Union for the Mediterranean
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Final Report

Regional Analysis of (I)NDCs in the SEMed Region

The UfM Secretariat is co-funded by the EUROPEAN UNION

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The Union for the Mediterranean (UfM) is the intergovernmental Euro-Mediterranean organisation that brings together 43 countries to enhance regional cooperation and dialogue, as well as the implementation of concrete projects and initiatives with tangible impact on the citizens in order to address the three strategic objectives of the region: stability, human development and integration.

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Executive Summary

As part of the Paris climate agreement, countries have submitted (Intended) Nationally Determined Contributions (NDCs), which includes greenhouse gas reduction proposals beyond 2020. This study provides an overview of 13 South Eastern Mediterranean (SEMed) countries, presenting their current emissions profiles and socio-economic situations, while examining their mitigation and adaptation priorities as well as the implementation of actions within the context of their global commitments towards reaching the objectives of the Paris Agreement. These 13 countries are: Albania, Algeria, Bosnia and Herzegovina, Egypt, Israel, Jordan, Lebanon, Mauritania, Montenegro, Morocco, Palestine, Tunisia and Turkey. Libya and Syria have not submitted (I)NDCs.

The SEMed countries have been actively involved in the adoption of the Agenda 2030 and welcome the Sustainable Development Goals (SDGs). At the same time, climate change is expected to have direct and indirect negative effects on several aspects of these countries, such as: agricultural productivity, including changing rainfall patterns, increasing frequency and severity of hydrometeorological hazards such as drought, storms and floods among others. In the SEMed region, climate change could certainly threaten the ability to secure food production, decrease (or even erase) poverty and achieve sustainable development.

This report applies the joint approach of the Multilateral Development Banks (MDBs) to categorize the measures and priorities communicated by the countries in sectoral dashboards. These dashboards represent the main output of this report, as they present the sectoral priorities as well as the countries of the region that have set the same priorities. In other words, the dashboards function as a repository of the countries'' priorities per sector in mitigation and adaptation. The information provided in these dashboards can be easily utilized by different stakeholders (i.e.: UfM, member countries, donors, etc.) to identify actions in the region and potential joint approaches.

Following the results provided in the dashboards, the report includes four cases to provide concrete examples of how the identified prioritized measures could be used in order to pursuing a forwards looking dialogue on action to tackle climate change in the Mediterranean region and in the context of the UN Framework Convention on Climate Change. These cases, however, should be seen only as examples on how to proceed with the repository of sectoral measures. The design and development of projects and programs requires not only meticulous planning and analysis of information beyond the information included in the NDCs, but also and foremost the participation of the countries concerned in the case.

Abbreviations and Acronyms

CBD	Convention on Biological Diversity
COP	Conference of the Parties
DHS	Demographic and Health Survey
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EERE	Energy Efficiency and Renewable Energy
GCF	Green Climate Fund
GHG	Greenhouse Gas
GVA	Gross Value Added
IAS	Invasive Alien Species
ICT	Information and Communication Technology
INDC	Intended Nationally Determined Contributions
IPCC	International Panel on Climate Change
LEED	Leadership In Energy & Environmental Design
LULUCF	Land Use, Land-Use Change and Forestry
MDB	Multilateral Development Bank
NAMA	Nationally Appropriate Mitigation Actions
NAPs	National Adaptation Plans
NDC	Nationally Determined Contributions
PPP	Public Private Partnership
SEMed	Southern and Eastern Mediterranean
SMEs	Small- and Medium-sized Enterprises
ToR	Terms of Reference
UfM	Union for the Mediterranean
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

1 Introduction

1.1 Background and Objective

The Paris Agreement sets a long-term goal for global climate action and establishes a number of binding requirements for all Parties, setting the pace of the international climate agenda. These include the preparation and communication of Nationally Determined Contributions (NDCs); the periodic review of these and the associated measures; the development of long-term low-carbon development strategies; adaptation, capacity building, finance and technology transfer. The Agreement includes a mention of regional, bilateral and multilateral approaches.

The Union for the Mediterranean (UfM), bringing together developed and developing countries, has received the mandate to support countries in the preparation of their NDCs. In line with the commitments made under the Union for the Mediterranean (UfM) Ministerial Declaration on Environment and Climate Change, adopted in Athens in March 2014, UfM Member States have been actively involved in the adoption of the Paris Agreement.

This study aims at providing a compact assessment of where the South East Mediterranean (SEMed) countries stand with the NDCs implementation process. And thereby contributes to providing an accurate understanding of the UfM regional context and of possible synergies and complementarities among the national policies and measures in the region. The analysis considers the NDCs of 13 of the 15 SEMed Countries[1]. Libya and Syria have not submitted NDCs. Due to constraints with regards to limited data available, these countries are not included in this analysis.

1.2 Scope and expected output

In accordance with the Terms of Reference (ToR), the study will cover the following aspects:

- **Synthetic analysis of SEMed countries' NDCs and, whenever available, National Adaptation Plans (NAPs), classifying them by sectors and presenting them in a clear common dashboard.**
- **Identification, of common goals in the countries' NDCs and Adaptation Plans, that could lead to joint approaches (with a minimum of 3 countries).**
- **Qualitative analysis of the advantages of collective (and regional) approaches.**

The ultimate expected output from this assignment is a set of proposals of joint approaches (with a minimum of 3 countries), in the field of public policies, technical assistance and capacity building as well as investment projects. This report sets out the background of and rationale to identify those approaches that will be presented in the next report.

This final report provides the results of an in-depth analysis of SEMed countries' NDCs (and whenever available NAPs), and presents a common indicators dashboard used to identify potential joint approaches. Furthermore, it illustrates four cases for proposals of joint approaches, including a qualitative analysis of the advantages of the proposed joint actions.

1.3. Methodology

To fulfill the expected output of the assignment, NDCs (and whenever applicable NAPs) from all 13 SEMed countries were studied in full text. It must be noted that countries' NDCs are of different length,

[1] The 13 SEMed countries included in this study are: Albania, Algeria, Bosnia and Herzegovina, Egypt, Israel, Jordan, Lebanon, Mauritania, Montenegro, Morocco, State of Palestine (a modern de jure sovereign state in the Middle East recognized by 136 UN members and with non-member observer state status in the United Nations), Tunisia, Turkey

with some of them being very short, which had a strong influence on the coverage and level of detail on certain topics.

Generally, an assessment of coverage of the different sectors included in the NDCs, national and regional circumstances as well as means of implementation, has been conducted. And whenever required, other relevant documents were analyzed to complement information provided in the NDCs and NAPs. Information and data collected from these documents were extracted into a database, which facilitated the re-examination of the screening process.

It is also very important to note that, as mentioned in the previous section on the scope and expected output, The mandate given to the consultant team was to provide a „Synthetic analysis of SEMed countries' NDCs and, whenever available, National Adaptation Plans (NAPs), classifying them by sectors and presenting them in a clear common dashboard". The dashboard itself aimed to show status and progress in SEMed countries, through presentation of different sets of relevant indicators. To create this common dashboard, a uniform set of data from selected indicators is highly required. Even when this means that the data used may not be the most updated ones.

During the data collection phase, the consultant team explored the possibility of utilizing countries' data, i.e. collecting information from countries' NDCS, National Communication as well as National Statistics. While indeed the countries' NDCs, National Communications, as well as national statistics have provided very rich and updated information, there's an absence of harmonious set of data among the SEMed countries. Data set, especially those related to GHG emission and mitigation, socio-economic, as well as other sector-relevant indicators, are not uniform, i.e. different base year, different latest year, different indicator used, different unit, etc. To this end, to allow synthetic analysis in a clear and common dashboard, the consultant team, upon agreement with UfM, has decided to consult other available international databases (i.e. CAIT WRI, UNStat, FAOStat, WorldBank Open Data, etc.) where data of all 13 SEMed countries are available (or mostly available) in a unified manner, and thus allow the presentation of a common dashboard of all 13 countries.

The consultant adopted the following methodological approach:

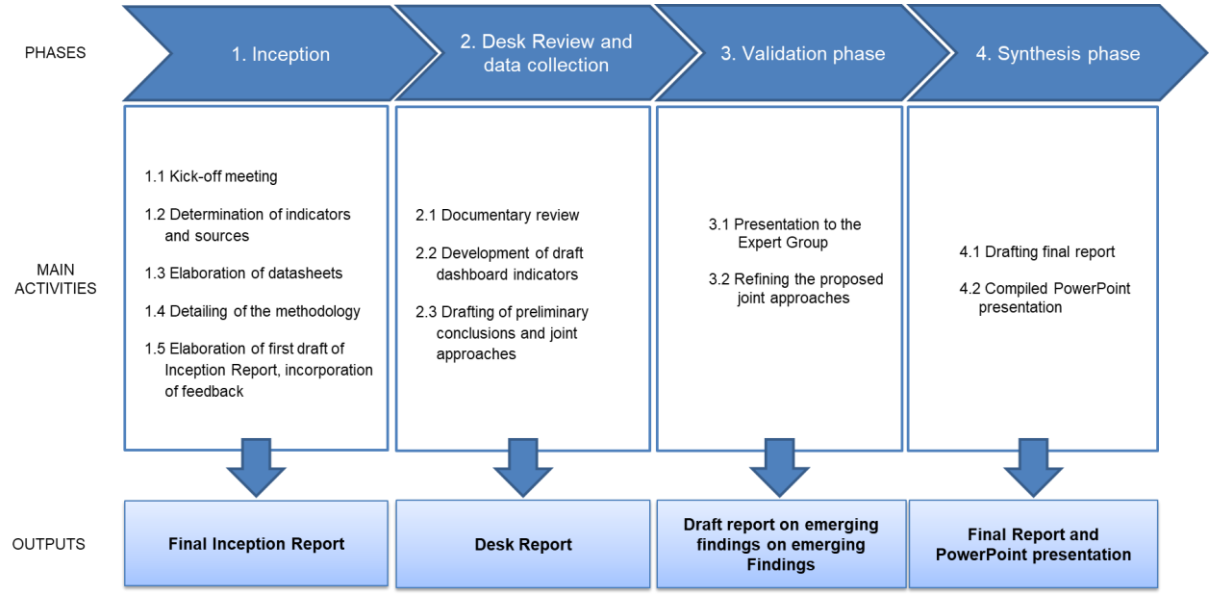

Figure 1: Methodological Approach

This final report takes into account the results of the previous phases and foremostly the comments and feedback received on the preliminary results from members of the UfM Secretariat as well as from various stakeholders present at the presentations given at:

- **UfM Working Group Environment and Climate Change – Barcelona, 12-13 November 2018**
- **Annual Meeting of the UfM Energy Platforms – Barcelona, 29 January 2019**

- **UfM Regional Climate Finance Committee 6th meeting – Barcelona, 9 April 2019**
- **UfM Climate Change Expert Group 7th meeting – Barcelona, 10 April 2019**

1.4 Linking NDCs sectors with MDBs sectoral grouping

As clearly indicated in the ToR, sectoral categorization of the proposed joint approaches shall adhere to the sectoral grouping as used by the Multilateral Development Banks (MDBs). However, it must be noted that the countries' NDCs (and NAPs) have followed different approaches in presenting their priority sectors. Therefore, it is deemed imperative to present how the NDCs sectors are linked with the MDBs' sectoral grouping, as presented in table 1 and 2.

Table 1 Linking NDCs sectors with MDBs sectoral grouping (Mitigation)

Mitigation		
NDC Sectors	**MDBs Sectoral Grouping (based on measures)**	**Sub-categories of sectoral grouping**
Energy	Renewable Energy	Electricity Generation
		Heat Production or other renewable energy application
		Measures to facilitate integration of renewable energy into grids
Energy supply	Lower-Carbon and Efficient Energy Generation	Transmission and distribution systems
		Power Plants
	Non-Energy GHG Reductions	Fugitive emission
		Carbon capture and storage
Transport	Transport	Urban transport modal change
		Transport oriented urban development
		Inter-urban transport
		Vehicle energy efficiency fleet retrofit
		Energy audits
Industrial energy	Energy Efficiency	Energy efficiency in Industry in existing facilities
		Energy audits
		Air conditioning and refrigeration (cooling agent retrofit)
Buildings	Energy Efficiency	Energy efficiency improvements in existing commercial, public and residential buildings
		Energy efficiency in new commercial, public and residential buildings
		Energy efficiency improvements in the utility sector and public services
		Energy audits
		Air conditioning and refrigeration (cooling agent retrofit)
Industrial Processes	Non-Energy GHG Reductions	Industrial processes (through process improvement and cleaner production)
Waste	Waste and Wastewater	Waste and Wastewater
LULUCF	Agriculture, Forestry and Land-Use	Afforestation and reforestation and biosphere conservation
Agriculture	Agriculture, Forestry and Land-Use	Agriculture
		Livestock
		Biofuels

In addition to the abovementioned measures there are other measures/activities which are eligible for financing by the MDBs under the Climate Mitigation window. These measures grouping, according to MDBs are:

1. **Low Carbon Technologies, which encompasses:**
    a. ***Product or equipment:*** **Projects producing components, equipment or infrastructure dedicated for the renewable and energy efficiency sectors**
    b. ***Research and development:*** **Research and development of renewable energy or energy efficiency technologies**
2. **Cross cutting issues, which encompasses:**
    a. ***Support to national, regional or local policy, through technical assistance or policy lending:*** **This group includes activities related to development of policy framework related to climate change mitigation, establishment of monitoring and evaluation system, tariff and price reformation as well as training, education and public awareness activities.**
    b. ***Financing instrument:*** **Carbon markets and finance (purchase, sale, trading, financing and other technical assistance). Includes all activities related to compliance-grade carbon assets and mechanisms, such as Clean Development Mechanism, Joint Implementation, Assigned Amount Units, as well as well-established voluntary carbon standards like the Verified Carbon Standard or the Gold Standard.**
3. **Others, which encompasses:**

a. ***Miscellaneous:*** **Other activities with net greenhouse gas reduction**

Any sectoral measures identified which are fulfilling the scope and definition of the above grouping, will be presented directly in their corresponding sector.

