and agriculture, where the financial viability might be uncertain but the environmental and social benefits are significant. For instance, a blended finance approach could support the development of water-saving technologies in agriculture by combining grants or low-interest loans with private capital, allowing SMEs to adopt these innovations without bearing the full financial risk. For such a set-up, for

¹⁷⁴ <https://conservation-collective.org/>

¹⁷⁵ <https://www.waltonfamilyfoundation.org/our-work/environment-program/oceans#:~:text=Our%20Ocean%20Initiative%20investments%20build,that%20sustainably%20managed%20fisheries%20provide.>

¹⁷⁶ <https://www.packard.org/insights/news/packard-foundation-announces-480-million-to-advance-ocean-conservation/>

¹⁷⁷ <https://conservation-collective.org/>

example, concessional funding from international donors or philanthropies can be paired with private investment to develop projects that enhance water efficiency, such as advanced irrigation systems or water recycling technologies. For example, the newly launched Emerging Market Climate Action Fund is an innovative “Blended Finance Fund of Funds” created in partnership by Allianz Global Investors and the European Investment Bank (EIB). The Fund provides highly catalytic early-stage equity financing to greenfield climate mitigation and adaptation projects (i.e. new projects built from scratch) thus catalysing further funding by investors who might otherwise be reluctant to invest in emerging market climate projects due to perceived risks¹⁷⁸. Another example is the Climate Investor Two fund that uses blended finance to invest in the early stage development, asset creation and re-financing of newly built assets focused on climate mitigation and adaptation¹⁷⁹

Most blended finance structures work best when they are paired with additional support services that help agribusinesses become more commercially attractive to investors, such as: grants and technical assistance (TA). For example, donors or philanthropies may co-fund the development and launch of a new agricultural product or service with a private company which, if successful, can catalyse additional commercial investment. Also, government agencies or NGOs may fund skills training designed specifically to complement a blended finance investment and make it more impactful.

6.2.4.2 Public Private Partnerships

As elaborated in section 5.1, Public-private partnerships (PPPs) can pool resources, share risks, and foster innovation and by doing so be effective in leveraging resources from both public and private sectors to finance climate adaptation projects. Indeed, PPPs have mobilized private co-investment in climate-resilient infrastructure that generate a reliable cash-flow such as desalination installations, which have benefited both public and private stakeholders. They continue to be used throughout the Mediterranean region.

6.2.5 MICROFINANCE

Local SMEs often struggle to access traditional financing due to high risks perceived by large financial institutions. Microfinance and impact investing offer viable alternatives. Microfinance can support small-scale adaptation projects, particularly in vulnerable communities, by providing access to financial services that are otherwise unavailable. Microfinance institutions (MFIs) offer small loans to SMEs and individual entrepreneurs, enabling them to invest in climate-resilient technologies and practices. In the context of agriculture, for example, microfinance can help farmers purchase drought-resistant seeds or install efficient irrigation systems.

6.2.6 IMPACT INVESTMENT

Impact investing is another promising tool, where investors seek not only financial returns but also positive environmental and social impacts. Impact investors can support SMEs developing innovative solutions for climate adaptation. In the Mediterranean, impact investment funds can focus on projects like ecotourism ventures, organic farming, and sustainable fisheries.

¹⁷⁸ <https://emcaf.allianzgi.com/>

¹⁷⁹ <https://climatefundmanagers.com/project-type/climate-investor-2/>

6.2.7 SUSTAINABILITY TYPE BONDS

6.2.7.1 Green Social Sustainable Bonds

Green Social Sustainable (GSS) bonds are primarily debt instruments that are linked with their end use dedicated to environment, climate, social objectives. In principle, these are not riskier than other bond types. Green bonds raise capital specifically for projects with environmental benefits, including climate adaptation. They can attract institutional investors looking for sustainable investment opportunities. Blue bonds target marine and coastal protection projects and funds can be allocated to, for example, sustainable aquaculture initiatives, improving the sustainability of fisheries, or coastal habitat restoration projects, ensuring that these sectors can withstand climate impacts.

GSS bonds attract institutional investors who are increasingly looking to fulfil their environmental, social, and governance (ESG) criteria. GSS bonds can be issued both by Governments and by Corporates. A number of Governments in the Southern and Eastern Mediterranean have issued GSS bonds. For example, the Egyptian Ministry of Finance issued its first sovereign green bonds in November 2020 worth USD 750 million with a five-year term and a coupon rate of 5.25%. The proceeds are targeting, amongst others, projects focusing on coping with climate change and sustainable management of water resources and wastewater¹⁸⁰. Fifty-four percent of the green bond proceeds, or roughly USD 400 million, have been spent on 14 water and wastewater projects including desalination and sludge treatment facilities. The remaining 46 percent, about USD 350 million, has been spent on clean transportation to build a monorail system from Cairo to the New Administrative Capital¹⁸¹.

In the Southern Mediterranean region, GSS bonds have not only been issued by Governments but also by commercial financing institutions. In Jordan, the Jordan Kuwait Bank has issued the first green bond in Jordan for the amount of USD 50 million. The bond was purchased by IFC (USD 36 million), Canada-IFC Blended Climate Finance Program (USD 10 million) and the Dutch-funded MENA Private Sector Development Facility (USD 4 million) implemented by IFC. The Jordan Kuwait Bank has earmarked the proceeds for green projects and assets, including for example, renewable energy projects and sustainably managed water resources and waste management. As such this commercial green bond will provide SMEs with direct access to green financing to assist them in implementing environmentally friendly projects¹⁸². In a similar way, the Jordan Ahli Bank has issued a sustainability bond of USD 50 million to finance loans towards climate projects and women-owned or women led SMEs¹⁸³.

For the private sector to issue green bonds, it is important to have clear guidance on this matter. In Morocco, the Moroccan Capital Market Authority, in partnership with the IFC, published its first guidelines in 2016 setting the regulatory framework and rules for issuing green bonds. The guidelines help issuers and investors to identify, evaluate, and select eligible projects. They also provide guidance on the regulatory requirements for the issuance, use, and management of green bonds' proceeds, for independent external reviews, and for reporting and disclosure¹⁸⁴.

¹⁸⁰ https://www.sbfnetwork.org/wp-content/assets/policy-library/692_Egypt_Egyptian_Sovereign_Green_Bonds.pdf

¹⁸¹ Global Centre on Adaptation 2022. State and Trends in Adaptation Reports 2021 and 2022. (Case study). <https://gca.org/reports/sta22/>

¹⁸² <https://jkbcy-stage.dot.jo/news/jordan-kuwait-bank-issues-the-first-green-bond-in-jordan#:~:text=This%20issuance%20of%20the%20first,transportation%2C%20waste%2C%20and%20water.>

¹⁸³ <https://disclosures.ifc.org/project-detail/SII/48972/dcm-ahli-sustainability-bond>

¹⁸⁴ Global Centre on Adaptation 2022. State and Trends in Adaptation Reports 2021 and 2022. <https://gca.org/reports/sta22/>

6.2.7.2 Debt for Nature / Climate Swaps

A debt-for-nature and climate (D4NC) swap is a sovereign debt restructuring aimed at reducing debt service costs, in exchange for local investment in conservation. In a D4NC swap, a creditor country or entity agrees to cancel a portion of the debt owed by a debtor country in exchange for the latter's commitment to use the freed-up resources to fund conservation or restoration projects. A D4NC swap can provide low-income countries with a unique possibility to link debt reduction with poverty reduction and the implementation of internationally agreed objectives such as the SDGs, the Paris Agreement on Climate Change, and the Kunming-Montreal Global Biodiversity Framework & Targets. D4NC swaps have been implemented in various countries in Latin America, Africa and Asia from the 1980s onwards. More recently other countries such as Ecuador (2023), Barbados (2022), Belize (2021) and the Seychelles (2018) have applied this model to secure financing for marine protected areas. A Debt-for-nature and climate swap is a transaction mechanism that normally includes some form of sovereign debt relief.

There are two categories of these swaps: a) bilateral agreements, and b) tri-party or commercial agreements. In a bilateral Debt-for-nature and climate (D4NC) swap, the public sovereign debt to be restructured is not traded on the secondary market but is a bilateral debt between a debtor and a creditor government. In this case, a bilateral D4NC swap can take place directly between the debtor and creditor governments. In such a swap, a creditor country forgives a portion (or all) of the public bilateral debt of a debtor country in exchange for environmental commitments by the debtor government. Egypt recently concluded a D4NC swap with Germany totaling EUR 54 million Euro. The agreement relieves Egypt from the repayment of debts of 54 million Euro in order to utilize them to finance the green energy transition in Egypt instead. During COP27 in Sharm El-Sheikh in Nov. 2022, the Government of Germany committed to contribute substantially to Egypt's Country initiative "Nexus Water Food Energy – Energy Pillar" (NWFE-EP). The debt swap will support the Government of Egypt in achieving its goal of 42% renewables by 2030, by financing investments in the upgrade of the transmission network to connect two windfarms ("Amunet" and "Red Sea Wind Farm") to the national transmission grid¹⁸⁵. While this particular D4NC swap focused on renewable energy promotion, the mechanism can also be used to finance climate adaptation activities throughout the Mediterranean region.

In a commercial D4NC swap, the debtor country's debt that is traded on secondary markets (e.g., through government treasury bonds) is being restructured to create fiscal and environmental benefits. Using a commercial D4NC swap, the transaction sponsor (often an environmental NGO or dedicated private entity) sets-up a Trust Fund that purchases a sovereign, hard currency debt title from commercial banks on the secondary market at a discounted rate compared to the face value of the debt¹⁸⁶. The Trust Fund uses a combination of funds from the transaction sponsor, non-governmental organization, governments, banks, or other private organizations to finance this purchase. Payments of the debtor country on the new loan are deposited into the Trust Fund and are used to pay the new debt holders and for building up the principal. Interest earned from this principal balance and the

¹⁸⁵ <https://kairo.diplo.de/eg-de/-/2604434>

¹⁸⁶ Note: It is also possible that the Government buys back its treasury bonds on the secondary market using a loan provided by the SPV.

principal itself is used to fund conservation projects based on grants. This model was used in the Seychelles transaction in 2017 (Table 6-2).

TABLE 6-2: DEBT-FOR-NATURE SWAP: SEYCHELLES (2016)¹⁸⁷

The first ever climate adaptation debt restructuring that also includes a strong marine conservation component was finalized in 2016 between the Government of Seychelles and its Paris Club creditors. The Seychelles debt-for-climate-adaptation swap converts a portion of the Seychelles' debt to other countries into more manageable debt held by a local entity. It also has introduced impact investing to debt restructuring.

The Nature Conservancy, a US-based environmental NGO, provided an impact capital loan of USD 23 million and a grant of USD 5 million to buy-back USD 29.6 million of Seychelles debt owed to Paris Club members (mostly the United Kingdom, France, Belgium, and Italy) at a 5.4 percent discount in exchange for Government commitments to protecting the ocean. The government of Seychelles agreed to do three things accordingly: 1) pay back loans at a lower interest rate; 2) spend the savings on ocean conservation work; 3) designate 30% of its marine area as protected, free from unregulated economic activities such as fishing and drilling.¹⁸⁸

Led by The Nature Conservancy, the Seychelles Conservation and Climate Adaptation Trust was established, which was the entity that actually bought the debt from the creditor countries at a discount. After this purchase, the Government of Seychelles redirected the servicing of this debt to SeyCCAT. The debt service payments fund three distinct streams: 1) repays impact investors, 2) capitalizes SeyCCAT's endowment, and 3) funds work on the ground that advances marine and coastal conservation, including strategies for ecosystem-based climate adaptation and disaster risk reduction.

The estimated amount to be invested in nature conservation activities and the endowment is estimated at USD 13 million, with nearly 70 percent of this to be payable in local currency rather than hard currency, averting the extra cost of conversion. In addition, the period for debt payment will be extended from eight years to twenty years, reducing the government's debt service by over USD 2 million per year. TNC will seek to re-finance the impact investment loan with financing from another investor and place the freed-up finance into new conservation projects. By March 2020, Seychelles had made every debt-related payment on time and completed the protection of 32% of its marine areas.

In an alternative commercial D4NC swap model, the transaction sponsor sets-up a Special Purpose Vehicle (SPV) that purchases the sovereign, hard currency debt title as above through the issuance of a Green Social Sustainability (GSS) bond to finance this purchase. The SPV is to hand-over the purchased bonds to the debtor country in exchange for:

- a debtor government's commitment to finance conservation by issuing a local currency 'Conservation/Climate Note' to a dedicated debtor country Environment Trust Fund (which can include an Endowment Fund to ensure sustainability of the conservation efforts), and
- (optional) a debt reduction, and
- the debtor country issues a new hard currency debt note to the SPV based on the newly agreed coupon rate and maturity guaranteed by an outside party.

This model was used in the Ecuador (2023) transaction (Table 6-3).

As discussed above, D4NC swaps can comprise a range of transaction structures, all including different forms of debt forgiveness, and a reduction in debt capital and debt services cost. To mobilize private sector financing for climate adaptation, commercial D4NC with the repurchasing of debt on the (commercial) secondary market could be envisaged for several developing countries in the Mediterranean region.

¹⁸⁷ <https://seycat.org/wp-content/uploads/2019/07/SSCOE-Debt-for-Nature-Seychelles-Case-Study-final.pdf>

¹⁸⁸ Saqib Rahim, "How Investors Are Coming up with the Green to Save the Ocean Blue," *Washington Post*, October 28, 2020, <https://www.washingtonpost.com/climatesolutions/2020/10/28/climate-solutions-ocean-conservation/>.