Table 2 Linking NDCs sectors with MDBs sectoral grouping (Adaptation)

Adaptation		
NDC Sectors	**MDBs Sectoral Grouping (based on measures)**	**Sub-categories of sectoral grouping**
Water	Water and Wastewater System	Water supply
		Wastewater infrastructure/management
		Water resources management
Agriculture and Food Security	Crop Production and Food Production	Primary Agriculture and Food Production
	Other Agriculture and Ecological Resources	Agricultural irrigation
		Forestry
		Livestock production
Industry*	Industry, Extractive Industries, Manufacturing and Trade	Manufacturing
		Food processing distribution and retail
		Trade
		Extractive industries (oil, gas, etc.)
		Mining
Coastal	Coastal and Riverine Infrastructure (including built flood protection infrastructure)	Sea defenses/flood protection barriers
		River flood protection measures
Energy	Energy, Transport, and other Built Environment and Infrastructure	Thermal energy generation
		Energy generation (including renewables)
		Energy Transmission and distribution
Waste**	**Energy, Transport, and other Built Environment and Infrastructure**	Solid waste management
Fisheries***	Other Agriculture and Ecological Resources	Fisheries
		Marine fisheries
Forestry	Other Agriculture and Ecological Resources	Forestry
Biodiversity and Ecosystems	Other Agriculture and Ecological Resources	Ecosystems/Biodiversity (including ecosystem-based flood protection)
		Construction

Infrastructure and Transport	**Energy, Transport, and other Built Environment and Infrastructure**	**Transport**
		Urban Development
Tourism	**Energy, Transport, and other Built Environment and Infrastructure**	**Tourism**
Health	**Cross-cutting sector**	**Health**
Disaster Risk Management	**Cross-cutting sector**	Disaster Risk management

*Only the State of Palestine include industry sector in their adaptation, and therefore not eligible for joint approach with other countries.
** Only the State of Palestine include waste sector in their adaptation, and therefore not eligible for joint approach with other countries
***Measures on freshwater fisheries are mainly included in agriculture, whereas marine fisheries are mainly included in Coastal

Similar to mitigation, in adapting to climate change, the following are measures groups which are eligible for financing by the MDBs:

1. **Financial services, which encompasses *Banking* and *Insurance.***
2. **Cross cutting sector, which encompasses *Education (*provision of technical capacity building and public awareness), *Monitoring and Evaluation* and development of *Cross-sector policy and regulation*.**
3. **Others, which encompasses *Information and Communication Technology (ICT)* as well as *Institutional Capacity Support or Technical Assistance***

2 Regional circumstances

The SEMed region covers more than 6 million km^2 of surface area[2], and is populated by more than 330 million people[3], with diverse cultures, landscape, languages, population and density. While the regions´ competitiveness is growing, it still faces many challenges from water scarcity, ocean pollution, high rate of urbanization, to growing energy consumption, and hence emissions. Increasing poverty and development gaps are deemed as main challenges. Additionally, migration resulted in additional pressure on resources, e.g. energy and water, which are already scarce.

The annual population growth rate in the countries are varying, on average between 1 – 2 percent. The total population of Jordan, Mauritania and Palestine are growing with the highest rate at respectively 2.6%, 2.7%, 2.8% per year[4]. Whereas Albania and Bosnia & Herzegovina have shrinking tendency, respectively -0.1% and -0.3%, which may be due to low-fertility, economic contraction and emigration.[5]

The global issue of growing urbanization remains a challenge for the Mediterranean region, one of the most urbanized in the world[6]. Global trends show that currently about 55 % of the world's population reside in urban areas.[7] The same tendency is shown across the SEMed countries, where urban populations are accounted for more than 50% of the total population in 2017, except Bosnia and Herzegovina (48%) and Egypt (43%). Israel, Jordan and Lebanon have the most urban population in the region, respectively 92%, 91% and 88% of the total population. And the number is expected to grow in the future, with 45% increase in urban populations projected by 2030, according to the United Nation's World Urbanization Prospects 2014[8].

The growing urbanization also influences the rise of population density in the region. In cities where principles of sustainable development were not taken into account, this will lead to higher consumption of water and energy, in a non-sustainable manner, increasing waste generation, traffic congestion and the potential loss of social cohesion in urban areas.[9] Palestine, Lebanon and Israel are the three SEMed countries with the highest population density, compared to others, respectively 816 people/km^2, 595 people/km^2 and 403 people/km^2.[10] Whereas Mauritania and Algeria are the least dense countries with respectively 4 and 17 people/km^2.

Aside from the demographical challenges, the Mediterranean region, including the Southern and Eastern parts, is famous for its beautiful coastline, rich history and diverse culture, attracting approximately one third of the world's international tourists.[11] Tourism is one of the most important sources of income for many Mediterranean countries, and an important driver for development in the region. Combination of growing urbanization in SEMed countries (with cities that are mostly located in coastal regions)[12] with tourism, marine and land-based activities puts more pressure on the coastal and marine resources.

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[2] Own elaboration, derived from population data of the World Bank Data Indicator 2018 and the United Nations Statistics Division.
[3] Own elaboration, derived from population data of the World Bank Data Indicator 2018. https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart
[4] WB. 2018. World Development Indicators. World Bank. Specific to Palestine, figure is based on PBSC
[5] INSTAT. 2014. Albania Population Projections 2011-2031. Republic of Albania Institute of Statistics. Retrieved from https://unstats.un.org/unsd/demographic/sources/census/wphc/Albania/02-analysis.pdf
[6] UfM. 2018. How Can Regional Cooperation In The Mediterranean Support Cities' Energy Transition Efforts. Union for Mediterranean.
[7] UN. 2018. World Urbanization Prospects: The 2018 Revision. United Nations Department of Economic and Social Affairs. Retrieved from https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf
[8] UN. 2014. World Urbanization Prospects: The 2014 Revision, Highlights. United Nations Departments of Economic and Social Affairs. Retrieved from https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf
[9] ARLEM 2011. Report on Urban Development in Mediterranean. Euro-Mediterranean Regional and Local Assembly. Retrieved from https://ufmsecretariat.org/wp-content/uploads/2013/01/ARLEM-report-on-urban-development-in-the-Mediterranean_EN_fin.pdf
[10] WB. 2018. World Development Indicators. World Bank. Specific to Palestine, figure is based on PBSC
[11] Coastal Care. 2011. The Mediterranean and Climate Change's Impacts. Retrieved from http://coastalcare.org/2011/06/other-threats-in-the-mediterranean/
[12] UNDESA 2018. Growth Rates of Urban Agglomerations by Size Class 2018-2030. United Nations Department of Economic and Social Affairs. Retrieved from https://population.un.org/wup/Maps/

Responding to this challenge, the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean was adopted in 1995. The convention has 22 contracting parties. From the 13 SEMed countries, being the object of this study, only Jordan, Mauritania and the State of Palestine are not the contracting parties of the convention. These contracting parties are determined to protect the Mediterranean marine and coastal environment while boosting regional and national plans to achieve sustainable development.

The SEMEd countries are growing with an annual GDP growth rate ranging from 2% to 4%, except Algeria at 1.7% and Turkey which is growing rapidly at a pace of 7.4, as of data from 2017[13]. Detailed information on countries GDP is presented in table 3 below.

Table 3 Gross Domestic Product in the 13 SEMed countries[14]

	Total GDP 2017 (US$)	Annual GDP Growth Rate (%)	GDP Per Capita (US$)	Agriculture share (% of GVA)	Industry share (% of GVA)	Services and Others share (% of GVA)
Albania	13,039,352,740	3.8	4,537.9	22.3	26	51.7
Algeria	170,370,810,920	1.7	4,123.4	12.2	37.3	50.5
Bosnia & Herzegovina	18,168,579,580	3.0	5,180.6	7.3	26.5	66.2
Egypt	235,369,129,340	4.2	2,412.7	11.2	36.3	52.5
Israel	350,850,537,830	3.3	40,270.3	1.3	21.2	77.5
Jordan	40,068,308,520	2	4,129.8	4	27.7	68.4
Lebanon	51,844,487,740	2	8,523.7	3.2	19.6	77.2
Mauritania	5,024,705,930	3.5	1,136.8	20.9	41.7	37.4
Montenegro	4,774,086,090	4.3	7,669.6	9.8	17.5	72.6
Morocco	109,139,484,010	4.1	3,007.2	13.7	28.9	57.4
State of Palestine	12,677,000	3.5	2,715.5	4.8	23.4	71.9
Tunisia	40,256,675,210	2	3,490.8	10.3	27.8	62
Turkey	851,102,411,120	7.4	10,540.6	8.6	26.4	65

The data provided in the table above indicates that countries' economy is dominated by the service sector, which includes production activities in wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional, and personal services such as education, health care, and real estate services, representing more than 50% of the countries' Gross Value Added (GVA). The service sector in SEMed countries shows a growing tendency, albeit slow, since the early 90s. It has the highest percentage of population working in the sector, compared with the total population employed in the countries. In most SEMed countries, industry sector serves as the second contributor to the economy, followed by the agriculture sector. Mauritania is however an exception, as its economy

[13] UNSTAT. 2018. UNDATA. United Nations Statistics Division. Retrieved from http://data.un.org/
[14] Own elaboration, derived from population data of the World Bank Data Indicator 2018 and the United Nations Statistics Division 2018.

is dominated by the industry sector, representing more than 40% of the GVA. The country's economy is dominated by extractive industries (oil and mines), fisheries, livestock, agriculture, and services.[15]

The countries' economies in the region are highly dependent on natural resources as major contributor to regional socio-economic development, the growing population (and in some cases migration) puts even more pressure to the already scarce resources. Water is, for example, one of the primary resources in SEMed countries which is declining at alarming rates.[16]

At the same time, all SEMed countries show substantial reduction in per capita renewable internal freshwater supplies between 1962 to 2014, ranging at average between 60% - 70%[17], whereas the number for the Middle East and North Africa countries is around 71%[18]. Albania is found to be the country with the least reduction, 40.8% over the same period. Whereas Jordan suffers from more than 88% reduction over the same period. The situation is exacerbated by the changing climate and therefore requires efforts to better manage population growth and the use and distribution of freshwater.

On a positive note, regional circumstances have resulted in numerous regional cooperation initiatives since the past decades on various thematic areas, from justice and security to economic development. It involves not only countries from the region, but also the neighboring European countries, complementing national assistance programs. The regional cooperation usually focuses on activities which are:

- **addressing common challenges in the region, where common approaches are deemed most effective,**
- **concerning shared resources in the region, for which common responsibility needs to be taken,**
- **moving towards more integrated economies and need to work in a coordinated manner on such issues as transport networks or electricity transmissions.**

2.1 Climate Change Agenda in SEMed Region

With the global rapid emission growth changing our climatic systems, the impact can already be felt in many parts of the world. The South and Eastern rim of the Mediterranean region are found more vulnerable to the impacts of climate change than the Northern region[19]. Higher exposure to climate related hazards, such as droughts and desertification, combined with the nature-based economy as the main source of income, is affecting the countries' vision for sustainable development, economic growth and society.

The latest IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels shows that the Mediterranean region will be hit, especially in terms of food security as well as water resource availability. Food availability, both crops and livestock, in the Mediterranean region, will reduce dramatically when temperature rises above 1.5°C.[20] With climate change being one of the major threats globally, rigorous efforts to limit the increase of the global average temperature to 1.5°C must be in place.

In 2015, countries across the globe, including those in the SEMed region, adopted an historic international climate agreement at the U.N. Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris. In anticipation of this moment, countries publicly outlined

[15] CIA.2018. The World Factbook: Mauritania. Central Intelligence Agency. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/print_mr.html
[16] FAO. 2018. FAOSTAT. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/nr/water/aquastat/data/query/results.html
[17] Own elaboration, derived from population data of the World Bank Data Indicator 2018 and the United Nations Statistics Division.
[18] Rayne, Sierra and Forest, Kaya. 2013. The Decline of Global per Capita Renewable Internal Freshwater Resources. viXra. United Kingdom. Retrieved from http://vixra.org/pdf/1301.0073v1.pdf
[19] EIB. 2008. Climate Change and Energy in the Mediterranean. European Investment Bank. Retrieved from http://www.eib.org/attachments/country/climate_change_energy_mediterranean_en.pdf
[20] IPCC. 2018. Global Warming of 1.5 °C. Intergovernmental Panel on Climate Change. Retrieved from http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

what post-2020 climate actions they intended to take under the new international agreement, known as their Intended Nationally Determined Contributions (INDCs). The climate actions communicated included in these INDCs largely determine whether the world achieves the long-term goals of the Paris Agreement, and to achieve net zero emissions in the second half of this century. INDCs have been turned into NDCs as soon as a country signs the Paris Agreement.

Almost all SEMed countries, being the object of this study, have ratified the Paris agreement, except Turkey. Turkey has a peculiar situation since the country signed up to the convention as a developed country and has since argued that it is a developing country. In doing so, Turkey had the opportunity to opt-out of supplying finance, but at the same time, cannot access one source of finance, the Green Climate Fund (GCF). Status of ratification of Paris Agreement of the SEMed country is presented in the Table 4 below.

Table 4: Status of ratification of Paris Agreement by SEMed Countries (Source. Author's elaboration[21])

Countries	Ratification of Paris Agreement
Albania	21.09.2016
Algeria	20.10.2016
Bosnia & Herzegovina	16.03.2017
Egypt	29.06.2017
Israel	22.11.2016
Jordan	04.11.2016
Lebanon	06.03.2019
Mauritania	27.02.2017
Montenegro	20.12.2017
Morocco	21.06.2016
State of Palestine	22.04.2016
Tunisia	10.02.2017
Turkey	Has not ratified the Paris Agreement

To date, only Morocco offered a plan different from its INDC, as their first NDCs.[22]

All 13 countries include mitigation component in their NDCs, but only 9 include adaptation, namely Algeria, Egypt, Israel, Jordan, Lebanon, Mauritania, Morocco, State of Palestine and Tunisia.

On the national level, all SEMed countries state the existence of national climate change strategies which serve as legal policy framework for the implementation of their NDCs. Although a few are still under development, for example Albania and Montenegro. The national climate change strategies are mainstreamed into countries' development plan as well as sectoral strategies and action plan to assure implementation.

Ministries dealing with environmental affairs are usually appointed as the coordinating agency for NDCs implementation. Given the multi and cross sectoral nature of climate change, countries also set up national climate change committee/working group. Table 5 below present the identification of the existing strategies and action plan serving as policy framework for NDCs implementation in SEMed countries.

[21] Information on the ratification of Paris Agreement has been taken from United Nations Treaty Collection, retrieved from: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en
[22] Countries are required to submit an updated NDC every five years. The next deadline for submission is 2020

Table 5: Existing national policy framework in the SEMed countries (Source. Author's elaboration[23])

Countries	Policy Framework	Responsible Ministry / CC Working Group
Albania	Environmental and Climate Change strategy	Ministry of Environment
Algeria	• National Climate Plan • National Actions Plan for Environment and Sustainable Development • National system of Measurement, Reporting and Verification -MRV- (2016-2020)	Ministry of Environment National Climate Committee National Climate Change Agency
Bosnia and Herzegovina	Existing national legislation relevant for Climate Change and its identified key priority sectors	
Egypt	Sustainable Development Strategy; Egypt's Vision 2030	
Israel	Israel Adaptation to Climate Change Policy Recommendations Proposed National Adaptation Plan	Ministry of Environmental Protection Ministry of Finance and National Infrastructures Ministry of Energy and Water Resources Inter-ministerial committee Israeli Climate Change Information Center
Jordan	• National Climate Change Policy of Jordan 2013-2020 • Jordan's 2025 National Visions and Strategy • National Strategy and Action Plan to Combat Desertification (2015-2020) • National Biodiversity Strategy and Action Plan (2015-2020) • National Green Growth Plan and Implementation Roadmap 2016-2025	Ministry of Environment National Climate Change Committee
Lebanon	• National Energy Efficiency Action Plan for 2016-2020 • National Renewable Energy Action Plan 2016-2020 • National Biodiversity Strategy and Action Plan • National Water Sector Strategy • National Forest Plan • Ministry of Agriculture Strategy • National Sustainable Development Strategy	Ministry of Environment Climate Change Coordinating Committee
Mauritania		Ministry of Environment and Sustainable Development; Each Ministry has designated a Sectoral Focal Point in charge of climate change issues for its sector.
Montenegro	National Climate Change Strategy	
Morocco	• Framework Law on the National Charter for Environment and Sustainable Development • National Strategy for Sustainable Development • Vision of Morocco in 2030 • National Plan for the Fight against Global Warming • National Energy Strategy	Moroccan Competence Centre for Climate Change

[23] Information is gathered from the initial analysis of the SEMed countries NDCs

	• National Waste Recovery Program • National Liquid Sanitation and Wastewater Treatment Program • Morocco Green Plan • Preservation and Sustainable Forest Management Strategy	
State of Palestine	• National Development Plan • National Adaptation Plans • Initial National CommunicationReport. • Excutive Summarry of the Initial National. Communication Report. • National Policy Agenda. • Environment Sector Strategy (2017-2022) • Sustainable consumption and production national action plan in palestine • Renewable Energy Strategy • Water Strategy 2017-2022. • National Solid waste stategy 2017-2022. • The National Strategy, Action Program and Integrated Financing Strategy to combat desertification in the occupied Palestinian territory 2012.	
Tunisia	National Climate Change Strategy	Ministry of Environment and Sustainable Development
Turkey	• National Strategy on Climate Change • National Climate Change Action Plan • National Development Plan • National Strategy on Industry • Strategy on Energy Efficiency • National Strategy and Action Plan on Recycling • National Legislation on Monitoring, Reporting and Verification of GHG emissions • National Smart Transportation Systems Strategy Document (2014-2023) and its Action Plan (2014-2016)	Ministry of Environment and Urbanization

Financing of the NDCs implementation depends on the public national budget, this is especially for the realization of their unconditional targets. In addition, countries are seeking for international support, through, for example, international donors (such as Green Climate Fund (GCF) which was adopted as the financial mechanism of the UNFCCC at the end of 2011), bilateral cooperation and NAMAs, etc. Countries also stated their willingness to deploy international market-based mechanism for carbon trade as well as call for cooperation with the private sector.

Availability of technology and capacity are imperative to assure the implementation of NDCs as well as achievement of the targets. SEMed countries through the NDCs are ensuring that efforts to build capacity and appropriate technology are in place. Countries' aims to enhance capacities are varying, ranging from mobilization of national experts, to the initiation of regional and international cooperation. Algeria, for example communicated that both their mitigation and adaptation ambition will be achieved within North-South and South-South cooperation, with its bilateral and multilateral- traditional and new-partners. A group of "Friends of Algeria's Ambition for Adaptation and Mitigation" (G5A), was established and convened its first meeting on the sidelines of the Paris Conference. Whereas Tunisia and Morocco are the two SEMed countries joining the NDC Partnership coalition, to mobilize support and achieve ambitious climate goals while enhancing sustainable development.

3 Mitigation

3.1 Emission Status

All 13 countries analyzed within the framework of the assignment include a mitigation component in their NDCs. The priority sectors (as named in the official countries' NDCs) identified are Energy, Industrial Processes, Land Use, Land-Use Change and Forestry (LULUCF), and Agriculture and Waste. The energy sector usually includes sub sectors such as transportation, manufacturing industries, commercial and residential (or sometimes referred as building), agriculture, energy industries (oil and gas) and others. Details of sectors included by country is presented in the table 6 below.

Table 6: Overview of key priority sectors included in SEMed countries NDCs (Source. Author's elaboration[24])

	Mitigation Component	Energy	Industrial Processes	LULUCF	Agriculture	Waste
Albania	x	x	x			
Algeria	x	x	x	x	x	x
Bosnia and Herzegovina	x	x	x	x	x	x
Egypt	x	x	x		x	x
Israel	x	x	x		x	x
Jordan	x	x	x	x	x	x
Lebanon	x	x	x	x	x	x
Mauritania	x	x	x	x	x	x
Montenegro	x	x	x		x	x
Morocco	x	x	x	x	x	x
State of Palestine	x	x		x		x
Tunisia	x	x	x	x	x	x
Turkey	x	x	x	x	x	x

The rapid growth that takes place in SEMed countries, which is also supported by the exploitation of fossil fuels, implies accelerated changes to the climate and environmental state in the region. Before the 1990s, trend of emissions in the Mediterranean region steadily increased, but were mainly steered by population growth. Post 1990, GHG growth trend started to increase exponentially, due to the additional influence of the growing GDP per capita.

Based on the consultant's analysis of the total GHG emission in SEMed countries (data of 2011, CAIT WRI[25]), the region emitted a total of 1,149.39 $MtCO_2$ e in 2011 excluding LULUCF, or 1,078.55 $MtCO_2$ e including LULUCF. The LULUCF sector represents a net sink (-68.16 $MtCO_2$e). The total emission accounts for about 3% of the global GHG emission. Turkey, Egypt and Algeria are the three highest GHG emitting countries, respectively 395.9 $MtCO_2$ e, 274.99 $MtCO_2$ e and 171.75 $MtCO_2$ e. However,

[24] Information is gathered from the initial analysis of the SEMed countries NDCs
[25] CAIT. 2018. CAIT Climate Data Explorer: Historical Emission. World Resource Institute. Retrieved from: http://cait.wri.org/historical

on per capita basis, Israel, Bosnia and Herzegovina as well as Montenegro have the highest GHG emission, respectively 10 tCO_2 e, 9 tCO_2 e and 6 tCO_2 e. (See. Figure 2)

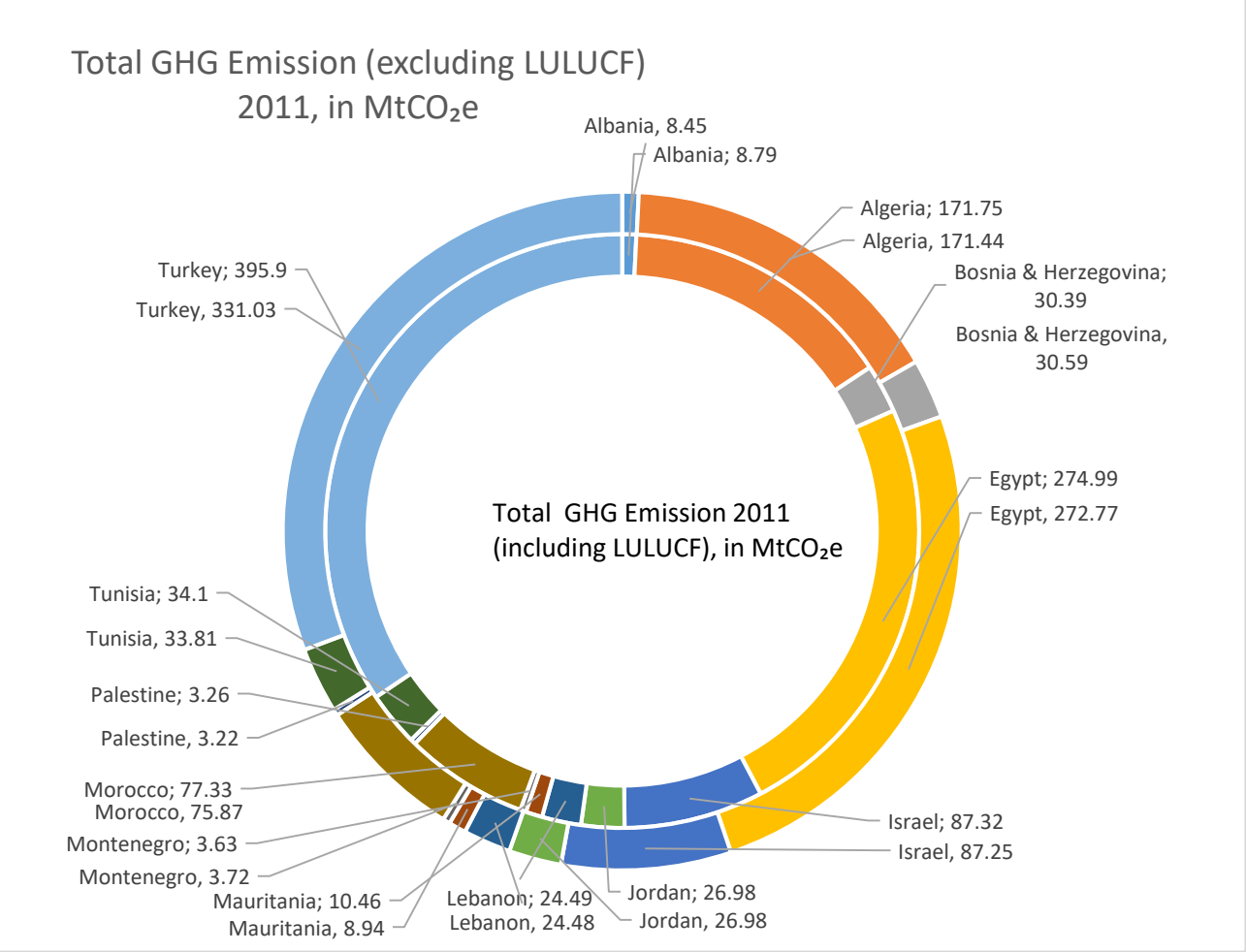


Figure 2: Total GHG emissions (excluding LULUCF) in 13 SEMed countries (Source. Author's elaboration[26])