TABLE 6-3: DEBT-FOR-NATURE SWAP: ECUADOR (2023)¹⁸⁹

The ‘Galapagos debt conversion’ exchanged USD 1.628 billion in Ecuadorian treasury bonds for a USD 656 million impact loan. The transaction is to generate savings to the Ecuadorian fiscus of \$1.126 billion through to 2041. In return, Ecuador will direct a part of its debt servicing savings (\$323 million over the coming 18 years) to the conservation of the Galapagos and establish a new endowment fund maturing. The endowment fund is expected to grow to \$227 million by 2041 and fund conservation efforts thereafter. Ecuador will spend \$12.05 million a year on marine conservation in the Galapagos Islands. Combined, the debt conversion and endowment will generate more than \$450 million for marine conservation in the Galapagos Islands providing vital protection for marine life whilst also promoting sustainable fishing and tourism, enhancing ecosystem richness, and building resilience to climate change.

The transaction involved a consortium of international organisations engaged by the Oceans Finance Company. Credit Suisse arranged and structured the USD 656 million Galapagos marine conservation-linked bond used to finance the debt conversion and acted as offeror for the international bonds. U.S. International Development Finance Corporation (DFC) provided a USD 656 million in political risk insurance for the Loan while Inter-American Development Bank (IDB) provided an USD 85 million guarantee.

Potential for D4NC in Mediterranean Developing Countries

As of July 2024, the Mediterranean Developing Countries (WES members) had a total of 323 outstanding Treasury Bonds (T-Bonds) for a total value of USD 147.73 billion. Of these T-Bonds, 17 are nominated in EUR (EUR 19.55 billion) and 306 in USD (USD 126.42 billion)¹⁹⁰ (Table 6-4).

TABLE 6-4: OUTSTANDING TREASURY BONDS FROM DEVELOPING COUNTRIES IN THE MEDITERRANEAN REGION¹⁹¹

COUNTRY	NUMBER OF T-BONDS OUTSTANDING (USD, EUR)	OUTSTANDING VOLUME (BILLION EUR)	OUTSTANDING VOLUME (BILLION USD)	OUTSTANDING VOLUME TOTAL (BILLION USD)
Algeria	0	0	0	0
Egypt	38	5.28	39.49	45.24
Israel	72	11.57	32.96	45.57
Jordan	20	0	11.40	11.40
Lebanon ¹⁹²	181	0	35.17	35.17
Libya	0	0	0	0
Morocco	9	2.00	6.25	8.43
Palestine	0	0	0	0
Syria	0	0	0	0
Tunisia	3	0.70	1.15	1.91
Total	323	19.55	126.42	147.73

For some of the developing countries, a D4NC swap could be a viable option for debt reduction and mobilising private investment in climate adaptation. For example, our estimates indicate that Egypt has USD 6.75 billion and EUR 2.25 billion in T-Bonds that are potentially suitable for a D4NC swap. In Jordan there is a potential for USD 5.25 billion of T-Bonds to be included in a potential D4NC swap. To better understand the full potential of D4NC swaps to finance climate adaptation in the Mediterranean developing countries, a further analysis will be required which falls outside the scope of the current report.

¹⁸⁹ <https://www.dfc.gov/media/press-releases/financial-close-reached-largest-debt-conversion-marine-conservation-protect>

¹⁹⁰ <http://cbonds/bonds>

¹⁹¹ <http://cbonds/bonds>

¹⁹² Including T-Bonds issued by the Bank of Lebanon

6.2.8 VENTURE CAPITAL FINANCE

Venture capital (VC) plays a significant and growing role in climate adaptation efforts in the Mediterranean region. Through strategic investments, VC firms facilitate the development and scaling of innovative solutions that enhance the region's resilience to climate change. VC investors provide essential funding to early-stage companies developing cutting-edge technologies aimed at climate adaptation. These technologies may focus, for example, on agriculture innovations such as drought or salt resistant crops, precision farming tools, and advanced irrigation systems. They can also focus on efficient water use, desalination, and water recycling, crucial in the Mediterranean region facing water scarcity.

For example, in Egypt the startup company Pylon, has raised USD 19 million seed funding to accelerate its expansion, including into new markets¹⁹³. Founded in 2017, Pylon is a smart infrastructure management platform providing a subscription-based “Smart Metering as a Service”. This subscription-based service provides a software solution that helps improve operational efficiencies and revenue collection for electricity and water companies. The seed funding round began with initial funding from US-based startup accelerator ‘Y Combinator’, and has since attracted a diverse group of investors from North America, the Middle East and Africa. It comprises both equity and debt, and was led by Endure Capital, which is backed up by Commonwealth Development Corporation (CDC), the UK government’s development finance Institution (rebranded as British International Investment (BII)). Also participating are various institutional and high profile foreign “angel investors”¹⁹⁴. The proceeds will accelerate Pylon’s growth via expansion into other emerging markets in Southeast Asia, Africa and Latin America, and advance engineering and product development.

Beyond seed funding, venture capital helps scale up sustainable business practices and innovations, resulting in products and services that are more accessible and affordable. For example, VC was provided by IntilaQa, a venture capital firm based in Tunisia seeking to invest in early-stage Tunisian-based companies operating in the information and communications technology sector¹⁹⁵. IntilaQa invested in Ezzayra, a Tunisian agritech startup that leverages data analytics and IoT to enhance agricultural practices¹⁹⁶. The funding has supported the scaling up of smart farming solutions that optimize resource use, such as water and fertilizers, thereby helping farmers adapt to climatic variability and change. IntilaQa is currently one of the market leaders in the region in this domain.

Beyond seed funding and round A funding, VC can also support startups to further commercialize their products and services. Finally, by investing in startups and innovative projects, VC contributes to economic development and job creation, fostering a more resilient and adaptive local economy throughout the region.

¹⁹³ <https://disruptafrica.com/2022/04/13/yc-based-egyptian-infrastructure-management-startup-pylon-banks-19m-seed-funding-round/#:~:text=Egyptian%20startup%20Pylon%2C%20an%20infrastructure,expansion%2C%20including%20into%20new%20markets.>

¹⁹⁴ These are high-net-worth individuals who provide capital to start-ups or early-stage companies, typically in exchange for equity (ownership shares) or convertible debt. These investors are often willing to take on higher risks than traditional investors because they see the potential for substantial returns on their investment if the company succeeds.

¹⁹⁵ <https://pitchbook.com/profiles/investor/342129-61#overview>

¹⁹⁶ <https://www.ezzayra.com/actualites/>

6.2.9 INTERNATIONAL CLIMATE AND DEVELOPMENT FINANCE

Across Africa, multilateral development finance institutions (DFIs) were the most significant source of adaptation finance flows (53 percent, USD 6 billion), followed by governments (23 percent, USD 2.6 billion) and bilateral DFIs¹⁹⁷ (16 percent, USD 1.8 billion). Multilateral institutions like the European Union, and related financial institutions such as the European Bank of Reconstruction and the European Investment Bank (EIB) play a pivotal role in catalysing private investment in climate adaptation in the Mediterranean region. A number of instruments are currently available for this purpose with the European Union.

6.2.9.1 European Union

The European Neighbourhood Instrument (ENI)¹⁹⁸ is a key financial mechanism for the implementation of the European Neighbourhood Policy, aimed at helping neighbouring countries, including those in the Southern Mediterranean. The Cross-Border Cooperation programme supports projects aiming to strengthen the capacity of local authorities and SMEs to address development and environmental issues, including climate change, through partnerships, focusing on olive production, vineyards, fisheries and tourism, amongst others¹⁹⁹.

The European Fund for Sustainable Development Plus (EFSD+) aims at promoting sustainable investments in the European Union's (EU) partner countries, including in the developing countries of the Mediterranean. Offering a variety of risk-sharing instruments of up to EUR 40 billion, the EFSD+ aims to mobilise up to EUR 135 billion of public and private financing to help partner countries achieve the Sustainable Development Goals (SDGs), including action on climate adaptation such as sustainable agriculture, sound water management and resilient infrastructure²⁰⁰.

In addition, the European Bank for Reconstruction and Development (EBRD) provides both direct funding and co-financing options for climate-related projects in its partner countries, including climate resilience projects in the Southern Mediterranean²⁰¹. For example, the EBRD is financing the climate resiliency of several ports along Morocco's Atlantic coastline by providing a EUR 40 million loan to Agence Nationale des Ports²⁰². While strictly speaking falling outside the Mediterranean region, this investment gives a good example of how a package of construction and infrastructure improvements, with the involvement of the private sector, can deliver climate resilience against hazards such as sea level rise and extreme flooding caused by storm surges. The loan will be supplemented by an investment grant of EUR 5.3 million from the Global Environment Facility (GEF) and a TA package of up to EUR 1.4 million.

Furthermore, there is a range of instruments that can involve the private sector in climate adaptation in the Mediterranean region, such as financing provided by the European Investment Bank (e.g.

¹⁹⁷ Global Centre on Adaptation 2022. State and Trends in Adaptation Reports 2021 and 2022. (Case study). <https://gca.org/reports/sta22/>

¹⁹⁸ https://www.eeas.europa.eu/eeas/renewed-partnership-southern-neighbourhood-new-agenda-mediterranean_en

¹⁹⁹ [https://www.enicbcmec.eu/projects/funded-](https://www.enicbcmec.eu/projects/funded-projects?field_thematic_objective_target_id=69&field_priority_target_id=All&field_country_target_id=All)

[projects?field_thematic_objective_target_id=69&field_priority_target_id=All&field_country_target_id=All](https://www.enicbcmec.eu/projects/funded-projects?field_thematic_objective_target_id=69&field_priority_target_id=All&field_country_target_id=All)

²⁰⁰ https://international-partnerships.ec.europa.eu/funding-and-technical-assistance/funding-instruments/european-fund-sustainable-development-plus_en

²⁰¹ <https://www.ebrd.com/news/2024/ebrd-delivers-robust-support-to-the-semmed-region-in-2023.html>

²⁰² EBRD 2023. The EBRD Climate Adaptation Action Plan 2023-25. Investing in climate resilience to support economic and social development in a changing world.

Mediterranean Hot Spots Investment Programme (MeHSIP)²⁰³ and the Natural Capital Financing Facility (NCCF). In addition, financing is available for Southern Mediterranean countries through dedicated EU programmes such as Horizon Europe²⁰⁴ (EU's flagship research and innovation program, which includes actions on climate change adaptation) and the EU Life Programme²⁰⁵ (grant financing for innovative environmental and climate action demonstration projects and best practices). Also, in the framework of COP27, the European Union, UN Capital Development Fund and the French Development Agency (AFD) officially launched the "Advancing Climate Adaptation in the Southern Mediterranean" programme²⁰⁶. The programme aims to increase climate and environment resilience in the Southern Mediterranean countries. The programme has an estimated value of €16,6 million over three years. Also, various forms of financing are available through EU Delegations in individual countries managing various grant programs targeting local development priorities, including climate adaptation.

As presented briefly above, various European funding windows and initiatives offer critical financial and technical support for climate adaptation projects in the southern Mediterranean region. Directly or indirectly, these funds are designed to support SMEs in key sectors vulnerable to climate change, such as agriculture, water management, and sustainable tourism. By leveraging these resources, private sector actors can co-finance innovative projects that enhance their resilience and contribute significantly to sustainable development in the region. Understanding the eligibility criteria, application processes, and specific focus areas of each funding program is crucial for maximizing the benefits and successfully accessing these European funds and financing institutions.

6.2.9.2 United Nations

The United Nations, through a range of programmes, contributes directly and indirectly to climate change adaptation in the Mediterranean region. A specific grant programme, the LoCAL Facility, designed and managed by the UN Capital Development Fund, channels grant financing to local government authorities for locally led adaptation to climate change projects. To date, 15 communes in Tunisia have received grants to a total of USD 7.6 million until 2027 with a focus on mitigation and adaptation²⁰⁷.

An important contribution to building capacities for climate adaptation in the Mediterranean is the UNEP MAP "Enhancing Regional Climate Change Adaptation in the Mediterranean Marine and Coastal Areas" financed by the Global Environment Facility (GEF)²⁰⁸. The programme focuses enhancing capacities of countries in the Mediterranean region to adapt to climate change with a view to influencing wider development processes in the region. It focuses specifically on: a) Stakeholder engagement, and enhanced capacity building and cooperation, b) Development of best practices for enhanced sustainability and climate resilience in the coastal zone, c) Creating access to existing and

²⁰³ https://www.eib.org/attachments/country/femip_mehsip_en.pdf

²⁰⁴ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls_en

²⁰⁵ https://cinea.ec.europa.eu/programmes/life_en

²⁰⁶ <https://www.uncdf.org/article/8015/eu-un-and-france-boost-access-to-climate-finance-for-local-governments-in-the-southern-mediterranean-region>

²⁰⁷ <https://www.uncdf.org/local/> and <https://www.uncdf.org/article/8654/a-new-national-fund-paves-the-way-for-local-action-against-climate-change-in-tunisia>

²⁰⁸ <https://www.thegef.org/projects-operations/projects/9670>

emerging finance mechanisms relevant to climate change adaptation, including international and domestic instruments, and d) knowledge management, and influencing.

6.2.9.3 Climate Finance

Several international funds specifically target climate adaptation. The Green Climate Fund (GCF) is a significant player, providing financial support for adaptation and mitigation projects globally. The Adaptation Fund (AF), established under the Kyoto Protocol, also offers grants for projects that enhance resilience to climate change impacts. Especially, the GCF has been focusing on mobilizing private sector co-financing for its projects.