Based on the same historical emission database, the energy sector represents the most significant share of net emissions in the region (70%), mainly due to the growing service and industrial sectors in almost all SEMed countries. It is then followed by Agriculture (9%), Industrial processes (8%) and Waste sector (7%). (See. Figure 3)

[26] Data is gathered from CAIT WRI

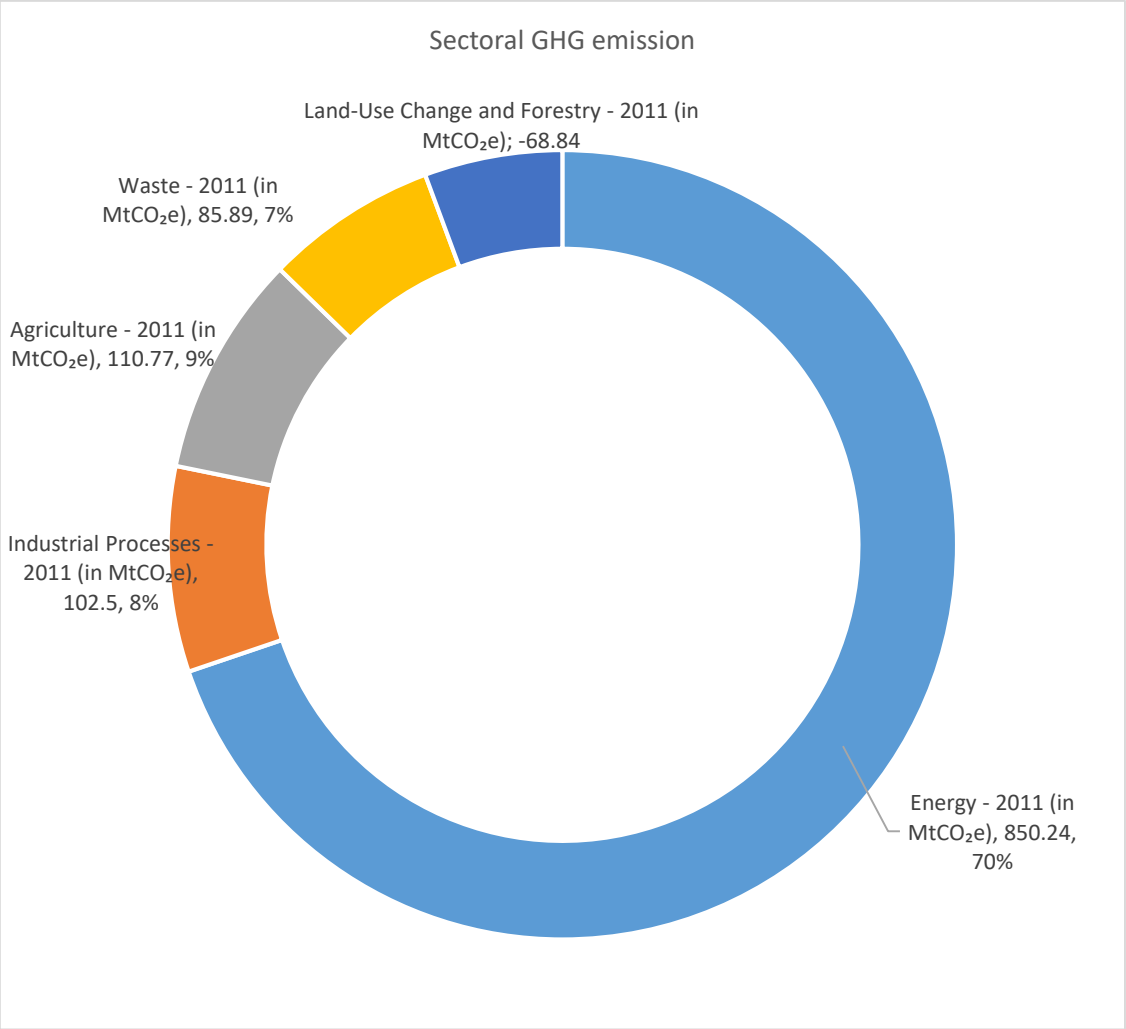


Figure 3: Sectoral GHG emissions (excluding LULUCF) in 13 SEMed countries (Source. Author's elaboration[27])

All countries deem the energy sector as their priority sector, mainly due to the growing projection of energy consumption, driven by population and economic growth coupled with heavy reliance on fuel, migration as well as the vulnerability of their current energy generators to the impacts of climate change. The latter especially expressed by Albania, as hydro power is the main energy source in the country.

While all other countries include industrial processes as their mitigation priority sector, the State of Palestine has included industry sector only as part of their adaptation sector, particularly due to their high vulnerability to the impacts of climate change, with severe implications for its economy and environment. Adaptation actions for industry sector in the State of Palestine focused on protecting the existing industries from the impacts of climate change, unreliability of energy supply and implementation of energy efficiency and renewable energy (EERE).

Pledges on mitigation contribution by the 13 countries are mostly expressed by setting unconditional (relying on solely national efforts) and conditional targets (relying on international support) relative to a set base year. Countries have utilized a variety of base years, i.e. 1990, 2005 and 2010, and some have not specifically stated their base year on their NDCs.

All SEMed countries expressed their conditional target, varying from 3% (Bosnia and Herzegovina) to 88% (Mauritania). Tabulation of SEMed countries' emission reduction targets is presented in Table 7.

[27] Date is is gathered from CAIT WRI

Table 7: Tabulation of SEMed countries' emission reduction targets (Source. Author's elaboration[28])

	Emission reduction target		
	Unconditional	Conditional	Base Year
Albania	-	11.50%	2016
Algeria	7%	22%	-
Bosnia and Herzegovina	-	3%	1990
Egypt	-	-	-
Israel	26%	-	-
Jordan	1.50%	12.5%-14%	2006
Lebanon	15%	30%	-
Mauritania	12%	88%	2010
Montenegro	30%	-	1990
Morocco	17%	42%	2010
State of Palestine		12.8% (Status quo) 24.4% (Independence)	-
Tunisia	13%	41%	2010
Turkey	-	21%	2012

It must be noted however, that countries also acknowledged their uncertainties of, or exclusion of sectors from, their emission data and thus reserve the right to review its NDC targets until 2020.

In addition, all SEMed countries communicated their non-GHG mitigation contributions, as complementary to the GHG contributions. The non-GHG contributions are expressed in actions plan on implementation of EERE, reforestation target, and policy actions. These non-GHG goals enable countries to take actions in achieving the GHG reduction target, for example implementation of EERE backed-up by a sound legal framework will not only result in the reduction of emission but will also improve productivity and growth.

Following the Bali Action Plan, and concluded at the Conference of Parties (COP) 18 in Doha, developing country Parties agreed to take Nationally Appropriate Mitigation Actions (NAMAs) in the context of sustainable development. NAMAs are seen as concrete measures to achieve the objectives of Nationally Determined Contributions (NDCs). A total of 33 NAMAs projects are identified from six SEMed countries, namely, Egypt, Jordan, Lebanon, Morocco, State of Palestine and Tunisia. However, only two NAMAs projects are being implemented. Energy related NAMAs are dominating the sectoral distribution in all countries which have NAMAs, showing also the priority stated in the NDCs. It must be noted that the region is blessed with a huge renewable energy potential, especially solar power. Commitment to harness the abundant renewable energy sources, combined with rigorous implementation of energy efficiency could represent a major part of the solution.

[28] Information is gathered from the initial analysis of the SEMed countries NDCs

3.2 Mitigation contribution

3.2.1 Energy Sector

Regional Circumstances – (based on Indicators)

As of 2016 the 13 SEMed countries registered a total primary energy supply of 356,807 ktoe, from which more than 90% was generated from fossil fuels (i.e.: coal, petroleum and natural gas). Slightly over 2% was generated by hydropower and approx. 5% from renewable energies, including geothermal, solar, biofuels and waste (See. Figure 4).

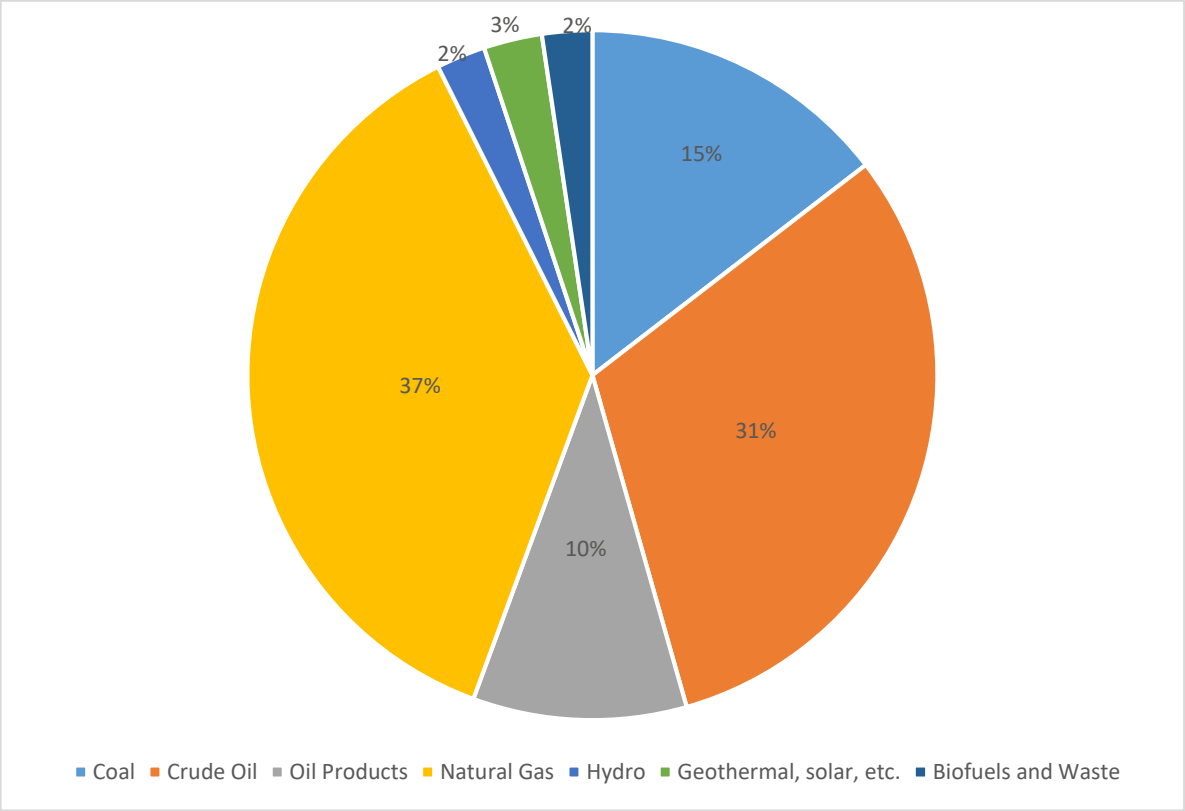


Figure 4: Total primary energy supply, 2016 (in %) (Source. Author's elaboration[29])

Energy consumption in the same year reached 249,669 ktoe. Almost 50% of final consumption came from oil products (including diesel, gasoline, etc.). Approximately 40% came from both natural gas and from electricity (i.e.: approximate 20% each). Slightly over 5% came from coal and the remaining 5% came from a mix of biofuels and waste, heat, and renewable sources (See. Figure 5).

[29] Data is gathered from the WRI/IEA

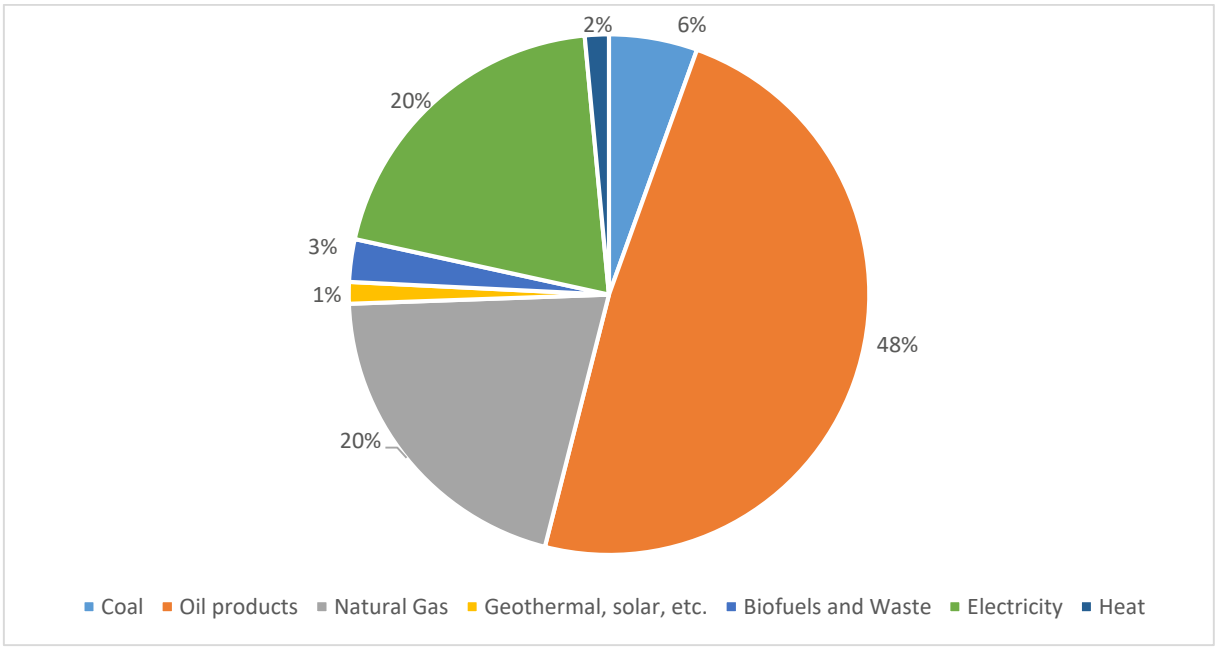


Figure 5: Energy consumption in 2016 (in %) (Source. Author's elaboration[30])

The regional energy balance points out to the transport, residential and industrial sectors as the main consumers of energy with approximately 33%, 23% and 22% of total consumption. (See. Figure 6)

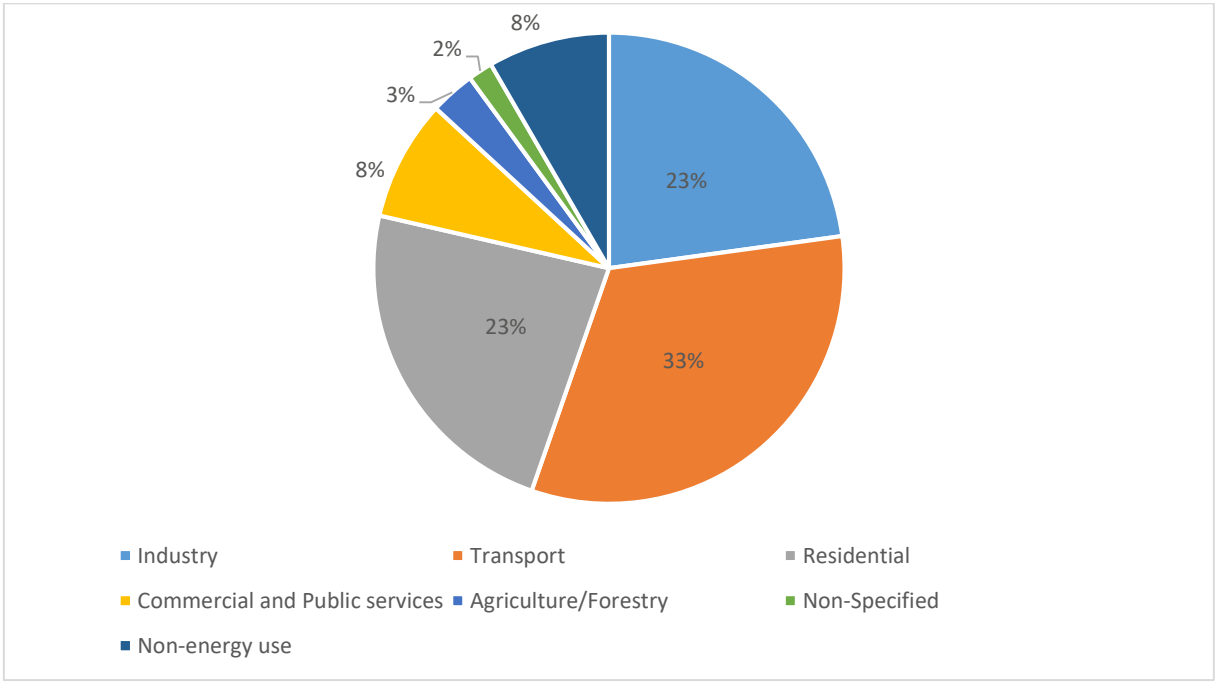


Figure 6: Energy consumption per sector in 2016 (in %) (Source. Author's elaboration[31])

In the transport sector, consumption relies almost solely on fossil fuels with approximately 97%. Residential sector has a greater diversification of energy sources, with main energy sources for consumption are 31.53% natural gas and 30% electricity, followed by oil products with 20.3% and biofuels and waste with 10%.

[30] Data is gathered from the WRI/IEA
[31] Data is gathered from the WRI/IEA

The industrial sector uses natural gas as its main source of energy with 33.5% followed by electricity with 31.7%, oil products with 18.7% and coal with 13.6%.

Even though energy supply and demand profiles across the 13 countries are presented in the form of aggregated data, the trends respond to countries with the highest energy demand, in particular Turkey, Egypt and Algeria.

73.5% of energy supply is generated by the sub-region of Eastern countries, comprising Egypt, Israel, Jordan, Lebanon, State of Palestine and Turkey. Whereas, 23.6% of energy supply came from the sub-region of Maghreb consisting of Mauretania, Morocco, Tunisia, Algeria. Finally, the sub-region of the West Balkan countries (Albania, Bosnia and Herzegovina and Montenegro) represents 2.8% of the energy supply.

Renewable energy targets

The SEMed countries benefit from being endowed with large natural and energy resources. The countries can count on, not only non-renewable resources such as oil and gas reserves, but also abundant solar and wind potential that is currently underutilized.

The share and expansion of renewable energies in the energy matrix of the 13 countries is defined in terms of percentages and periods of execution. Whether these are indicative or of mandatory compliance depends on the internal planning processes of the countries. As presented in table 8 below, the objectives for the introduction of renewables vary considerably from 10% to 40% for the period 2020 to 2030.

Table 8: Targets for renewable energy shares by country (Source. Authors' elaboration)

Country	%	Year
Albania	38% of RES in gross final energy consumption	2020
Algeria	27% of RES in total power generation	2030
Bosnia and Herzegovina	40% of RES in gross final energy consumption	2020
Egypt	20% of total electricity generation from RES	2022
Israel	10% of electricity generation capacity from RES	2020
Jordan	10% of electricity generation capacity from RES	2020
Lebanon	15% of RES (power and heat demand)	2030
Mauritania	20% of total electricity generation from RES	2020
Montenegro	33% of RES in gross final energy consumption	2020
Morocco	42% of electricity generation capacity from RES	2020
State of Palestine	20% under status quo scenario by 2040 33% independence scenario by 2040	2030
Tunisia	30% of RES in total electricity generation	2030
Turkey	30% of electricity generation capacity from RES	

Projections indicate that energy consumption will continue to rise. Consequently, it is expected that by 2015 CO2 emissions will double emissions of 1990, due to energy use.[32] Governments became aware of the importance of the energy sector for development and the environment and the NDCs reflect that importance. All 13 countries, hence, include the energy sector as a key priority sector to reach the objectives of the Paris Agreement.

Mitigation measures

Of all the mitigation measures in the renewable energy sub-sector listed in the countries' NDCs, those aiming at promoting renewable energies in the power generation are the most common, mainly through the promotion of solar or wind technologies.

In the transport sub-sector, mitigation measures related to urban transport modal change and transport oriented urban development are those commonly mentioned.

Measures in the energy efficiency sub-sector relate energy efficiency frameworks in buildings (new and existing) and utilities such as promotion of more efficient lightning and/or equipment.

[32] http://www.eib.org/attachments/country/climate_change_energy_mediterranean_en.pdf

Table 9 Prioritized measures on Energy sector in SEMed countries[33]

Energy		
Measures grouping	**Measures**	**Potential Countries**
Renewable Energy	The main objective of the measures is to contribute to support climate action activities as outlined in the NDCs, through the deployment of the following the following technologies: • Solar electricity/power generation activities • Wind electricity/power generation activities • Hydro-electricity generation activities • Renewable sources electricity generation activities	Albania, Algeria, Bosnia and Herzegovina, Egypt, Jordan, Montenegro, Morocco, State of Palestine, Tunisia, Turkey
Lower Carbon and Efficient Energy generation	Measures related to lower carbon and efficiency energy generation; Promotion of measures geared to reduce electricity transmission and distribution losses (such as upgrading of electricity grid) and rehabilitation of public electricity generation power plants	Turkey, State of Palestine
	Measures related to power plants Replace existing thermal power plants with new more efficient plant; Construct co-generation plants fueled by wood chips and wood waste from wood processing industry	Bosnia and Herzegovina
Transport	Measures related to mass transit, focusing on moving people • Increasing the share of busses-and microbuses- passengers; • Increasing the total number of commuters using public transport; • Implementing the national BRT (Bus Rapid Transit) system; • Implement large-scale public transit in major urban centers powered by renewable energy; • Increasing the share of public transport for passengers	Egypt, Jordan, Lebanon, Morocco, Albania,

[33] Derived from countries'NDCs/NAPs/other national climate change strategies documents

	Measures related to transport oriented urban development: • Improvement of road transport organization in cities and the introduction of integrated concepts (SMART cities); • Increasing taxes for second hand cars (newly registered) in order to reduce their introduction to market.	Albania, Montenegro, State of Palestine
	Measures related to Inter-urban transport: • Switch from road to river and rail transport, as well as increasing the share of Railways and river passengers; • Implementing sustainable transport approaches in urban areas; • Restructuring of the railway system	Albania, Egypt, Jordan, Montenegro, Turkey
Energy Efficiency	Improvement of energy efficiency in industry in existing facilities: • Energy efficiency improvements in industry sector and power generation sector, reduce energy consumption in industry; • Increasing energy efficiency in industrial installations and providing financial support to energy efficiency projects	Egypt, Montenegro, Morocco, Tunisia, Turkey
	Improvements of energy efficiency in existing commercial, public and residential buildings: • Implementation of the improved energy Building Code; • Systemic energy rehabilitation of existing buildings (focus on public sector); • Energy efficiency improvements in residential and commercial buildings	Albania, Algeria, Egypt, Tunisia
	Improvements of energy efficiency in the utility sector and public services: • Use of efficient refrigerators and efficient lighting; • Generalize high-performance lighting; • Increase of 1% per annum using energy efficient lightbulbs.	Albania, Algeria, State of Palestine, Tunisia
	Improvement of vehicles' energy efficiency: • Introduction of the Zero Emission Electric Vehicle; • Increase share of fuel-efficient vehicles	Jordan, Lebanon, Tunisia

	Improvements in new commercial, public and residential buildings: • Increasing the uptake of residential, commercial and public new build which adheres to recognized green building standards; • Requiring the implementation of green building codes: by setting clear standards for construction, materials and land based on best practices; and requiring all new buildings in the public sector to comply with Leadership In Energy & Environmental Design (LEED); • Buildings standards on thermal efficiency, developing on existing regulations	Montenegro, Morocco, Israel, State of Palestine, Tunisia, Jordan, Turkey
	Introduction of energy audits: • Putting up an auditing scheme for industries; • Legal energy survey and energy officer requirements for large energy consumers; • Implementing programs of energy audits and energy efficiency measures in public and governmental buildings	Albania, Israel, Jordan

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

3.2.2 Industrial Processes Sector

Regional circumstances

The industrial processes sector represents 8% of net emissions across the SEMed countries (see chapter 3, emissions status) after the energy and agriculture sector. Of the total net emissions contributed by this sector in the 13 countries, almost 90% is produced by 5 countries only, namely Turkey: (33%), Egypt (24%), Algeria (13%), Israel (11%) and Morocco (7%). Figure 7 illustrates that distribution.