The GCF is currently funding a number of climate adaptation projects in the Mediterranean region that will mobilize private co-financing. For example, the project “Improving the climate resilience of agricultural systems in the Saïss Plain, Morocco” will help farmers switch from the use of highly unsustainable groundwater to sustainable surface water. The EUR 208 million project includes a bulk water transfer scheme and the preparation of a Public-Private Partnership (PPP) to implement new irrigation networks²⁰⁹. Another project, co-financed by AFD will provide sustainable irrigation to improve the climate resilience of subsistence oasis farming and larger-scale commercial date and olive agriculture within the Boudnib Valley²¹⁰. The EUR 82.2 million project will build the climate-resilience of oasis communities and set up cross-cutting sustainability measures such as technical assistance, groundwater preservation, and environmental and social impacts management.

Also, GCF, through investing in the blended finance Climate Investor Two fund, managed by Climate Fund Managers (CFM) (The Netherlands), has the potential to co-invest with private investors in climate adaptation in the water, fisheries and ports sectors in the developing countries in the Mediterranean²¹¹.

The Adaptation Fund is investing in climate adaptation in the developing countries of the Mediterranean, albeit that their mobilization of private co-financing seems to be limited. The Fund has invested ca. EUR 9 million in the oasis zone of southern Morocco to create drought resilience by refurbishing an ancient “khattara” rain and groundwater collection system including a system of underground water canals first developed by the indigenous Berber people of the region some 2,000 years ago. This system is being rebuilt, enhanced and expanded for agricultural irrigation and community use to address extreme dry weather, recurrent droughts, water scarcity, unsustainable use of water resources and forced seasonal migrations²¹². The Adaptation Fund has financed similar

²⁰⁹ <https://www.greenclimate.fund/project/fp043>

²¹⁰ <https://www.greenclimate.fund/project/fp042>

²¹¹ <https://climatefundmanagers.com/2023/12/01/cfm-announces-third-close-of-climate-investor-two-fund-at-usd-875-million/>

²¹² <https://www.adaptation-fund.org/wp-content/uploads/2016/10/AdaptationStory-centered-highres-1.pdf>

climate resilience interventions in southern Egypt²¹³ and Jordan²¹⁴, Lebanon²¹⁵, Syria²¹⁶, and Tunisia²¹⁷ (up to EUR 9 million per country).

Climate Investment Funds (CIF) is one of the world's largest multilateral funds helping low and middle income countries adapt to and mitigate climate change. Since 2008, it has been channelling funds from government donors and the private sector to support more than 370 projects in 72 countries. Its investment in the MENA region has been focused on investments through its Clean Technology Fund. This includes investments of USD 490 million in concentrated solar power (CSP) supporting the development of 960 megawatts of new CSP capacity across Egypt, Tunisia, Morocco, Jordan, and Libya²¹⁸. The CIF has the potential to become an important source of multilateral financing for climate adaptation for countries in the Mediterranean region.

6.2.10 RISK TRANSFER AND INSURANCE

Risk transfer mechanisms can protect governments and businesses from financial losses due to climate-related events. One such mechanism is catastrophe bonds (cat bonds), which allow countries and regions to transfer some of their risks to the financial markets. These bonds pay out in the event of a specified disaster, providing immediate funds for recovery and rehabilitation. Another risk transfer mechanism that is used is risk-pooling. By pooling risks premiums paid by governments for extreme events, insurance costs can be significantly lowered. For better understanding how such a mechanism could work in the Mediterranean region, the Caribbean Catastrophe Risk Insurance Facility provides a good example (Table 6-5).

Another instrument is 'climate risk insurance' (CRI) which can protect SMEs from financial losses due to extreme weather events or other climate-related impacts. For example, it can protect agricultural SMEs against crop failure due to drought or extreme weather. Traditionally, the most commonly used CRI is an 'indemnity insurance' which compensates insurance policyholders based on their actual, verified losses which are evaluated after an adverse event. Though it is the widest used model, it often brings high administrative costs and sometimes delayed payouts due to time consuming loss verification.

TABLE 6-5: CARIBBEAN CATASTROPHE RISK INSURANCE FACILITY (CCRIF) PROVIDING PARAMETRIC INSURANCE AT REGIONAL SCALE²¹⁹

CCRIF SPC is a not-for-profit risk pooling facility, owned, operated and registered in the Caribbean with 19 Caribbean and 3 Central American governments being members of the Facility²²⁰. It offers parametric insurance designed to limit the financial impact of catastrophic tropical cyclones, earthquakes and excess rainfall events on members governments. CCRIF helps to mitigate the short-term cash flow problems developing economies suffer from after major natural disasters. A critical challenge is often the need for short-term liquidity to maintain

²¹³ <https://www.adaptation-fund.org/project/building-resilient-food-security-systems-to-benefit-the-southern-egypt-region/>

²¹⁴ <https://www.adaptation-fund.org/project/increasing-the-resilience-of-poor-and-vulnerable-communities-to-climate-change-impacts-in-jordan-through-implementing-innovative-projects-in-water-and-agriculture-in-support-of-adaptation-to-climate-4/>

²¹⁵ <https://www.adaptation-fund.org/project/climate-smart-agriculture-enhancing-adaptive-capacity-of-the-rural-communities-in-lebanon-agricultural/>

²¹⁶ <https://www.adaptation-fund.org/project/climate-change-resilient-communities-through-integrated-natural-resource-management-in-eastern-ghouta-in-rural-damascus-syria/>

²¹⁷ <https://www.adaptation-fund.org/project/economic-social-and-solidarity-insertion-for-resilience-in-the-governorate-of-kairouan-iess-adapt-2/>

²¹⁸ <https://www.cif.org/projects/noor-midelt-phase-1-concentrated-solar-power-project>

²¹⁹ https://www.ccrif.org/frequently-asked-questions?language_content_entity=en

²²⁰ Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, Montserrat, St. Kitts & Nevis, Saint Lucia, Sint Maarten, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos Islands, Nicaragua, Panama and Guatemala.

essential government services, which CCRIF provides when a policy is triggered. It is the world's first regional risk-pooling fund issuing parametric insurance and, as such, gives its member governments the opportunity to purchase natural catastrophe coverage at a price substantially below what they would be able to obtain through a non-pooled arrangement. Since CCRIF's inception in 2007, the Facility has made 62 payouts totalling USD 265 million to 17 of its member governments²²¹. The facility was capitalized by the World Bank, Japan and other bilateral donors. Members governments contribute ca. USD 110 million per year varying according to the policies that is taken out.

Similar to a mutual insurance company, CCRIF is operated on behalf of 17 current participating states in the Caribbean and Central America, each of which pays an annual premium directly related to the amount of risk each transferred to CCRIF and purchases coverage up to a limit of approximately USD 100 million for each insured hazard (tropical cyclones, earthquakes or excess rainfall events). By pooling these catastrophe risks into a single diversified portfolio, capital needs for paying claims are significantly lowered. This in turn leads to a pricing reduction of 50% compared to individual country purchases of coverage. CCRIF has demonstrated that risk pooling and insurance can provide rapid financial relief and resilience to climate impacts.

Over the last years, two other CRI models have emerged relevant for climate adaptation. One of these is 'parametric insurance'. This insurance pays out based on the occurrence of specific events and predefined triggers like rainfall or temperature levels, making it particularly suitable for SMEs in the agriculture production sector. Another CRI model that has emerged more recently is 'index-based insurance'. With this model a combination of parameters is synthesized in indices. For example, an agriculture index can combine rainfall, temperature and satellite crop information. When a certain threshold of the index is crossed, policyholders automatically receive a pay out, irrespective of the actual damages to crops or property.

Unfortunately, throughout the Southern Mediterranean region, climate insurance services are relatively nascent and market penetration is still very low. In Tunisia, for example, not more than 8% of farmers take out a risk insurance²²². Private insurance companies and Governments do, however, promote insurance schemes to farmers. For example, the Jordan Ministry of Agriculture and the Jordan Central Bank, supported by UNDP, aim to increase the resilience of small farmers against production and market risks, especially those resulting from the impact of climate change²²³. To do so, a dedicated project focuses on strengthening the role of the Agricultural Risk Fund to reduce risks to the agriculture sector and related investments. By doing so, the Jordan Government aims to encourage the private sector to participate more actively in the development of the agricultural sector. In Morocco, "Mutuelle agricole marocaine d'assurance" (MAMDA) offers climate related risk insurance against weather risks, such as risk insurance against hail, or specific crop failure risks, such as an insurance that specifically covers oilseed crops²²⁴. Some of the insurances offered by MAMDA benefit from a 90% subsidy on insurance premiums from the Government. Also in Tunisia, climate related risk insurance exists, such as those offered by Groupe des Assurances de Tunisie (GAT) insurance for loss of crop due to frost or fire²²⁵.

Beyond specific climate risk insurance mechanisms, a range of insurance products exist that can help attract private finance for climate adaptation. One such insurance is a guarantee covering the risks of breach of contract by the government. In Jordan, the Multilateral Investment Guarantee Agency (MIGA) provided a guarantee of USD 13.1 million to protect private equity investors covering them for a period of up to 20 years against the risk of breach of contract. This allowed them to invest

²²¹ https://www.ccrif.org/sites/default/files/publications/annualreports/CCRIFSPC-Annual-Report-2022-2023_lowres.pdf

²²² <https://www.atlas-mag.net/category/pays/tunisie/la-souscription-a-l-assurance-agricole-reste-faible-en-tunisie#:~:text=En%20Tunisie%2C%20pr%C3%A8s%20de%2092,uniquement%20assur%C3%A9e%20contre%20la%20gr%C3%AAla>

²²³ <https://www.undp.org/jordan/press-releases/central-bank-ministry-agriculture-undp-launch-inclusive-insurance-and-risk-financing-project-0>

²²⁴ https://www.mamda-mcma.ma/nos-produits?profile_id=28&type_produit_id=5

²²⁵ <https://www.gat.com.tn/professionnel/assurances-agricultures>

in the As-Samra Wastewater Treatment PPP and increase the treated wastewater available for re-use in irrigation by more than 35 percent²²⁶.

Risk transfer and insurance mechanisms can play an increasingly important role in attracting private investment in building climate resilience in the Mediterranean region. To do so, however, such mechanisms will need to be promoted and their market penetration will need to increase significantly over the coming years.

²²⁶ <https://www.miga.org/project/samra-wastewater-treatment-expansion-project>

6.3 KEY ACTORS PRIVATE FINANCE CLIMATE ADAPATATION MEDITERREANAN

	Potential Lead Organisation - Mediterranean	Examples of Potentially Collaborating Organisations / Companies - National	Examples of Potential Associated Organisations - Mediterranean / International	Examples of Potential Private Sector Companies - Mediterranean / International
A. INITIATING CLIMATE ADAPTATION ACTION				
1	Water Loss Reduction GWP Med	Miyahuna (Jordan), ONEE (Moroc), SONEDE (Tunisia), WAJ (Jordan)	International Water Association	TaKaDu (Israel), Miya-INDAQUA (Spain), Xylem (US)
2	Wastewater Treatment Capacity GWP Med	ASPAR (Maroc), ONAS (Tunisia), SEAL (Algeria), Sidi Amor Agricultural Development Group (Tunisia)	International Water Association, International Desalination Re-use Association	Suez (France), Veolia (France), Nijhuis Saur Industries (France)
3	Desalination Solutions GWP Med	ONEE (Maroc), GCB (Algeria)	International Desalination Re-use Association	Metito (UAE), Acciona (Spain), Suez (France), Veolia (France), IDE Technologies (Israel), Almar (Spain)
4	Sustainable fish farming and natural fisheries WestMED Initiative (Italy)	Pro Terra (Maroc)		NewTechAqua (Italy)
5	Digital Climate Information Services GWP Med	Maroc Meteo (Morocco), Meteo Algerie (Algeria), Institute National de Meteorologies (Tunisia), Egyptian Meteorological Authority (Egypt)	WMO, Copernicus Climate Change Service, Centro Euro-Mediterraneo Cambiamenti Climatici,	MeteoMed (Italy), MeteoBlue (Switzerland), MeteoMaroc (Marocco),
B. DEVELOPING AN ENABLING ENVIRONMENT AND CAPACITY BUILDING				
6	Update climate policies IEMed, GWP Med, UNEP MAP	Ministry of Energy Transition and Sustainable Development (Morocco), Ministry of Foreign Affairs and the National Community Abroad (Algeria), Ministry of Environment (Tunisia), Egyptian Environmental Affairs Agency (Egypt), Ministry of Environment (Jordan)	UNFCCC, IUCN, WBCSD, UFM, MID-ECSD	
7	Create regulatory framework IEMed, GWP Med, UNEP MAP	Ministry of Energy Transition and Sustainable Development (Morocco), Ministry of Foreign Affairs and the National Community Abroad (Algeria), Ministry of Environment (Tunisia), Egyptian Environmental Affairs Agency (Egypt), Ministry of Environment (Jordan)	UNFCCC, IUCN, WBCSD, UFM, MID-ECSD	
8	Develop institutional frame IEMed, GWP Med, UNEP MAP	Ministry of Energy Transition and Sustainable Development (Morocco), Ministry of Foreign Affairs and the National Community Abroad (Algeria), Ministry of Environment (Tunisia), Egyptian Environmental Affairs Agency (Egypt), Ministry of Environment (Jordan)	UNFCCC, IUCN, WBCSD, UFM, MID-ECSD	
9	Accelerate Agricultural Innovation Mediterranean Innovation Partnership (CIHAM) (Italy)	Hydrofarms (Egypt), Pylon (Egypt), Sand to Green (Morocco), Ezayrahas (Tunisia)	FAO, CGIAR	
10	Tourism accommodation upgrades Mediterranean Tourism Foundation (Malta)	Jordan Society of Tourism and Travel Agents (JSTA), Egyptian Travel Agents Association (ETTA), Tunisian Inter professional Tourism Federation, Egyptian Hotel Association	Middle East - Mediterranean Travel and Tourism Association (MEMTTA) (Jordan)	
11	Develop Capacity Building Initiatives Various actors - sector specific	Various actors - sector specific	Various actors - sector specific	