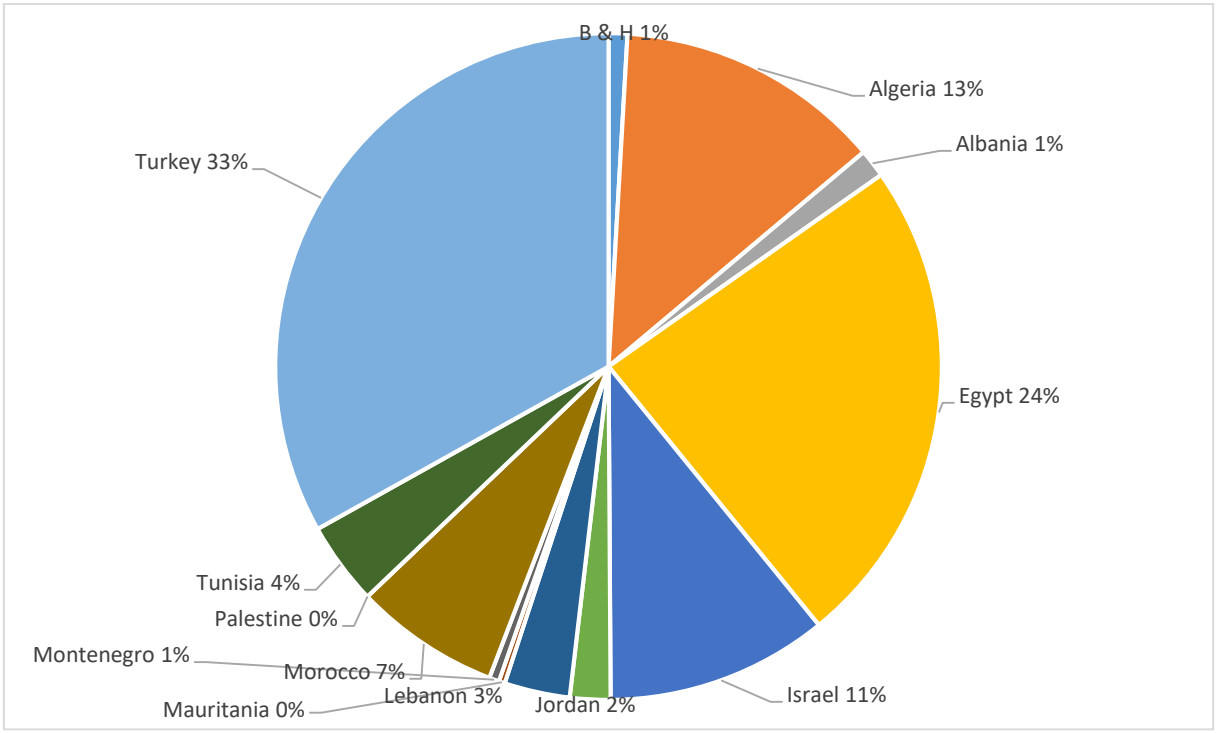


Figure 7: Total regional GHG in the industrial processes sector distributed by country (Source. Authors' elaboration[34])

A different image is presented when looking at the contributions of GHG emissions per country. For example, Montenegro contributes approximately 1% to the regional GHG emission from industrial processes. However, compared to the other countries, Montenegro's industrial processes are responsible for 14% of the country's GHG emissions, ranking second after the energy sector. In Egypt, the second main contributor of GHG from industrial processes in the region, this sector represents 9% of the country's total net emission, after energy (72%) and agriculture (9%). Figure 8, presents the share of GHG emissions from industrial process of the different countries, compared to other sectors (excluding LULUCF)

[34] Data is gathered from WRI/IEA

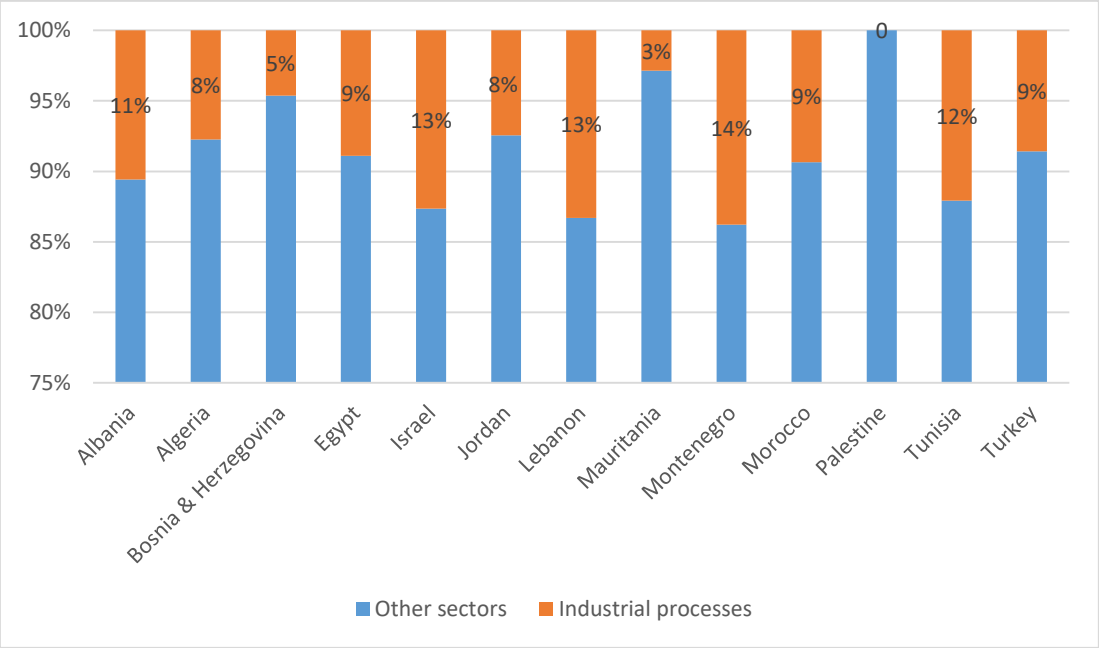


Figure 8: Share of GHG emissions from industrial processes by country

Cement and metal industries are mainly responsible for GHG emissions in industrial processes sector. This applies to all SEMed countries, except the State of Palestine, as the country does not have any heavy industries that contain chemical or metal, and only little light industry. To date the State of Palestine has not included any emissions generated from this sector. However, a cement factory, which was planned to start its business in 2019, which will certainly change the circumstances, once it really operates.

Countries' policy to accelerate growth in industrial processes sector, coupled with foreign demand, will continue to increase the contribution of the sector's GHG to the total national and regional emissions. Exception may apply for Montenegro, where there is a declining trend in industrial production in general. In Mauritania, for example, GHG emissions in industrial processes sector increased from 113.896 GgCO2e in 1990 to 426.26 GgCO2e in 2018, resulting in an increase of about 274.25%.[35] If growth is not accompanied by adequate measures to halt the GHG emissions generation, this trend will continue.

Technologies used and production processes applied in industry sector across the SEMed countries are relatively outdated. Implementation of appropriate measures to improve production processes in industry, ensuring environmental and climate soundness are urgently required. It could encompass modernization of productions system coupled with the application of updated technologies. Greening the industrial sectors could produce significant co-benefits, e.g.: decrease energy consumption, generation of less waste, reduce CO_2 emissions and increase job generation.[36]

Mitigation measures

Almost all SEMed countries include industrial processes in their NDCs as a key priority sector. The State of Palestine is the only exception.

[35] Government of Mauritania. 2014. Troisieme Communication Nationale Sur Le Changement Climatique.
[36] IBRD. 2012. Toward Green Growth in Mediterranean Countries. International Bank for Reconstruction and Development / The World Bank. Retrieved from http://www.femise.org/wp-content/uploads/2014/10/Femise_T2012_wb_greengrowth_full_gb.pdf

Table 10 below presents the prioritized actions related to minimizing GHG emission generation in industrial processes sector, as communicated by SEMed countries in their NDCs or other national mitigation strategy documents. This section only contains policies and measures for emissions originating from industrial processes.

Table 10 Prioritized measures on Industrial Processes sector in SEMed countries[37]

Industrial Processes		
Measures grouping	**Measures**	**Potential Countries**
Industrial processes *(Reduction in GHG emissions resulting from industrial process improvements and cleaner production (e.g. cement, chemical), excluding carbon capture and storage)*	Optimize the production process of cement, mineral and chemical industries. For example: - **In cement industries: Use of steel slag and/or fly ash to substitute the raw materials needed to produce clinker; Increasing the additive blend in cement production** - **In Nitric Acid Plant: Use of Catalytic Reduction of N_2O inside the ammonia burner of the Nitric acid Plant**	Egypt, Jordan, Lebanon, Mauritania, Tunisia, Montenegro
	Potential reduction of CO2 emissions in industry could be achieved by switching from a traditional fossil fuel to a biomass fuel which is based on the specific emission factor for the fuel as related to its calorific value and carbon content. For examples through: - **Use of biomass (municipal solid waste or/and Sewage Sludge) as alternative fuels** - **encourage waste management and recycling in industrial processes, such as recovery of fly ash in the building materials industry, increase in PVC recycling.**	Albania, Algeria, Jordan, Egypt, Morocco, Turkey
	Modernization of existing industry (including introduction of new and more efficient technologies) and the development of new industry that will primarily be based on knowledge and innovation using domestic resources and raw mineral materials whilst respecting environmental standards.	Albania, Montenegro

[37] Derived from countries' NDCs/NAPs/other national climate change strategies documents

Industrial Processes		
(Accompanying) Measures grouping	**Measures**	**Potential Countries**
Support to national, regional or local policy, through technical assistance or policy lending	Regulate the technologies used in processing industries and the development of new industries with the creation of conditions for developing entrepreneurship (ecological entrepreneurship) and innovative economic potential (investments in new technology, innovations, sustainable development, meeting high ecological requirements etc.)	Albania, Montenegro
	Introduction of incentive measures for investing in cleaner industrial processes, with a view to improve the impact of industry on the environment, to both large-scale industries and SMEs.	Montenegro, Turkey
	Promote cleaner production/eco-efficiency applications that will contribute to sustainable growth of industry and increasing its international competitiveness	Turkey
	Carry out intensive information studies in order to raise awareness of industrialists on fight against climate change,	Turkey
Financing Instruments	Use of NAMAs and improving access to carbon markets to finance GHG reduction measures in Industrial Processes sector.	Tunisia
	Attraction of foreign investment and development of industrial zones to use and practice all available potential in the field of industry, relying particularly on small and medium sized enterprises (establishing industrial cooperation between economic entities with a view to strengthening the private sector)	Montenegro

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

3.2.3. Waste and Wastewater Sector

Regional circumstances

Compared to other sectors, waste and wastewater generates the least GHG emission across SEMed countries, about 7% of the total GHG. The sector is, however, prioritized by 12 SEMed countries, except Albania. The growing population as well as economic status influence the growth of waste as well as wastewater generation in the countries. Waste has become a major problem in the region, especially as it is also polluting water bodies, including the ocean, and thus affecting the growth of other economic sectors, for example tourism. It is recorded that about 40 pieces of marine litter can be found in every km^2 of water, in the Mediterranean Sea, and over 892,000 pieces of plastic marine litter per km^2 in the most polluted areas.[38]

Indicator data regarding waste generation, composition and recycling rate in the SEMed countries are rare to find.[39] The same applies for wastewater. And when identified, they are not available for all countries and/or do not have uniform annual data set.

Yet, based on the available (incomplete) data set, collection of solid waste and wastewater are increasing, but in a low pace, and thus disproportionate with the rise of its generation. In some countries, i.e. Bosnia and Herzegovina and Morocco the rate of collection is even declining over the years. The situation is usually driven by the low public investment in the sector, as solid waste management in many places is not regarded as priority. However, this may change under the climate change regime, especially given the increased awareness of the potential of solid waste management and the concept of circular economy.

The total population served by the municipal solid waste collection in SEMed countries ranges between 60-70 percent, except the State of Palestine whose coverage is above 90% of the total population (See. Table 11). As for wastewater, barely any comparable data set is available in this regard.

Table 11 Solid Waste Collection and Composition in SEMed countries (Source. Authors' elaboration[40])

Country	Latest year	Municipal waste collected (1000 tones)	Population served by municipal waste collection (%)	Organic material (%)	Paper, paperboard (%)	Plastics (%)	Others (%)
Albania	2003	1,057.0	63.0	51.4	9.9	9.6	29.1
Algeria	2015	5,182.2	85.0	54.4	9.8	16.9	19
Bosnia and Herzegovina	2015	924.1	76.0	n/a	n/a	n/a	n/a
Egypt	2012	94,868.0	n/a	53.5	13.6	6.8	26.1
Israel	2015	5,126.2	n/a	n/a	n/a	n/a	n/a
Jordan	2015	3,458.0	n/a	50.0	15.0	16.0	19
Lebanon	2012	1,940.0	n/a	50.0	17.0	13.0	20

[38] Tara Expeditions. 2018
[39] In the case of Mauritania, no data is available in any solid waste related database.
[40] UNSD. 2018. UNSD Environmental Indicators. United Nations Statistics Division. Retrieved from https://unstats.un.org/unsd/envstats/qindicators

Montenegro	2012	279.7	75.9	n/a	n/a	n/a	n/a
Morocco	2015	5,817.1	n/a	60.0	7.5	7.5	12
State of Palestine	2015	1,650.9	94.5	59.0	15	12.0	14
Tunisia	2004	1,316.3	65.0	68.0	10	11.0	11
Turkey	2015	31,283.0	n/a	n/a	n/a	n/a	n/a

Organic material is still dominating solid waste composition in SEMed countries (50% - 60%), followed by paper and plastics (10% - 17%).

Table 12 below presents various types of waste treatment in SEMed countries. Landfill treatment is still deemed as a prioritized option in most countries (80% - 100%). Rate of solid waste recycling and composting are still deemed low, roughly at average of 10-15%. This number is even lower than the average of recycling rate in the European countries, which is already deem as very low, at 20%.[41]

Table 12 Solid Waste Treatment in SEMed countries (Source. Authors' elaboration[42])

Country	Latest Year	Municipal waste collected (%) (1000 tons)	Municipal waste landfilled (%)	Municipal waste incinerated (%)	Municipal waste recycled (%)	Municipal waste composted (%)
Albania	2003	1,057.0	n/a	n/a	n/a	n/a
Algeria	2015	5,182.2	82.0	n/a	10.0	1.0
Bosnia and Herzegovina	2015	924.1	103.2	0	n/a	n/a
Egypt	2012	94,868.0	20.0	n/a	2.1	n/a
Israel	2015	5,126.2	80.0	n/a	15.7	4.4
Jordan	2015	3,458.0	99.4	0.6	n/a	0.0
Lebanon	2012	1,940.0	81.0	0	8.0	11.0
Montenegro	2012	279.7	n/a	n/a	n/a	n/a
Morocco	2015	5,817.1	90.0	n/a	10.0	n/a
State of Palestine	2015	1,650.9	53.0	0	<1.0	2.5
Tunisia	2004	1,316.3	99.9	n/a	n/a	0.1
Turkey	2015	31,283.0	87.6	n/a	n/a	0.5

Table 13 below presents the combustible renewables and waste in correspond to the percentage of the total energy use, and its trend in each SEMed countries. The combustible renewable and waste comprise solid biomass, liquid biomass, biogas, industrial waste, and municipal waste, measured as a

[41] Tara Expeditions. 2018.
[42] UNSD. 2018. Except for the State of Palestine, figures have been updated in accordance with information provided by government officials.

percentage of total energy use. The numbers in most countries are declining over the years, except for Bosnia and Herzegovina.

Table 13 Combustible renewables and waste (% of total energy) in SEMed countries (Source. Authors' elaboration [43])

Country	Combustible renewables and waste (% of total energy)	Trend
Albania	9.36	↘
Algeria	0.01	↘
Bosnia & Herzegovina	19.07	↗
Egypt	2.29	↘
Israel	0.11	↔
Jordan	0.08	↔
Lebanon	1.68	↘
Mauritania	n/a	-
Montenegro	17.32	↔
Morocco	7.19	↘
Palestine	n/a	-
Tunisia	10.22	↘
Turkey	2.93	↘

Due to the lack of available data on wastewater, a detailed and elaborated analysis is not presented in this report. However, based on the available information wastewater is treated in countries through different means, i.e. treated in urban wastewater treatment plants or other wastewater treatment plants, or else left entirely untreated. Furthermore, available data show that volume of wastewater treated is increasing over the years, yet, volume of untreated wastewater is also increasing. The situation can be inferred that the increasing wastewater generation is imbalanced with the capacity of treating wastewater.

Mitigation measures

Responding to the circumstances in the countries, and in order to comply with the committed emission reduction, prioritized actions expressed by the countries' NDCs evolve mainly on topics such as waste conversion to energy, both domestic and municipal waste as well as increasing the rate of waste separation, and thus recycling. As for wastewater, countries are committed to enhance the coverage of wastewater treatment and in some areas, also increasing the energy efficiency of the wastewater treatment plants. Table 14 presents the prioritized actions proposed by countries in their NDCs, as well as the corresponding initial proposal for potential joint approaches.

[43] WB. 2018

Table 14 Prioritized measures on Waste and Wastewater sector in SEMed countries[44]

Waste and Wastewater		
Measures grouping	**Measures**	**Potential Countries**
Wastewater treatment	Capturing and recycling methane from waste water treatment plants (for example by utilizing anaerobic digestion)	Algeria, Egypt, Israel
	Improving energy use efficiency in water utilities and/or implementing utilization of renewable energy sources (e.g. Solar PV, utilization of sludge or other bio solids) in the operation of waste water treatment plants.	Jordan, Tunisia
Waste management projects that capture or combust methane emissions	Recycling of methane from landfill sites (for example through gasification), for example to be used for cooking fuel or electricity)	Algeria, Egypt, Israel, Palestine, Tunisia, Turkey
Waste to energy projects	Energy recovery from solid waste using advanced thermal processes or incineration	Algeria. Bosnia and Herzegovina, Egypt, Israel, Jordan, Lebanon, Mauritania, Montenegro, Palestine, Turkey
Waste collection, recycling and management projects that recover or reuse materials and waste as inputs into new products or as a resource	Replacing fossil fuels with non. hazardous waste in Industry (Refuse-Derived Fuel production) through waste management -industry symbiosis approach	Albania, Egypt, Palestine, Israel, Tunisia, Turkey
	Composting organic waste and green waste	Algeria, Egypt, Israel, Montenegro
	Improve the coverage of waste collection, accompanied by improved landfilling practices and/or construction of new facility	Bosnia and Herzegovina, Egypt, Morocco, Turkey
	Development of a sorting (preferable at the source), re-use and recycling system	Bosnia and Herzegovina, Egypt, Israel, Jordan, Morocco, Turkey

Note: It is important that while implementing these measures, net emission reduction can be demonstrated.

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[44] Derived from countries'NDCs/NAPs/other national climate change strategies documents

The measures presented in table 14 above serve as a summary of the prioritized actions presented by the countries in the NDCs. However, given the circumstances in the waste sector, it is important that countries' government create enabling conditions for the implementation of those measures. This could include, for example:

1. **Policy framework: Mainstream waste management master plans and standardize them, assuring harmonization of legal basis in all administration levels, i.e. national and sub-national.**
2. **Institutional capacity: Improve the management of the waste sector, by providing training and awareness raising for stakeholders on waste issues, as well as increasing knowledge exchange with other countries. It must be acknowledged that oftentimes projects are developed in accordance with the international standards which are not compatible with the resources and technical capacity available.**

   Gaps of experience between countries can serve as a good environment for better exchange and learning processes. Moreover, authorities in European countries (members of UfM) have long standing experience in the area, their provision of technical expertise and institutional support to their counterparts in the countries of southern and eastern Mediterranean can be beneficial in strengthening the management of solid waste on the basis of sustainability and integration[45]
3. **Financing: Enhance cooperation with private sector. Public Private Partnership (PPP) has been utilized in the SEMed region to deliver sizeable investments in solid waste management.**

3.2.4 Agriculture Sector

Regional circumstances

Agriculture remains an important sector for the SEMed countries with an average contribution of 10.5% to total GDP in 2014, although the sector's contribution to GDP has been continuously decreasing since 1990. In 2014, agriculture's contribution to the economy of the countries ranged from 4% in Lebanon to 23% in Albania and Mauritania. Table 15 illustrates the development of the agriculture sector's contribution per country.

Table 15: Agriculture, added value (% GDP) (Source. Authors' elaboration [46])

Country	1990	2000	2014
Albania	36	29	23
Algeria	11	9	10
Bosnia & Herzegovina		11	8
Egypt	19	17	14
Israel		1.27	1.15
Jordan	8	2	4
Lebanon		7	6
Mauritania	30	36	23
Montenegro		12	10
Morocco	19	15	16
Palestine		11	5
Tunisia	18	11	9
Turkey	18	11	8

[45] ARLEM. 2013
[46] Data gathered from FAOSTAT

Although employment rates have also been decreasing, the sector still employs more than 20% of the total population of the 13 SEMed countries. In countries such as Albania and Morocco approximately 40% of the total population still works in this sector. Turkey has a population of almost 18 million or approx. 17% working in agriculture. In Egypt, the number is even larger with over 24 millions of people (i.e.: 30%). Israel and Jordan are the countries where the smallest share of population engage in agriculture with approximately 2% each.

Data on agricultural data performance from 1990 to 2014 indicates that the SEMed countries are net importers of agricultural goods (See. Figure 9). This situation suggests a significant food dependence on imports. Turkey is the only country with a favorable agricultural trade situation among the 13 countries.

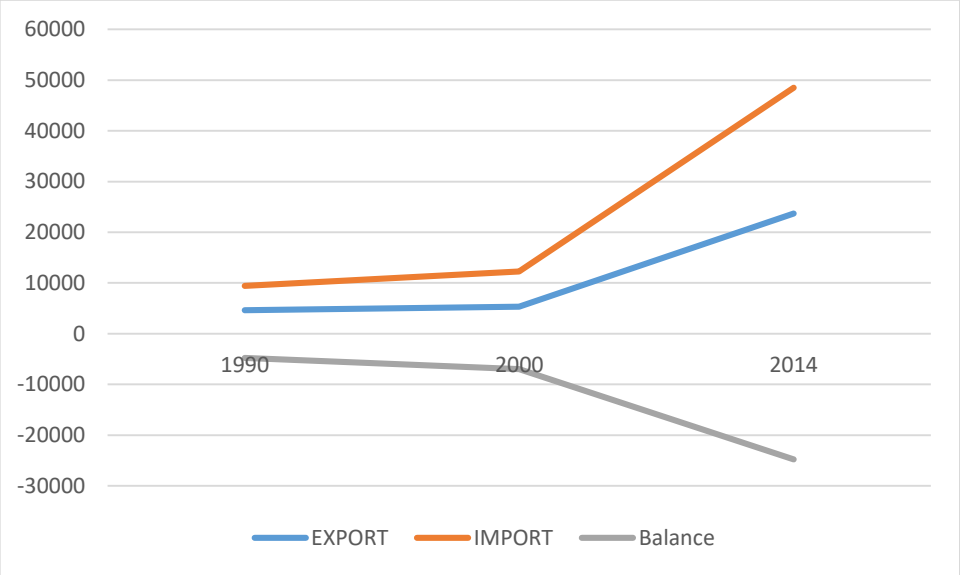


Figure 9: SEMed agricultural trade, US$ million 1990-2014 (Source. Authors' elaboration[47])

Almost all 13 SEMed countries include Agriculture under their climate change mitigation contributions. Only Albania and The State of Palestine make an exception.

According to data from 2011, the Agriculture sector represents 10.2% of the GHG emissions across the 13 countries. Interestingly, of the total 10.2% contributed in the sector, 70% can be traced back to only three countries, namely Turkey (32%), Egypt (28%) and Morocco (12%). Figure 10 provides an overview of the GHG emissions in the agricultural sector per country.