C. ATTRACTING PRIVATE FINANCING				
12	Green Financing Programs	IFC, EBRD	National Bank (Egypt), Banque Nationale d'Algérie (Algeria), Ahli Bank (Jordan), Attijariwafa Bank (Morocco)	GEF, GCF, IFC, EIB, EBRD, UNDP
13	Corporate Engagement	BUSINESSMED (Union of Mediterranean Confederations)	Chamber of Commerce (Jordan, Morocco, Egypt, Tunisia, Algeria)	CEO Water Mandate, AWS, GWP Med
14	Market-Based Financing	GWP-Med		TNC (US), IFC
15	Debt for Nature & Climate Swaps	GWP-Med	Ministry of Finance (Jordan), Ministry of Finance (Egypt)	TNC (US)
16	AI Grand Challenge		Relatively Fund (Jordan), Sequence Ventures (Egypt), Fusion Informatics (Jordan)	Microsoft, Google, Amazon
17	Venture Capital Mobilization	Innovation Hub Mediterranean	IntiliaQa (Tunisia), Global Ventures (Egypt), HiMangel (Egypt), Innoventures (Egypt), Sawari Ventures (Egypt), UM6P Ventures (Morocco), Silicon Badia (Jordan), Relatively Fund (Jordan), Beyond Capital (Jordan)	Mediterrania Capital Partners (Malta), Middle East Venture Partners (MEVP) (UAE), VentureFriends (Greece), Blue Horizon (Switzerland), Pymwymic (Netherlands), Peakbridge Partners (Malta), Agroecology Capital (France), Anterra Capital (Netherlands)
18	Finance Lab			
19	Climate Risk Transfer Initiative:	Mediterranean Insurance and Reinsurance Company	Wafa Assurance (Morocco), Allianz Life (Egypt), STAR (Tunisia), Lloyds (UK), SAA (Algeria)	
20	Monitoring and Evaluation	UNEP-MAP, GWP-Med, IUCN-		

7 CONCLUSIONS

7.1 CLIMATE CHANGE AND IMPACTS

Significant climate change impacts in the Mediterranean region will occur. The current projection sees temperature rise by 0.9–5.6°C, average precipitation to decrease by up to 22%, and more extreme rainfall events and droughts to occur affecting water supplies and crop production. The projected rise in sea levels will exacerbate flooding, causing extensive land loss, agricultural damage, and severe disruptions to water availability and ecosystem health. Forest fires are expected to increase, among others, affecting tourism operations and threatening infrastructure. Risks are higher especially in the low-lying coastal areas, hosting a significant part of the Mediterranean countries' population, economic activities as well as ecosystems. **The main economic sectors impacted by climate change include tourism, agriculture, water, fisheries, transport, manufacturing, forestry and energy.** Impacts vary across sectors and countries including effects on tourism activities, loss of crops and reduced water supply reliability. Fisheries are projected to see a decline in catch and harbours are to see an increase in maintenance costs due to sea level rise. The forestry sector is likely to face increased forest destruction due to wildfires. The energy sector is projected to be impacted by water scarcity affecting production and cooling capacities. In addition, human and environmental health will be affected due to high temperatures, the spread of alien species and outbreaks of pests and diseases.

The private sector engages in climate adaptation through four broad ways: companies of all sizes can climate-proof their operations; companies, mostly of larger scale, can invest upstream throughout their supply chain; responsible businesses can support climate adaptation actions for community ecosystems conservation; private capital can finance investments that contribute to climate resilience transitions.

Businesses are starting to engage in climate adaptation actions throughout the Mediterranean region, including those operating in or having interest in the coastal areas. Though there is a long way to go, there has never been more momentum for companies to become more sustainable. However, the degree to which actions are taken varies between countries, sectors and between private sector actors. Actions undertaken are often not framed explicitly as 'climate adaptation' activities. More often, they are presented as addressing extreme weather events, creating resilience, or presented as part of a broader set of sustainability initiatives. However, there are still several barriers restricting scaled up private sector engagement in climate action. For example, companies need more accurate climate data and climate risk information, improved financial incentives and better enabling environments for investing, and more information on emerging business opportunities that overlap with national priorities to increase private funding for climate action.

Businesses in the Mediterranean still tend to underestimate their exposure to climate risks. This reflects a narrow view of these risks and their impacts on supply chains and markets. To overcome this, businesses can conduct a Climate Risk Assessment to identify the risks of climate change and ways to address these by modifying business strategies and defining entry points for adaptation. To determine the financial effectiveness of a proposed adaptation measure, businesses can carry out a Cost Benefit Analysis (CBA). This helps define a sound investment rationale for the various adaptation options.

A major challenge remains in the perception that investing in climate adaptation is risky, with uncertain returns, unpredictable cash-flows and long payback periods. Climate adaptation financing is often given a low priority due to the lack of understanding of climate risks and the inability to translate known risks into investment opportunities. Especially SMEs frequently struggle to access affordable financing, including for adaptation projects.

Coordinated actions beyond national level across the region are quite challenging. This is due to the fragmented nature of stakeholders and the diverse impacts and adaptation response options existing across the region as well as to the limited interest by the private sector.

7.2 ROLES, RESPONSIBILITIES, CAPACITIES AND ENABLING ENVIRONMENT

New forms of collaboration will be needed to mobilize private actors and financing for climate adaptation. By fostering cooperation between the public and private sectors, local communities, civil society, as well as international organizations, resources and expertise can be pooled. Developing collective action can help overcome disparities, inefficiencies and duplications and create opportunities for sustainable initiatives.

Business' main responsibility for mobilising finance for climate adaptation is to turn climate risks into business opportunities. Businesses need to be profitable today and resilient in the face of an uncertain future so that they can attract business financing. This means displaying a form of entrepreneurship that seeks new opportunities to serve clients and pro-actively adapts to changing conditions, including climate change, throughout the entire value chain.

Finance institutions' primary role in climate adaptation is to support companies with commercial financing for climate adaptation measures. They can offer tailored financial products such as 'climate adaptation bonds', green loans, and insurance products to de-risk investments. Finance institutions also have an important role in leveraging public funds to mobilize private capital through blended finance approaches.

Governments play a crucial role in creating an enabling environment that encourages and supports private sector participation in climate adaptation efforts in the Mediterranean region. One aspect of this is establishing robust policy, regulatory, and institutional frameworks. It also entails enforcing compliance to stimulate private sector investments by reducing risks and boosting investor confidence. Another aspect is providing financial incentives, such as tax breaks, and offering grants, affordable loans, subsidies, or partial guarantees to mobilize private financing at scale.

Civil society can help mobilize private finance by calling for new initiatives and pro-active engagement of private and public actors. Civil society groups have a key role to play in raising awareness, engaging in public education campaigns and mobilizing public support, to help create a supportive environment for private sector investment in climate resilience.

Academia's primary role in private climate adaptation finance is to study and assess climate change impacts and inform private sector decision-making and investment strategies. By producing climate insight and foresight, academia and engineering schools can create the underpinning of capacity building programmes. Also, research and engineering institutions can be a driver of innovation and the development of new technologies, tools and solutions that can attract private investments. Through

these, Academia can promote thought leadership, science to policy, while preparing a new generation of managers that can address challenges through solutions.

International organizations can stimulate the private sector engaging in climate adaptation in the Mediterranean by facilitating multi-stakeholder dialogue and cooperation while piloting action and demonstrating feasibility of impact. Focusing on sharing knowledge, expertise, and resources, and offering technical assistance and training, they can help build the adaptive capacity of businesses. They can also be pivotal in mobilizing finance and facilitate access to funding mechanisms for climate adaptation projects. Piloting action at local level towards tangible outcomes that demonstrate feasibility, should also be in the focus.

Capacity-building across several sectors will be required to allow the private sector to effectively engage in climate change adaptation. Private sector actors and other stakeholders need to master a multi-faceted skill set, know-how and expertise that is specific for each sector, including: technical expertise, innovation abilities, fundraising, project management know-how, risk management and stakeholder engagement.

7.3 PRIVATE SECTOR ENGAGEMENT

A Public Private Partnership can be an effective mechanism for attracting private sector engagement in climate adaptation infrastructure assets. A PPP enables the construction and operation of these assets and the sharing of related risks, costs, and expertise between the public and private sectors. Throughout the Mediterranean, a range of PPP projects have been carried out and are currently ongoing that are relevant for climate adaptation. PPP projects can enhance the technical feasibility and mobilize know-how and technologies needed to deliver climate adaptation outcomes. Key lessons learned are considered related to political factors, project fundamentals, effective team management, bankability, risk allocation, transparency, stakeholder engagement, and capacity building.

Green and blue economy entrepreneurship are ways to mobilize technologies and methodologies that help to adapt to climate change. By prioritizing environmental sustainability and efficiency in resource use approaches, such as innovative agriculture, smart water management, and sustainable tourism and fisheries, sustainable ports, etc. green and blue economy entrepreneurship can help shape a climate-resilient economy on the ground throughout the Mediterranean.

Water- Energy- Food-Ecosystems Nexus approach and related projects to adapt to climate change are often perceived too risky by private sector actors given their complexity. This restrains domestic commercial banks to engage on a pro-active basis. However, businesses – especially SMEs – have a key role to play in WEFE projects such as those focused on energy efficiency, sustainable food production, land restoration, ecosystems' protection or water demand reduction, thus achieving tangible climate adaptation/mitigation co-benefits. International companies can also play a role through engaging in the construction and operation of large scale, water infrastructure and energy and agriculture transition projects. Engagement of private sector partners in existing Communities of Practice, like the PRIMA WEFE4Med, will enrich interaction, experience sharing and will foster joint initiatives.

Technological advancements in sensors, communication networks, remote sensing, Big-Data, IoT and AI are revolutionizing the way we adapt to climate change; a digital transformation process is on-going in the region, with different pace of development in its parts, including with an emerging

WEFE Nexus content. Embracing new technologies, such as climate-resilient infrastructure, early warning systems, water and energy efficient technologies, and drought-resistant crops are changing the way farmers, electricity operators, water managers, tourism operators and consumers make decisions. Mobilizing these new technologies throughout the Mediterranean will be key to effectively adapt to climate change and create new business opportunities from it. Supporting these through policy tools that will allow advancing digital transformation through integrated approaches, is needed; related regional initiatives will be helpful for defining contents and drawing action plans for that.

Private sector's engagement in using nature-based solutions for climate adaptation is in its infancy in the Mediterranean. However, by engaging in activities such as farming focusing on soil restoration or wastewater treatment for re-use through constructed wetlands, companies can make profitable use of nature-based solutions and contribute to climate adaptation.

Environmental, Social, and Governance (ESG) and Corporate Social Responsibility (CSR) driven initiatives play a pivotal role provide opportunities to integrate climate adaptation into core business strategies. By focusing on establishing sustainable supply chains, , socio-economic benefits to local communities, efficient water management for replenishment targets, energy efficiency or ecosystems including coastal and marine conservation programs, and collaborating with stakeholders, these initiatives can leverage local knowledge and co-create solutions that build climate resilience at the grassroots level.

Technical training and capacity-building initiatives can help accelerate the engagement of the private sector and help private sector actors understand and implement effective adaptation strategies. These initiatives could include, for example, the development of technical oriented programs on specific adaptation measures relevant to types of businesses or train businesses to access new capital from (local) private sources or international sources (e.g. European Union, GCF, GEF, etc.).

7.4 MOBILIZING PRIVATE FINANCE

Private finance, other from risk-reduction investments to own business's needs, to climate adaptation remains extremely modest throughout the Mediterranean. Most climate adaptation actions have been financed through public debt financing which falls drastically short of the financing needed to implement the NDCs of all developing countries in the Mediterranean. A substantial portion of private finance today comes from ESG/CSR and philanthropies.

Significant opportunities exist for mobilizing private investment in climate adaptation, including with mitigation co-benefits, in the tourism, agriculture, and water management sectors in the Mediterranean. A range of mechanisms and tools are available for financing climate adaptation measures in these sectors, such as private equity, venture capital, bonds, loans, guarantees, and risk insurance.

Catalytic public finance can help mobilize private finance using sector-based modernization programs in the tourism, agriculture, water and fisheries sectors. Public investments in innovation, entrepreneurship, value chain strengthening, and capacity building can unlock private investments in climate adaptation measures in these sectors. Also, governments, including with the support of international financing instruments and bilateral development aid, can stimulate private financing by

providing grants, subsidies, and tax breaks, abolish climate unfriendly regulation and tariffs on importing climate-resilient technologies, or offering (partial) concessional loans with more generous terms.

Most private climate adaptation finance is to be mobilized by SMEs as part of their regular financing. Its mobilization depends on the capacity of businesses to access finance in general using their retained earnings or existing credit lines at local banks. Climate adaptation dedicated local corporate financing needs a clear business motive, should directly serve the market, result in profitability, and have a direct contribution to climate adaptation.

National banks play a key role in private investments in climate adaptation by setting up special ‘Green Financing Programmes’ that offer SMEs commercial ‘sustainability credit’. Through various financial products, including those with government guarantees, banks can target environmentally friendly projects, such as water efficiency or smart irrigation solutions that promote climate resilience.

Philanthropy can help mobilize private investments through complementary funding for projects that do not attract immediate private investment. Grants can help kickstart initiatives, such as water management projects or coastal community resilience actions including with a focus on ecosystems conservation. Philanthropic efforts can also fund capacity-building programs that equip farmers and fishers with the knowledge and tools necessary to implement effective climate adaptation measures. They can also act as intermediaries, fostering new alliances between public, private, and civil society actors that can lead to innovative funding models and shared investment strategies.

Blended finance instruments can be instrumental in mobilizing private finance for climate adaptation de-risking projects with low financial viability, but high climate adaptation returns. By combining concessional funds from public sources or philanthropy with private capital, blended finance can make projects more attractive to private investors leading to both commercial returns and climate resilience.

Public Private Partnerships can be used to mobilize private co-investment in climate-resilient infrastructure that generates a reliable cash-flow. PPP also help sharing construction, operation, and maintenance risks with private sector actors’ leading to more efficient project delivery, better quality and more reliable service delivery through using performance-based contracts. To mitigate the potential risks of PPPs and navigate their complexities, careful planning, transparent procedures, and strong regulatory frameworks are essential.

Green, Social and Sustainability bonds from treasury and corporates can be used to attract institutional investors by dedicating the proceeds for climate adaptation projects such as marine conservation or sustainable agriculture. Green bonds issuance in the developing countries in the Mediterranean have been very modest to date. However, especially green private bonds carry significant potential for mobilizing climate adaptation finance if clear guidance is adopted that help issuers and investors to identify, evaluate, and select eligible projects

Commercial Debt for Nature and Climate swaps can be used to restructure government bonds and generate grant financing for climate adaptation projects. Repurchasing of the treasury bonds traded on the secondary market can be used for this purpose, especially in the case of Jordan, Egypt and

Morocco. Experienced partners and an “emblematic use of proceeds”²²⁷ are needed to make such transactions a success.

By adopting a more market-driven approach through ‘water trading’, ‘payment for ecosystem services’ or ‘catch shares’, private finance can be mobilized for climate adaptation throughout the Mediterranean region. Setting up ‘water trading’ schemes requires improving sustainable water management, valuing of water for multiple uses and promoting efficient, equitable and sustainable water allocation decisions. Payment for ecosystem services can mobilize downstream private capital to compensate upstream citizens for their sustainable water and land management practices. Developing catch shares requires a willing group of fishers in a specific area to voluntarily reduce their catch in the short term together to gain commercially through increased stocks and catches in the future.

Investments by Venture Capital can facilitate the development and scaling of innovative solutions that enhance the region's resilience to climate change. By providing seed funding to early-stage enterprises boasting cutting-edge technologies, or by mobilizing accelerator financing to scaling companies, Venture Capital debt and equity will form a keystone for climate adaptation financing in the Mediterranean.

Various European, international as well as bilateral funding windows and initiatives offer critical financial and technical support for climate adaptation projects in the southern Mediterranean region. Directly or indirectly, these funds are designed to support SMEs in key sectors vulnerable to climate change, such as agriculture, water management, tourism and fisheries, and include dedicated international climate finance mechanisms such as the Green Climate Fund, the Adaptation Fund, Global Environment Facility/SCCF and the Climate Investment Funds.

Risk transfer mechanisms can protect governments and businesses from financial losses due to climate-related events in the Mediterranean. Risk transfer mechanisms will be increasingly important to attract private finance to build climate resilience using instruments such as catastrophe bonds (cat bonds), risk-pooling, climate risk insurance (parametric and index-based insurance). To date, however, all types of climate insurance services are relatively nascent and market penetration is still very low throughout the Southern Mediterranean region.

²²⁷ Refers to a representative or notable example of how funds raised through specific financial instruments, such as green bonds, social bonds, or sustainability bonds, are allocated to achieve intended outcomes. These examples are often highlighted because they effectively demonstrate the impact or purpose of the funds and serve as models for similar projects

8 RECOMMENDATIONS

Based on the above analysis, a number of specific recommendations are provided that can help initiate and accelerate climate adaptation in the developing countries of the Mediterranean and enhance private sector engagement and financing; these concern actions that can be implemented at local or national level, while building new or supporting existing related regional coordination initiatives will be of added value.

A. Advancing Climate Adaptation Action

1. **Develop initiatives that focus on the expansion of wastewater treatment and re-use through blended finance and/or PPPs.** This could focus on building a pipeline of local projects, based on demand and synergy with beneficiaries, attracting public and private financing including utilizing international climate financing. It could also include a building capacity initiative at regional level on decentralized solutions and using NbS, like constructed wetlands, for wastewater treatment. Augmenting wastewater re-use can help provide additional water supplies for local farmers and industries and help them and the local communities adapt to climate change, while increasing energy efficiency, utilizing treatment's bi-products, etc.
2. **Set-up a dedicated initiative to accelerate efficient desalination solutions along the Mediterranean shore.** These could include upgrading existing and, where decided, increase desalination capacity through new plants powered by renewable energy to provide water for cities, industries and advanced agriculture systems. They also need to be designed to handle produced brine in a sustainable manner, including through innovative approaches like dilution before diffusion, use of brine to sequester CO₂, utilising bi-products etc. .
3. **Initiate a water loss reduction programme that mobilizes private engagement to gain water efficiency using performance-based contracts.** Such a programme can be initiated with, for example, 20 small and medium-sized municipalities in the Mediterranean region, where significant water loss reduction gains can be made. It can also include rainwater harvesting, on-site water storage and roof solar panel installation. Blended finance mechanisms could be used to make it attractive for the private sector to engage in the initiative. Reducing water loss and increasing on-site storage, while producing on-site renewable energy, can help augment water availability at local levels and strengthen climate resilience.
4. **Support climate-smart aquaculture promoting sustainable fish farming and protecting natural fisheries.** This could include the establishment and enforcement of Marine Protected Areas and the use of catch shares in specific areas with a selected group of fisherfolk. It can also include the creation of artificial reefs to help reduce erosion, protect shorelines and help with nature conservation and restoration.

5. **Promote climate-resilient tourism** through supporting green hotels, restaurants, and catering (HORECA) through water and energy efficiency, protection of adjacent ecosystems, sustainable supply chain, etc., focusing on related SMEs that are mostly family owned, thus enlarging the green critical mass of this top ‘industry’ in the region.
6. **Support climate-resilient ports** through water and energy efficiency investments, including minimizing environmental impact during the whole cycle (construction-maintenance-operation), safeguard resilience of infrastructure to climate risks and hazards, contribute to sustainable interrelated hinterlands infrastructure like towards low-emission transport connections in coordination with competent authorities, etc.
7. **Advance climate-resilient manufacturing** by accelerating industries’ natural resources efficiency, with due consideration of supply chain partners, safeguard production plants from climate risks and hazards, and contribute to ecosystems and habitats protection in the plant’s vicinity.
8. **Promote the further development of public and commercial digital climate information services that support adaptation investments and regular operations.** Specific data and information services, tailored to businesses needs, can assist in predicting and responding to impacts of climate change, like for infrastructure’s resilience. Furthermore, such services can be targeted at farm level to create agriculture production resilience and enhance food security. Beyond free available basic digital advisory services, subscription services can render farmers detailed advice to avoid crop loss, improve crop yields and increase profitability.

B. Developing an enabling environment and capacity building

9. **Incorporate in existing national climate policies and strategies as well as in Integrated Coastal Zone Management (ICZM) strategies and plans clear definitions of why, what, and how private sector participation in climate adaptation is sought.** This could include a roadmap and investment envelope on which the private sector can engage, and clear process of how the private sector can participate in climate adaptation actions in different economic sectors.
10. **Create regulatory frameworks that promote climate-smart practices and technologies.** This can include irrigation water efficiency standards, building codes and infrastructure standards that incorporate climate resilience. It can also include the streamlining of permitting processes for climate resiliency projects, the implementation of standardized Climate Risk Assessment protocols for businesses and mandating businesses to report and disclose their climate risks.
11. **Establish standard business models** for private sector contract and dispute settlement terms that meet international investor expectations, transparent and well-paced procurement processes, clear technical requirements, financing models that allow securitization of payment streams, risk allocation to the parties best able to hold them, and price levels that compensate for these risks.

12. **Develop institutional frameworks that promote dialogue and cooperation on climate adaptation among governments, businesses, civil society, communities and academia.** Governments can establish inter- ministerial coordination and sector specific support mechanisms to support such efforts. Also, Public-Private Partnerships units can incorporate climate adaptation actions in their work programmes to underpin a targeted effort to mobilize private finance, also building a related monitoring and reporting system to document and evaluate their impacts.
13. **Accelerate national agriculture innovation programmes, emphasizing climate adaptation opportunities, technologies, and capacities.** Cooperating with innovative farmers, national farmer associations and Mediterranean agriculture bodies, such programmes can focus on activities such as farmer-to-farmer exchange, adaptation incentives and (international) technology transfer. Financing could be mobilized from national funds, development assistance, international concessional financing and corporate marketing and CSR budgets.
14. **Develop a climate change adaptation training programme for tourism HORECA providers to improve climate resilience.** This will include guidance for existing hotels, resorts, guesthouses and B&Bs as well as for restaurants and catering on energy and water conservation, opportunities to enhance the property and services, and ways in which to market the climate-friendly aspects of the establishment.
15. **Develop capacity-building initiatives to help private sector actors understand and contribute to design and implement effective adaptation strategies.** Such national and regional initiatives can focus on sector specific technical oriented programs or inter-sectoral groupings or on prioritised contents like training to access new capital from (local) private and public sources or international climate finance (e.g. European Union, GCF, etc). Furthermore, initiatives can focus on capacitating and directly supporting the public sector to address and synergize with the private sector and manage related investments, including in PPP formations, and to improve access to domestic funding sources as well as to international financing that requires direct public engagement, like GCF.
16. **Develop and actively use a framework for monitoring and evaluating the implementation of the above recommendations.** Such framework can be used to track progress and impacts and identify gaps and challenges. In combination with an effective communication strategy, it can also help further mobilize private sector actors and other stakeholders to engage, finance and accelerate actions by the private sector on climate adaptation in the Mediterranean region.

C. Attracting Private Financing

17. **Initiate, with private national banks, the further development and setting up of special ‘Green Financing Programs’ that offer SMEs commercial ‘sustainability credit’.** Such programs can be financed through the issuance of green bonds by the commercial national banks which can be purchased by multi-lateral development agencies and other investors. Use of proceeds of these bonds can be focused on financing companies that address

climate adaptation and the WEF Nexus, through activities such as smart irrigation, regenerative agriculture or water and energy efficiency.

18. **Engage with leading international and national corporates to initiate investments in on-the-ground action on climate adaptation through their ESG – CSR programs, including through a peer-to-peer among businesses.** Using the increased awareness and emerging initiatives, this engagement can focus on actions such as creating climate resilient farms connected to supply chains, green urban spaces for better living and tourism, or water efficiency and water re-use boasting aquifer replenishment and corporate water neutrality. Integrating climate adaptation into core business strategies and engaging pro-actively with local communities can generate quick win-win solutions and inspire further action to build climate resilience. It can also include peer-to-peer learning as well hands-on assistance of more advanced to ‘start-up’ companies for advancing priority actions and investments.
19. **Explore the development of ‘market based’ financing mechanism for climate adaptation, focused on ‘water trading’, ‘payment for ecosystem services’ and ‘catch shares’.** Developing these mechanisms can best be done ‘place-based’ and use local multi-stakeholder coalitions that develop the necessary capacities and strategies and are closely involved in the design and implementation. It will be important to build on existing experiences, involve international expertise in the design and set-up of the mechanisms and establish a close collaboration with relevant line ministries and local authorities.
20. **Explore and actively develop Debt for Nature and Climate Swaps focusing on climate adaptation and restoration of emblematic ecosystems critical for climate resilience.** Initiating these initiatives will require a careful analysis of treasury bonds traded on the secondary market, a strong engagement with the Treasury departments and designing an attractive use of proceeds with national and local stakeholders. An initial analysis has indicated that Jordan, Egypt and Morocco are likely the most suitable countries to focus on for using this mechanism to mobilize climate adaptation finance.
21. **Create a ‘Grand Challenge’ to mobilize the power of Artificial Intelligence to accelerate climate adaptation investments in the Mediterranean region.** Such initiative can seed-finance scientists, engineers and entrepreneurs to put forward leading-edge AI ideas and can provide substantive follow-up grants to develop and test proposed AI innovative solutions to create climate resilience. Angel investors can then follow through and fund the first applications of successful trials. Philanthropic institutions based in the Mediterranean and the Gulf States could be approached for financing such ‘AI Grand Challenge for Climate Adaptation’.
22. **Catalyse the mobilization of Venture Capital for climate adaptation solution through setting up a ‘lion’s den’ focused on climate adaptation solutions for the Mediterranean region.** With this mechanism, entrepreneurs pitch their business ideas to a panel of national and international investors or "lions", seeking funding or partnership opportunities. The panel evaluates project ideas and provides constructive feedback, may decide on investment, and provide further technical support and network access. The recommended Lions' Den serves as a dynamic platform for evaluating innovative ideas,

promoting entrepreneurship, and facilitating investment in promising climate adaptation related solutions and businesses in the developing countries of the Mediterranean.

23. **Set-up a 'Finance Lab' focused on Mediterranean climate adaptation bringing together investors and leading innovators in various sectors (tourism, agriculture, water).** The 'Finance Lab' would serve as a collaborative platform designed to identify, develop, and implement financial solutions to address climate change adaptation challenges in the region. By fostering innovative financing mechanisms, conducting critical analysis, advancing stakeholder collaboration, and building entrepreneur capacities, such mechanisms can play a crucial role in bridging the gap between the finance sector, leading economic sectors and the ecological needs of the region.
24. **Create a dedicated initiative for the promotion of climate risk transfer mechanisms supporting public and private sector to reduce losses due to climate-related events in the Mediterranean.** The initiative would particularly focus on using catastrophe bonds, risk-pooling, parametric and index-based insurances. Collaboration with leading insurance companies, ministries of finance and national sector organizations would enable a targeted development of the demand for these risk transfer services enabling further private investment in climate adaptation in the region.

9 ANNEX 1. CLIMATE RISKS ASSESSMENT AND COST BENEFIT ANALYSIS

9.1 CLIMATE RISKS FOR KEY MEDITERRANEAN INDUSTRIES

Climate risks are impacting key industries in the Mediterranean in different ways. Below a short overview is presented of the main risks per sector.

Tourism Industry: The tourism industry is a vital sector that contributes significantly to the Mediterranean economy. However, this industry is increasingly vulnerable to the impacts of climate change, with risks to destinations, infrastructure, and visitor experiences. The tourism industry faces a range of climate-related risks that can impact overall industry performance and growth, including:

- **Changing Weather Patterns:** Altered rainfall patterns, temperature fluctuations, and extreme weather events can impact the attractiveness of destinations, affect outdoor activities, and disrupt tourism operations,
- **Water Scarcity and Quality:** Water scarcity can affect the water supply required in many tourism destinations that see a short-term influx of visitors. Also, water-dependent tourism activities, such as swimming, boating, and water sports and water quality can be impacted.
- **Sea-Level Rise and Coastal Erosion:** Rising sea levels and coastal erosion pose risks to coastal destinations and infrastructure, including beach erosion, flooding, and damage to hotels and resorts located in vulnerable coastal areas.
- **Natural Disasters:** Increasing frequency and intensity of natural disasters, such as hurricanes, wildfires, and droughts, can lead to the destruction of tourism infrastructure, disruption of travel plans, and negative perceptions of destination safety.
- **Ecological Impacts:** Climate change can disrupt fragile ecosystems, leading to the loss of biodiversity, coral bleaching, and degradation of natural attractions, impacting the overall appeal of destinations.
- **Electricity supply disruptions** due to supply and distribution challenges as a result of excessive use of Air Conditioners affecting visitor experiences and causing a loss of refrigerated food.

Agriculture and Farming Industry: The agriculture and farming industry plays a vital role in many Mediterranean economies particularly in rural areas. The sector is increasingly vulnerable to the impacts of climate change, which pose significant risks to agricultural productivity, supply chains, farm profitability and livelihoods, including:

- **Extreme Weather Events:** Intensifying and more frequent extreme weather events, such as droughts, floods, heatwaves, and storms, can damage crops, erode soil, and disrupt farming operations.
- **Changing Rainfall Patterns:** Alterations in rainfall patterns can lead to water scarcity or excess, affecting irrigation, crop growth, and the availability of livestock water and feed.
- **Temperature Changes:** Rising temperatures can impact plant growth cycles, reduce crop yields, and increase the prevalence of pests and diseases. Heat stress can also affect livestock production and animal welfare.

- **Shifting Growing Seasons:** Altered growing seasons and phenological changes can impact planting and harvesting schedules, requiring adjustments in farming practices and crop varieties.
- **Market Volatility:** Climate-related risks can influence market dynamics, including shifts in consumer preferences, the availability and affordability of agricultural inputs, and changes in demand patterns.

Food and Beverage Industry: The food and beverage industry in the Mediterranean region is increasingly vulnerable to the impacts of climate change, with risks to agricultural production and supply chain operations. These climate-related risks impact agricultural productivity, raw material availability, production processes, distribution networks, and consumer demand. These risks include:

- **Changing Weather Patterns:** Altered rainfall patterns, temperature fluctuations, and extreme weather events can affect crop yields and livestock health, impacting supply chains.
- **Water Scarcity and Quality:** Increasing water scarcity can impact irrigation systems, water-intensive production processes, and the availability of clean water for food & beverage processing.
- **Supply Chain Disruptions:** Climate-related risks can disrupt transportation networks, affect logistics, storage and refrigeration facilities, and impact the timely delivery of raw materials and finished products.
- **Market Volatility:** Climate-related risks can influence consumer preferences, demand patterns, and pricing dynamics. Changes in climate can lead to shifts in agricultural production regions and affect the availability and affordability of certain ingredients.
- **Regulatory and Policy Changes:** Evolving regulations, policies, and sustainability standards related to climate change and environmental protection can impact production practices, labelling requirements, and compliance obligations.

Water Industry: The water supply and water management in the Mediterranean is one of the most climate change impacted industries in the region. A range of risks can affect water availability and water supplies directly impacting on other industries. The main risks faced include:

Climate risks for the water industry in the Mediterranean region include:

- **Drought:** Decreased precipitation and prolonged dry periods can lead to water scarcity, impacting water availability for drinking, agriculture, and industry.
- **Changes in Hydrological Patterns:** Alterations in precipitation patterns can impact water availability and storage, influencing water management strategies.
- **Floods:** Intense rainfall events can overwhelm drainage systems, leading to flooding and damage to water infrastructure.
- **Sea-Level Rise:** Rising sea levels can result in saltwater intrusion into freshwater sources, affecting both quality and quantity of available water.
- **Temperature Extremes:** Higher temperatures can increase water demand for irrigation and cooling purposes, potentially straining water resources.
- **Extreme Weather Events:** More frequent and severe storms can damage water infrastructure, disrupt supply chains, and compromise water quality.

Fisheries and Aquaculture Industry: The Fishing and Aquaculture Industry faces a number of risks induced by climate change, including:

- **Overfishing:** Unsustainable fishing practices can deplete fish stocks that could recover more slowly under climate change, leading to reduced yields and impacting livelihoods.
- **Changes in Productivity:** Climate-related factors can influence the productivity of fish stocks and aquaculture operations.
- **Extreme Weather Events:** Storms, hurricanes, and other extreme weather events can damage aquaculture facilities, disrupt fishing operations, and result in economic losses.
- **Temperature Changes:** Rising sea temperatures can impact the distribution and abundance of fish species, affecting the availability of commercial fish species.
- **Habitat Degradation:** Climate change can alter marine habitats, such as coral reefs and seagrass beds, which are important for fish reproduction and biodiversity.
- **Ocean Acidification:** Increasing levels of carbon dioxide in the atmosphere are absorbed by the oceans, leading to acidification. This can harm shell-forming organisms and disrupt marine food chains.

Transport and Logistics Industry: The transport and logistics industry in the Mediterranean region face multiple climate related risks impacting infrastructure, operations, and overall supply chain efficiency, including:

- **Extreme Weather Events:** Intensifying and more frequent extreme weather events, such as storms, hurricanes, floods, and heatwaves, can damage transportation infrastructure, including ports, roads, railways, and bridges, leading to disruptions in freight movement.
- **Sea-Level Rise and Coastal Erosion:** Rising sea levels and coastal erosion pose risks to port facilities and coastal transportation infrastructure, potentially affecting port operations, vessel navigation, and cargo handling.
- **Changing Precipitation Patterns:** Alterations in rainfall patterns can lead to increased flooding, impacting road and rail infrastructure, and affecting the availability and reliability of transportation routes.
- **Supply Chain Disruptions:** Climate-related risks can disrupt supply chains by causing delays in the movement of goods, interruptions in cargo handling at ports, and disruptions in logistical operations, such as warehousing and distribution.

Manufacturing & Technology Industry: The Mediterranean manufacturing and technology industry faces a number of climate related risks, including:

- **Water scarcity:** Local water scarcity arising from climate change can affect operations and expansion of production / data centers that require substantial amounts of water for cooling and other operational processes.
- **Extreme weather events:** Events such as hurricanes, floods, and wildfires, can pose threats to data centers, manufacturing facilities, and critical infrastructure.
- **Temperature and rainfall regimes:** Changes in temperature and precipitation patterns can impact energy availability and increase operational costs.

- Supply Chain Disruptions: Climate-related risks can disrupt supply chains by causing delays in the movement of goods and critical supplies.
- Electricity supply disruptions due to supply and distribution challenges as a result of excessive use of Air Conditioners can affect manufacturing and supply chains.

Forestry Industry: Climate risks for the forestry industry in the Mediterranean region include:

- Wildfires: Climate change is expected to lead to an increase in the frequency and intensity of wildfires in the Mediterranean region, posing a threat to forest ecosystems and timber resources.
- Pests and Diseases: Warmer temperatures and changing precipitation patterns can facilitate the spread of pests and diseases that may impact forest health and productivity.
- Drought and Water Scarcity: Reduced water availability due to drought and changing rainfall patterns can stress forest ecosystems, leading to increased vulnerability to pests, diseases, and wildfires.
- Extreme Weather Events: Events such as storms, heavy rainfall, and heatwaves can cause damage to forests, disrupt timber production, and impact the overall health of forest ecosystems.
- Loss of Biodiversity: Climate change can alter habitats and disrupt the ecological balance of forest ecosystems, leading to a loss of biodiversity and affecting the long-term sustainability of the forestry industry.

Energy Production Industry: Climate risks for the Energy Production Industry in the Mediterranean region include:

- Water Scarcity: Energy production often requires significant water resources for hydropower, cooling and steam generation. Water scarcity due to drought and changing precipitation patterns can impact energy production capacity.
- Extreme Weather Events: Severe weather events such as storms, floods, and heatwaves can disrupt energy infrastructure, leading to power outages and operational challenges for energy production facilities.
- Wildfires: Increased frequency and intensity of wildfires due to hot and dry conditions can threaten energy infrastructure, particularly in areas with vegetation near power lines and facilities.
- Sea-Level Rise: Coastal energy infrastructure, such as power plants and refineries, are vulnerable to sea-level rise, leading to potential damage and operational risks.

9.2 CLIMATE RISK ASSESSMENT

9.2.1 FRAMEWORK

A comprehensive climate risk assessment helps businesses to identify and manage climate-related risks and opportunities with the aim to build resilience, enhance reputation, and create long-term value for the company and its stakeholders.

Climate Risk = SUM (hazard, exposure, vulnerability)

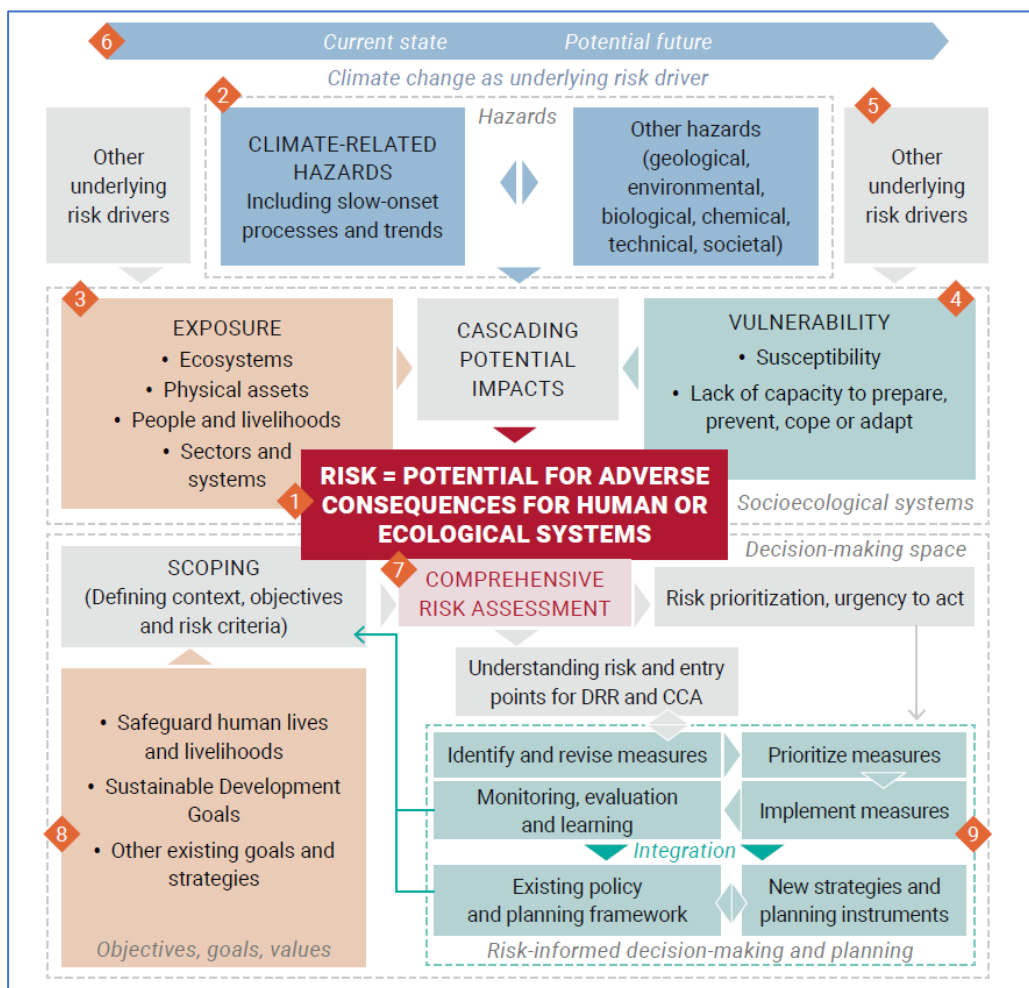
The core of risk, by definition, considers the hazards, the exposure, and the vulnerability level of assets and operations (as shown in the equation above). The typical approach for conducting a climate risk assessment for companies in the Mediterranean region uses the following steps:

1. **Hazard Assessment:** This includes a period of data collection and analysis of relevant climate data, historical climate patterns, and projections specific to the regions where the businesses operate.
2. **Supply Chain/ Exposure Mapping:** Here the entire supply chain is mapped to identify critical points, dependencies, and vulnerabilities. The supply chain covers the demand estimation, procurement planning, production planning, material management, logistics streamlining, inventory planning, among others,
3. **Vulnerability Assessment:** The vulnerability assessment to identify the potential impacts of climate risks on different aspects of the supply chain.
4. **Financial Impact Assessment:** This process includes the quantification of the potential financial implications of climate risks if no action is undertaken and assessing the need for adaptation measures.
5. **Adaptation and Risk Management Strategies:** Here adaptation strategies are developed and implemented to reduce vulnerability and build resilience. The determination of the business' risk appetite is key.
6. **Collaboration and Stakeholder Engagement:** Engaging with consumers, investors, and communities to raise awareness and promote sustainable consumption patterns is also critical.
7. **Continuous Monitoring and Review:** Climate risk assessment is an ongoing process. Regularly monitoring and reviewing the effectiveness of risk management strategies, considering new information, emerging risks, and evolving regulations is essential to ensure adaptability and improvement over time.

Figure 9-1 shows the framework for comprehensive risk assessment and planning in the context of climate change.

When analysing exposure, it is recommended to consider a sequence of exposed systems (e.g., ecosystems, infrastructure, human lives and livelihoods, and social sectors) to model and understand the cascading impacts from natural systems to business operation and society. This means widening the perspective of approaches that focus mainly on human lives and physical assets. Exposure is a highly dynamic risk factor that requires the consideration of current trends in population, socioeconomic development, and environmental factors. The underlying risk drivers affect exposure and can possibly contribute to an increase of climate-related risk even more than a single hazard.

FIGURE 9-1: FRAMEWORK FOR COMPREHENSIVE RISK ASSESSMENT AND PLANNING IN THE CONTEXT OF CLIMATE CHANGE²²⁸



Analysing vulnerability should include all relevant environmental, physical, technical, social, cultural, economic, institutional, or policy-related factors that contribute to susceptibility and/or lack of capacity to prepare, prevent, cope, or adapt. Understanding vulnerability is a key element in analysing entry points for adaptation and risk reduction options. As for exposure, underlying risk drivers such as land degradation, poverty or conflicts may affect vulnerability today or in the future, to an extent that could possibly contribute to an increase of climate-related risk even more than the single hazard.

Risk Finalization

Risk finalization involves the comprehensive consideration and assessment of all potential risks associated with climate change. This includes understanding both individual risks (such as extreme weather events, sea-level rise, etc.) and how these risks interact and accumulate over time to form complex, interconnected risk landscapes.

²²⁸ United Nations Office for Disaster Risk Reduction Deutsche Gesellschaft für Internationale Zusammenarbeit Federal Ministry for Economic Cooperation and Development UNDRR Bonn Office

By finalizing risk, climate risks assessments aim to not only identify and quantify individual risks but also to understand how these risks can amplify each other and create cascading effects. This process allows for a more accurate evaluation of the overall risk landscape and enables better-informed decision-making in terms of prioritizing mitigation strategies and adaptation measures.

Considering complex and cumulative risks is crucial in addressing the multifaceted challenges posed by climate change, as it helps stakeholders anticipate and prepare for interconnected impacts that may have far-reaching consequences. By finalizing risk in this holistic manner, it becomes possible to develop more robust and effective climate resilience strategies.

Risk finalization is often based on using hybrid approaches that describe hazards, exposure, and vulnerability with a mix of quantitative models, spatially explicit models, semi-quantitative, proxy-based indicators, and qualitative information in narrative form. Compared to single risk assessment approaches, such methods cannot be as quantitative and must consider more elements, value-based decisions, and qualitative conclusions.

In the risk calculation, two types of damages are commonly distinguished: (1) direct damage, or the physical damage to assets, and (2) indirect damage, or consequential losses as the result of direct damage (e.g., business interruptions, loss of income, increased operational costs). Per asset, direct damage is calculated for each hazard and associated return periods by multiplying its damage share²²⁹ from the damage functions²³⁰ with the assets associated maximum damage value²³¹. This results in the actual damage that is expected for the assets as a direct consequence of exposure to the hazard.

Example: If a building has a maximum damage value of \$1 million and a flood causes 50% damage, the direct damage would be USD 500,000.

For the calculations of the indirect damages/consequential losses resulting from the direct damage, often, a percentage of direct damage is taken to estimate indirect losses without much analysis to the system itself²³². Example: If indirect damage is estimated to be 20% of the direct damage, and the direct damage is USD 500,000, the indirect damage would be USD 100,000

The climate risk is calculated for current conditions and for each of the climate change scenarios. The final step of the risk analysis assesses the risk by assigning risk levels (e.g., from very low to very high). This assessment is a value-based²³⁴ process that needs an agreed and value-based target system and for which stakeholders from different target groups should be involved, ensuring an inclusive and participatory approach. Multiple risks can be compared across sectors, systems, spatial units, or timescales.

²²⁹ Damage share: The percentage of the maximum damage value that is actually realized based on the severity of the hazard.

²³⁰ These are mathematical functions that relate the extent of damage to the intensity of the hazard.

²³¹ Maximum damage value: The highest possible financial loss for an asset if it were completely destroyed.

²³² Koks, E. E., & Thissen, M. (2016). A multiregional impact assessment model for disaster analysis. *Economic Systems Research*, 28(4), 429-449.

²³³ Koks, E. E., Carrera, L., Jonkeren, O., Aerts, J. C., Husby, T. G., Thissen, M., ... & Mysiak, J. (2016). Regional disaster impact analysis: comparing input-output and computable general equilibrium models. *Natural Hazards and Earth System Sciences*, 16(8), 1911-1924.

²³⁴ Value-Based Process: A decision-making approach that incorporates the values, beliefs, and priorities of different stakeholders to guide the assessment and management of risks or resources.

9.2.2 EXAMPLES OF CRA APPLICATIONS WITHIN SECTORS

For several key economic sectors in the Mediterranean, example of a process for Climate Risk Assessment are provided below.

9.2.2.1 Tourism Industry

Steps in Climate Risk Assessment for the Tourism Industry include:

- **Data Collection and Analysis:** Gathering relevant climate data, historical weather patterns, and projections specific to the destinations of interest. This includes temperature records, precipitation patterns, storm frequency, and sea-level rise projections, as well as visitor data disaggregated into months and destinations.
- **Destination Vulnerability Assessment:** Assessing the vulnerability of destinations and tourism infrastructure to climate risks. This includes evaluating the exposure of coastal areas, natural attractions, hotels, resorts, and transportation infrastructure to sea-level rise, extreme weather events, wildfires and other climate-related hazards.
- **Visitor Experience Assessment:** Evaluating the potential impact of climate risks on visitor experiences, such as outdoor activities, cultural attractions, and access to natural resources. This includes considering changes in seasonal patterns, availability of specific activities, and the overall appeal of destinations.
- **Stakeholder Engagement:** Engaging with transport providers (air, sea and land), tourism operators both in source countries and in destinations, destination management organizations, local communities, and relevant government agencies to gather insights, share information, and collaborate on climate risk assessment and adaptation strategies.
- **Risk Mitigation and Adaptation Strategies:** Developing and implementing risk mitigation and adaptation strategies to enhance resilience. This may involve diversifying tourism products and activities, promoting sustainable practices and low-season travel, investing in climate-resilient infrastructure, and adopting innovative solutions for water and energy management.
- **Crisis and Emergency Preparedness:** Developing robust crisis management and emergency response plans to address climate-related risks. This includes establishing early warning systems, training staff on emergency procedures, and ensuring effective communication channels with visitors and stakeholders during times of crisis.
- **Education and Awareness:** Raising awareness among tourists, industry stakeholders, and local communities about the importance of climate change and sustainable tourism practices. Promoting responsible travel behavior, supporting local conservation efforts, and engaging in community-based tourism initiatives can contribute to long-term sustainability.
- **Creating a community spirit amongst hospitality industry outlets,** by creating local associations, stakeholder groups or other platforms dealing with climate issues.

9.2.2.2 Agriculture Industry

Steps in Climate Risk Assessment for the Agriculture Industry include:

- **Data Collection and Analysis:** Gathering relevant climate data, historical climate patterns, and projections specific to the farming region is crucial. This includes temperature records, precipitation patterns, extreme weather events, and long-term climate projections.
- **Vulnerability Assessment:** Conducting a vulnerability assessment to identify the potential impacts of climate risks on different aspects of agricultural operations. This involves evaluating the susceptibility of crops, livestock, infrastructure, and supply chains to climate-related hazards.
- **Financial Impact Assessment:** Quantifying the potential financial implications of climate risks, including crop losses, increased input costs, changes in market dynamics, and the need for adaptation measures.
- **Adaptation and Risk Management Strategies:** Developing and implementing adaptation strategies to reduce vulnerability and build resilience. This may involve adopting climate-smart agricultural practices, improving water management and irrigation systems, diversifying crops, investing in climate-resilient infrastructure, and exploring insurance options.
- **Collaboration and Knowledge Sharing:** Encouraging collaboration among farmers, researchers, policymakers, and industry stakeholders to share knowledge, best practices, and innovative solutions for climate risk management. This can include participating in farmers' networks, engaging with agricultural extension services, and leveraging technological advancements for information dissemination.
- **Policy Advocacy:** Engaging with policymakers to advocate for supportive policies and incentives that facilitate climate resilience in agriculture. This can involve promoting sustainable land management practices, incentivizing climate-smart farming techniques, and supporting research and development in climate-resilient crop varieties.

9.2.2.3 Food and Beverage Industry

Steps in Climate Risk Assessment for the Food and Beverage Industry include:

- **Data Collection and Analysis:** Gathering relevant climate data, historical climate patterns, and projections specific to the regions where the food and beverage supply chains operate. This includes temperature records, precipitation patterns, and climate modeling information.
- **Supply Chain Mapping:** Mapping the entire supply chain from farm to fork to identify critical points, dependencies, and vulnerabilities. This includes assessing the exposure of agricultural sources, processing facilities, transportation routes, and storage facilities to climate-related risks.
- **Vulnerability Assessment:** Conducting a vulnerability assessment to identify the potential impacts of climate risks on different aspects of the supply chain. This involves evaluating the susceptibility of crops, livestock, production facilities, distribution networks, and market dynamics to climate-related hazards.
- **Financial Impact Assessment:** Quantifying the potential financial implications of climate risks, including crop losses, supply chain disruptions, increased operational costs, changes in market dynamics, and the need for adaptation measures.

- **Adaptation and Risk Management Strategies:** Developing and implementing adaptation strategies to reduce vulnerability and build resilience. This may involve diversifying sourcing regions, investing in climate-resilient agriculture practices, optimizing water management, improving energy efficiency, enhancing storage and logistics capabilities, and engaging in sustainable packaging and waste reduction initiatives.
- **Collaboration and Stakeholder Engagement:** Collaborating with suppliers, farmers, industry associations, and policymakers to share best practices, exchange knowledge, and collectively address climate-related risks. Engaging with consumers, investors, and communities to raise awareness and promote sustainable consumption patterns is also critical.
- **Continuous Monitoring and Review:** Climate risk assessment is an ongoing process. Regularly monitoring and reviewing the effectiveness of risk management strategies, considering new information, emerging risks, and evolving regulations is essential to ensure adaptability and improvement over time.

9.2.2.4 Manufacturing

Steps in Climate Risk Assessment for the Manufacturing and Automotive Industry include:

- **Data Collection and Analysis:** Gathering climate data, historical weather patterns, and projections specific to the regions where the industry operates. This includes temperature records, precipitation patterns, storm frequency, and sea-level rise projections.
- **Infrastructure and Facility Assessment:** Evaluating the vulnerability of manufacturing facilities, warehouses, and distribution centers to physical risks. This includes assessing exposure to extreme weather events, floods, and other climate hazards, as well as considering potential retrofitting or relocation needs.
- **Supply Chain Analysis:** Assessing the vulnerability of the supply chain, including raw material suppliers, component's manufacturers, and transportation logistics, to physical and transition risks. This involves identifying climate-related vulnerabilities, potential disruptions, and alternative sourcing options.
- **Product and Technology Evaluation:** Analyzing the impact of physical and transition risks on current and future products, including the performance of internal combustion engines, electric vehicles, and emerging technologies. This assessment helps identify opportunities for innovation and adaptation.
- **Regulatory and Policy Review:** Monitoring and understanding evolving regulations, emission standards, and incentives related to climate change and sustainable transportation. This includes assessing compliance requirements, potential market impacts, and opportunities for collaboration with policymakers.
- **Stakeholder Engagement:** Engaging with suppliers, industry associations, policymakers, and other stakeholders to share best practices, exchange information, and collectively address climate-related risks. Collaboration with academia and research institutions can also provide valuable insights and support technological advancements.
- **Risk Mitigation and Adaptation Strategies:** Developing and implementing risk mitigation and adaptation strategies to enhance resilience. This may involve investing in renewable energy

sources, transitioning to electrified vehicle production, pursuing circular economy principles, and exploring innovative mobility solutions.

9.2.2.5 Transport and Logistics

Steps in Climate Risk Assessment for the Transport and Logistic Industry include:

- **Data Collection and Analysis:** Gathering relevant climate data, historical weather patterns, and projections specific to the regions and transportation routes of interest. This includes temperature records, precipitation patterns, storm frequency, and sea-level rise projections.
- **Infrastructure Vulnerability Assessment:** Assessing transportation infrastructure vulnerability to climate risks, including evaluating the exposure of roads, railways, ports, and terminals to extreme weather events, sea-level rise, and changing precipitation patterns.
- **Operational Vulnerability Assessment:** Assessing the vulnerability of transportation operations, including the impact of climate risks on fleet management, cargo handling, scheduling, and supply chain logistics. This includes considering potential disruptions and delays caused by extreme weather events or infrastructure damage.
- **Supply Chain Mapping:** Mapping the entire supply chain to identify critical nodes, dependencies, and vulnerabilities. This includes assessing the exposure of suppliers, distribution centers, warehouses, and other logistics facilities to climate-related risks.
- **Risk Mitigation Strategies:** Developing and implementing risk mitigation strategies to enhance resilience. This may involve diversifying transportation routes, upgrading infrastructure to withstand climate-related hazards, strengthening emergency response capabilities, and implementing alternative modes of transportation.
- **Collaboration and Stakeholder Engagement:** Collaborating with infrastructure operators, government agencies, industry associations, and supply chain partners to share best practices, exchange information, and collectively address climate-related risks. Engaging in public-private partnerships and working closely with local communities can also enhance resilience efforts.

Technology and Innovation: Leveraging technology and innovative solutions to enhance monitoring, early warning systems, and predictive analytics for climate-related risks. This can include using real-time data, remote sensing technologies, and advanced modeling to improve decision-making and operational efficiency.

9.3 COST BENEFIT ANALYSIS

Cost Benefit Analysis are an important tool for businesses to evaluate what investments can best be made in climate adaptation measures. The elaboration of adaptation interventions should be done in line with regulations and in close collaboration with key-stakeholders including local community and their decision makers. While businesses will primarily look at measures that will benefit their operations, they should also consider measures that generate a wider public benefit. For example, by reducing its water use intensity, a food and beverage company can reduce its groundwater

abstractions benefiting other local users of the same groundwater source. In this way, businesses can not only consider the positive impact on their business but also include their contribution to overall economic development in the area they operate.

To identify and screen adaptation and resilience options, businesses can use the table format as provided in Table 9-1.

TABLE 9-1: EXAMPLE OF TABLE FORMAT THAT MAY BE USED FOR THE ADAPTATION AND RESILIENCE OPTIONS

Risk	Indicate the risk classification based on their characteristics, likelihood, impact, type, time horizon, or source of risk
Asset/ Operation Description	Identify the stage in the lifecycle of an asset or the part of the asset that was impacted.
Hazard	Indicate the type of hazard (climatological, hydrological, biological, etc.)
Possible Hazardous Event	Indicate the possible hazardous event
Possible Impact	Describe the possible impact and specify the possible severity of such impact.
Adaptation/Resilience Measure	Describe possible adaptation/resilience measure to reduce the potential severity of impacts
Type of Measure	Indicate if the proposed intervention is a preventive, preparatory, response or recovery measure.
Advantages	List the advantages of the adaptation/resilience measure.
Disadvantages	List the disadvantages of the adaptation/resilience measure

Climate adaptation cost-benefit analysis can be complex due to the need to forecast long-term climate impacts and quantify intangible benefits, like ecosystem services. Additionally, the inherent uncertainty of climate projections and the diverse socio-economic contexts of affected communities further complicate the estimation of costs and benefits. However, they are also useful tools for businesses to achieve increased resilience, improved decision-making, enhanced stakeholder confidence, and long-term cost savings. Moreover, CBA goes beyond financial considerations and incorporates broader societal impacts. It considers the social, environmental, and economic consequences of a project. By considering factors such as environmental sustainability, social welfare, and public health, businesses can make decisions that align with their corporate social responsibility goals and contribute positively to society.

9.3.1 ELEMENTS OF COST-BENEFIT ANALYSIS

In order to develop a sound investment rationale for adaptation options, businesses preferably would carry out a Cost Benefit Analysis (CBA). The adaptation options that have been deemed technically feasible and effective in the previous steps will be assessed in the CBA that focuses on the financial effectiveness of a proposed adaptation measure or project. In carrying out a CBA, a business would take the following steps:

Base Case, Alternatives & the Value Chain

The first step in conducting CBA for climate adaptation is to identify and assess the potential hazards, exposure and vulnerability that climate change directly or indirectly (e.g. through climate change related regulatory changes) may pose to the business' entire value chain. The input for this will come from the Climate Risk and Vulnerability Assessment and the Adaptation Options as outlined above. The estimated losses from weather- and climate-related events can act as an initial proxy for the cost of not acting, both for the past and modelled for the future.

Determination of costs and benefits

First, businesses need to quantify the costs associated with implementing climate adaptation measures. These costs may include investments in infrastructure upgrades, technology enhancements, changes in operational processes, employee training, insurance premiums, and other expenses related to building resilience against climate risks. The financial costs for the CBA will be based on the investment (CAPEX and OPEX) and O&M estimates for the adaptation measures.

Second, a company identifies and quantifies the benefits that would result from implementing adaptation measures. These benefits may include reduced damages from climate-related events, improved operational efficiency, enhanced reputation and stakeholder trust, cost savings over the long term, and access to new business opportunities arising from climate adaptation efforts.

Third, a firm then compares the estimated costs and benefits of different climate adaptation strategies to determine their economic viability and effectiveness. By calculating metrics such as Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Rate of Return (IRR), businesses can assess the financial feasibility of investing in specific adaptation measures.

Calculation of financial return and sensitivity analysis

Business can now develop a financial model²³⁵ in which the financial costs and benefits will be set out in time. Growth scenarios will be integrated as well as a function to account for climate change. As climate adaptation involves inherent uncertainties related to the future impacts of climate change, it is important to carry out a sensitivity analysis. CBA incorporates sensitivity analysis by assessing how changes in key assumptions, such as the severity of climate risks or the effectiveness of adaptation measures, may affect the outcomes of the analysis. This helps businesses make more robust and informed decisions in the face of uncertainty.

Business decision making

The CBA will provide decision makers with valuable information on the financial viability of the different adaptation options. The CBA will be summarized in the financing rationale: it includes the

²³⁵ Note: for financial modelling standard see: <https://www.fast-standard.org/>

technically feasible adaptation options, their associated costs, and the quantitative and qualitative cost-benefit analysis results. It will provide comprehensive information to justify investments in climate resiliency throughout the company's value chain. With the financial rationale in hand, businesses can make strategic decisions about which climate adaptation measures to prioritize and invest in and obtain the corresponding short- and long-term benefits.

By applying Cost Benefit Analysis to climate adaptation, businesses can systematically assess the financial implications of preparing for climate change, prioritize adaptation measures that offer the greatest return on investment, and enhance their climate resilience. Additionally, CBA enables businesses to communicate the financial rationale behind their climate adaptation strategies to internal and external stakeholders, fostering support and buy-in for their resilience initiatives.

9.3.2 CHALLENGES AND LIMITATIONS OF THE CBA APPLICATION IN THE PRIVATE SECTOR

Some of the challenges and limitations of CBA in the private sector are:

- The difficulty of measuring and monetizing all costs and benefits. CBA requires that all relevant costs and benefits of a project or investment be identified, quantified, and expressed in monetary terms. However, this is not always possible or desirable, especially for intangible, non-market, or long-term effects.
- The problem of choosing an appropriate discount rate. CBA involves discounting future costs and benefits to their present values, using a discount rate that reflects the time preference and opportunity cost of capital. Different discount rates may lead to different rankings of alternatives and may favor short-term or long-term projects differently.
- The issue of incorporating externalities and market failures. CBA assumes that the market prices reflect the true social costs and benefits of a project or investment. However, this may not be the case when there are externalities or market failures, such as pollution, monopoly, asymmetric information, or moral hazard. CBA may need to adjust the market prices to reflect the social costs and benefits, using methods such as shadow pricing²³⁶, contingent valuation²³⁷, or hedonic pricing²³⁸.
- The challenge of dealing with multiple and conflicting criteria and objectives. CBA assumes that the sole objective of the decision-maker is to maximize the net benefit or minimize the net cost of a project or investment. However, this may not be realistic or desirable, as the decision-maker may have multiple and conflicting criteria and objectives, such as profitability, efficiency, equity, sustainability, innovation, or social responsibility. CBA may not be able to capture or accommodate all these criteria and therefore, CBA may need to be complemented or supplemented by other techniques, such as:

²³⁶ Shadow prices: Estimated prices for goods or services that do not have a market price, or where the market price does not reflect the true social cost or benefit. Example: Estimating the cost of carbon emissions per ton to reflect their environmental impact.

²³⁷ Contingent Valuation: A survey-based method used to evaluate non-market resources, such as environmental benefits or public goods, by asking people their willingness to pay for specific benefits or their willingness to accept compensation for losses. Example: Asking residents how much they would be willing to pay to preserve a local park.

²³⁸ Hedonic Pricing: A method that examines the impact of environmental factors on the prices of market goods. It often involves analysing real estate prices to determine the value of environmental amenities or dis-amenities. Example: Analysing how much property prices increase due to proximity to a clean park or decrease due to proximity to a pollution source.

- multi-criteria analysis which can handle qualitative and quantitative criteria (economic, environmental, social, and technical), and hence providing a more balanced assessment,
- stakeholder analysis to ensure that stakeholders’ concerns, interests, likely reactions and priorities are considered in the decision-making process, leading to more acceptable and sustainable decisions, or
- scenario analysis to examine how the project might perform under different climate scenarios, thus helping to plan for resilience and adaptability.

Below two examples of CBA in different industries are provided in Table 9-2.

TABLE 9-2: APPLICATIONS AND EXAMPLES OF THE CBA IN DIFFERENT INDUSTRIES AND SECTORS

Sector	CBA application example
Transportation	CBA can help transport planners, engineers, and policymakers to evaluate the performance and feasibility of different transportation projects, systems, and modes. For example, it can be used to compare the costs and benefits of different road, rail, or air transport options, considering the construction, operation, maintenance, and environmental costs and benefits. CBA can also help to optimize the allocation of resources and the design of transport policies and regulations, such as the pricing, taxation, or subsidization of transport services. For example, CBA can be used to estimate the costs and benefits of building a new highway, introducing a congestion charge, or subsidizing public transport.
Environment	CBA can help environmentalists, regulators, and stakeholders to assess the environmental and economic implications of different environmental projects, policies, and actions. For example, it can be used to compare the costs and benefits of different renewable energy sources, pollution control measures, or conservation efforts. CBA can also help to incorporate the externalities and non-market values of environmental goods and services, such as the value of clean air, water, or biodiversity. For example, CBA can be used to estimate the costs and benefits of reducing greenhouse gas emissions, restoring wetlands, or creating national parks.

9.4 ADDED VALUE OF CRA AND CBA FOR BUSINESSES

Climate Risk Assessment (CRA) allows businesses to identify and understand the potential impact of climate-related risks on their operations, supply chains, infrastructure, and financial performance. By conducting a thorough assessment, companies can develop resilience strategies to mitigate these risks and enhance their ability to withstand adverse climate events. CRA can also help businesses with regulatory compliance especially as businesses are facing a growing pressure to disclose their exposure to and impact on climate change. Also, being serious about CRA can help build a company’s reputation and improve stakeholder relations. By disclosing their exposure to climate risks and implementing appropriate mitigation measures, companies can strengthen relationships with investors, customers, employees, and other stakeholders who prioritize sustainability and environmental responsibility.

Furthermore, CRA can help firms uncover opportunities for improving operational efficiencies. This can include, for example, efficient transportation, water leakage detection, energy efficiency or a reduction of raw material inputs. By streamlining operations and reducing inputs, businesses can

reduce their exposure to climate risks and lower their operating costs simultaneously. Doing so, can drive innovation within a business, even leading to the development of new products, services, and business models that align with climate change adaptation goals. It can also help them gain a competitive advantage in a rapidly changing market environment. Finally, being proactive about assessing, disclosing and acting on climate risks, can also help companies to attract capital and secure financing on more favourable terms.

Cost Benefit Analysis (CBA) for climate adaptation measures can create added value for businesses in different ways. First of all, CBA provides a structured framework for evaluating the financial implications of potential climate resilience projects, investments, or policy decisions. By quantifying costs and benefits in monetary terms, businesses can make more informed and data-driven decisions on which adaptation measures are most appropriate. This in turn, helps businesses allocate resources efficiently by comparing the expected costs and benefits of different climate adaptation measures and options. It also enables companies to prioritize investments that offer the highest returns and contribute most effectively to delivering their climate adaptation strategic objectives. Also, using CBA allows businesses to assess and quantify the (financial) risks associated with a specific adaptation measure by considering both quantitative and qualitative factors and develop risk mitigation strategies. Finally, CBA can enable businesses to evaluate the actual performance of the adaptation project against the expected costs and benefits. This helps decision makers in assessing the effectiveness of past decisions and identifying areas for improvement for future climate adaptation investments.

By utilizing Climate Risk Assessment and Cost Benefit Analysis in the context of climate adaptation, businesses can proactively assess and address climate-related risks and opportunities, optimize their investment in adaptation measures, and enhance their overall resilience to climate change impacts, ultimately leading to long-term sustainability and competitiveness in a constantly changing environment.