[47] Data is gathered from FAOSTAT

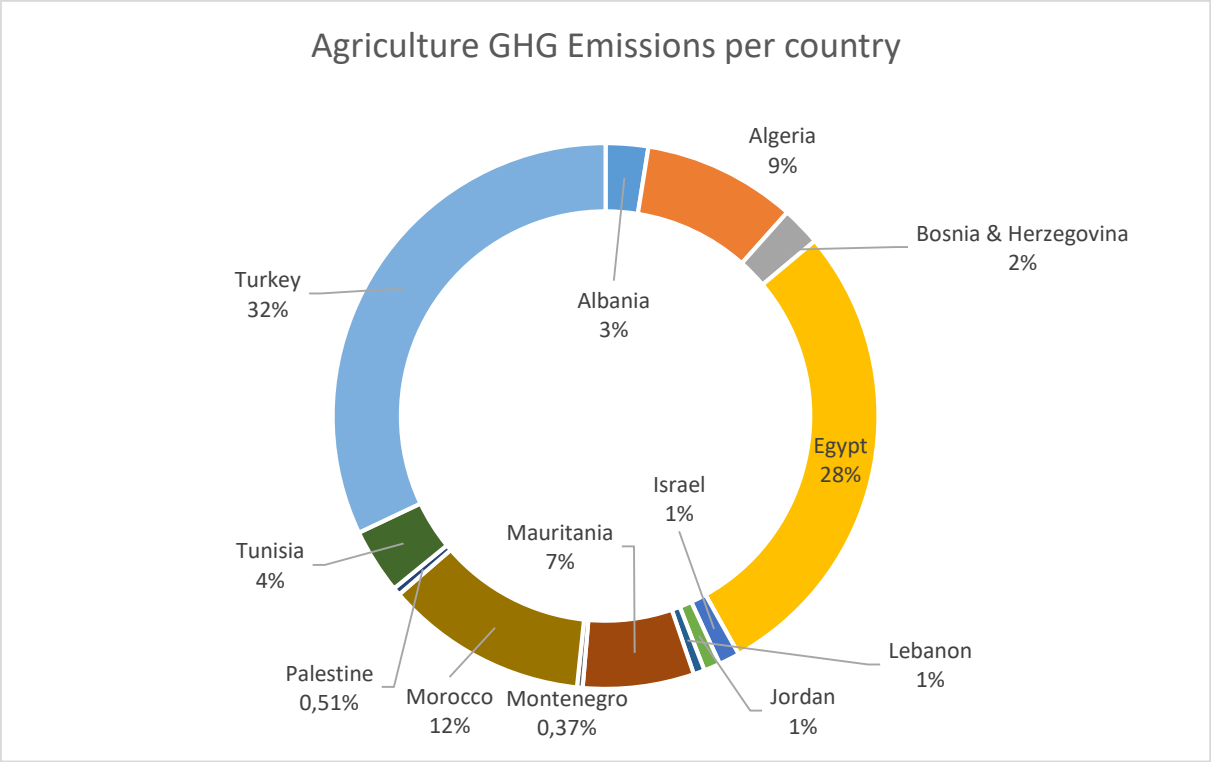


Figure 10 GHG emission from agriculture sector in SEMed countries (Source. Authors' elaboration[48])

In comparison to other regions in the world, the agriculture sector from the SEMed countries contributes very little to global emissions (see Figure 11), despite the countries' growing total emissions in the last years, due to economic growth.

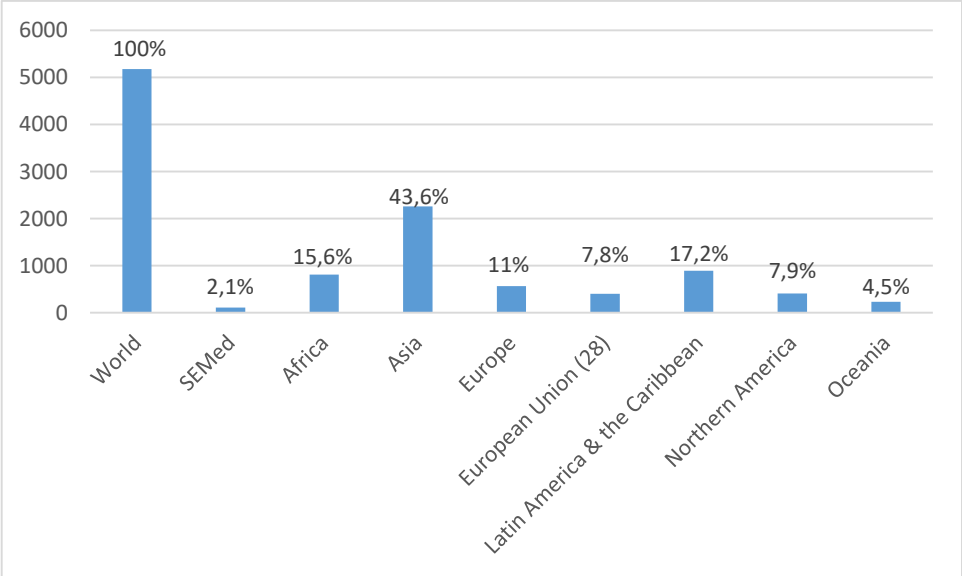


Figure 11: SEMed countries contribution to global emissions (Source. Authors' elaboration[49])

[48] Data is gathered from FAOSTAT
[49] Data is gathered from FAOSTAT

The share of the agriculture sector's emissions in each SEMed country is presented in figure 12:

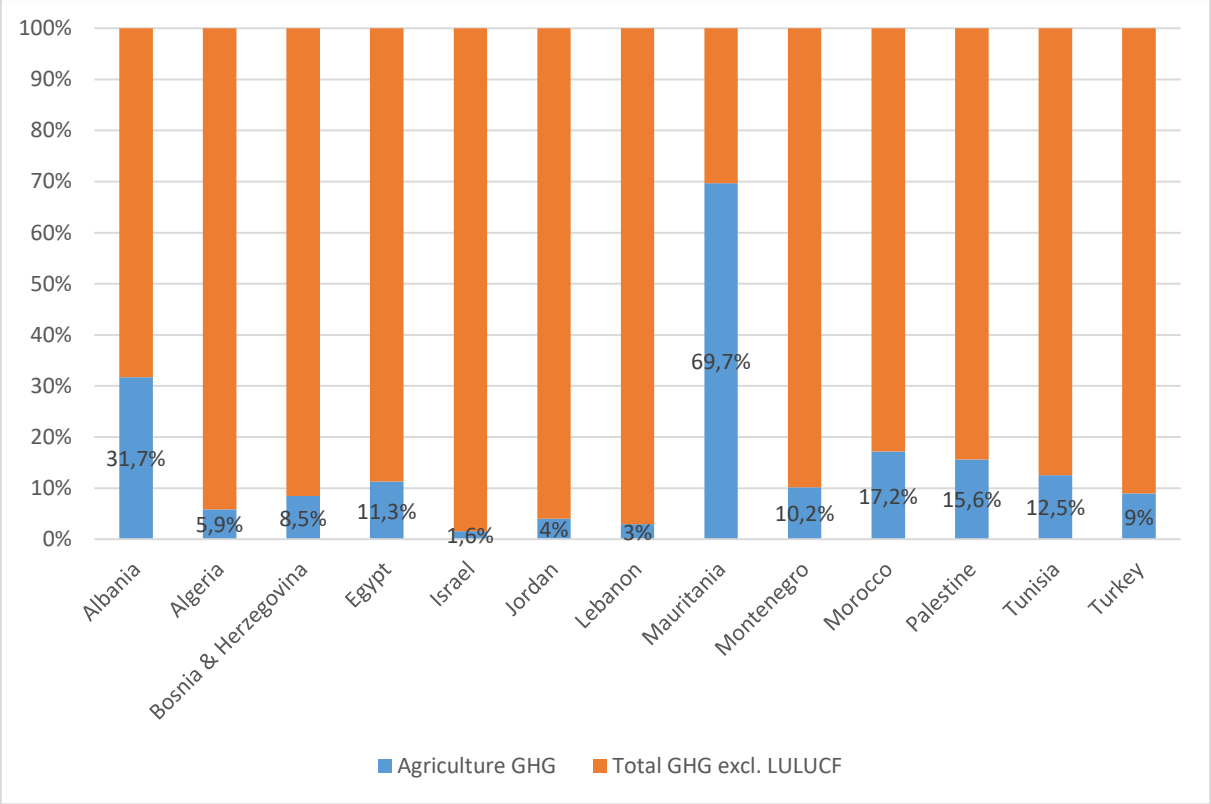
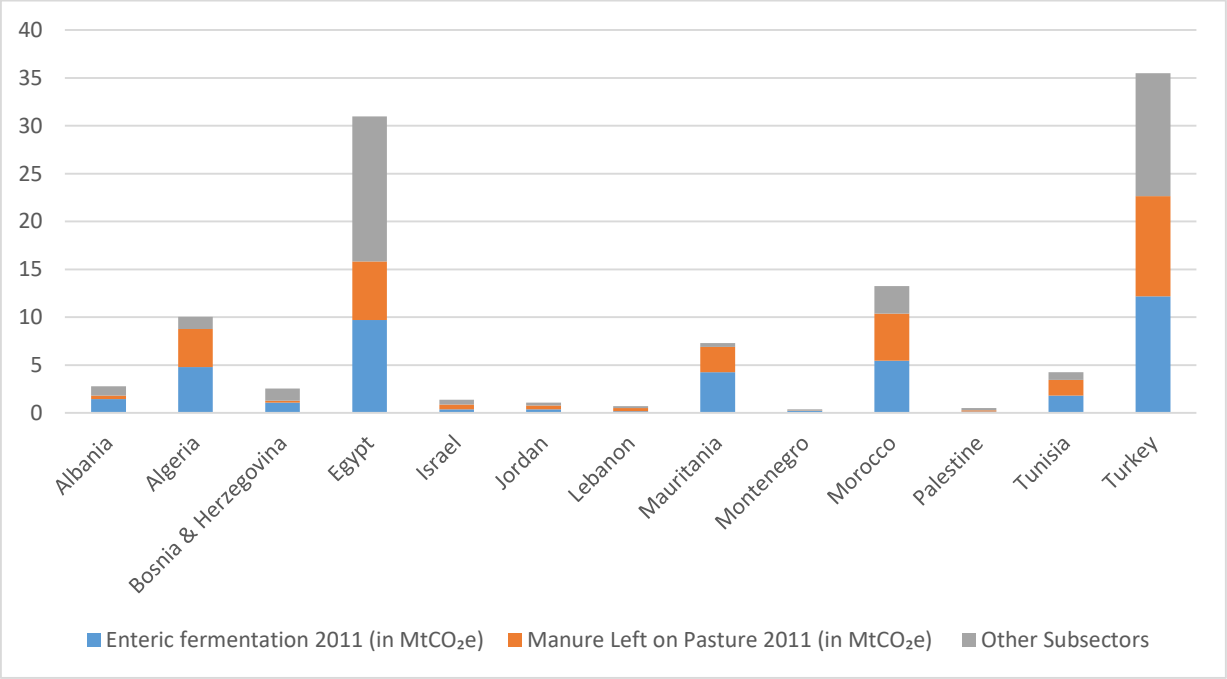


Figure 12: Share of Agriculture GHG emission within each country (Source. Authors' elaboration[50])

Figure 13 provides the breakdown of GHG emission sources in agricultural sector.



[50] Data is gathered from FAOSTAT

Figure 13: Breakdown of GHG Emissions in the Agriculture sector (Source. Authors' elaboration[51])

Among the 13 SEMed countries the contribution of GHG emissions from agriculture subsectors (i.e.: agriculture, livestock) varies considerably, mostly depending on production patterns. According to data from 2011, across almost all SEMed countries, livestock sector is a major contributor to agricultural emissions. Only countries such as Bosnia and Herzegovina, Jordan and the State of Palestine generate low GHG emission from livestock compared to the remaining countries in the region.

[51] Data is gathered from FAOSTAT

Mitigation measures

Table 16 presents prioritized adaptation measures on agriculture sector in the SEMed countries. Based on the identification of measures, it was found that many of the measures are strongly linked with the adaptation measures of the same sector, as well as mitigation measures of forestry sector. It is thus important, to take this interconnectedness into account, when designing joint approaches.

Table 16 Prioritized measures on Agriculture sector in SEMed countries[52]

Agriculture, Forestry and Land-Use		
Measures grouping	**Measures**	**Potential Countries**
Agriculture	Improving cropland management to reduce emissions, through for example: - **agronomic practices** - **nutrient management** - **Tillage/residue management** - **water management** - **agroforestry**	Albania, Algeria, Egypt, Jordan, Lebanon, Tunisia, turkey
	Improving grazing land and pasture management to reduce GHG emissions and enhance removals, through for example: - **grazing intensity** - **increasing productivity (including fertilization)** - **nutrient management** - **fire management** - **species introduction.**	Albania, Lebanon, Montenegro, Tunisia, Turkey
	Support organic agricultural production;	Albania, Lebanon, Montenegro, Turkey
	Increasing energy efficiency in agricultural sector, fuel savings by land consolidation in agricultural areas	Egypt, Turkey

[52] Derived from countries' NDCs/NAPs/other national climate change strategies documents

Livestock	Practices for reducing CH_4 and N_2O introducing improved feeding practices; use of specific agents, longer term management changes and animal breeding and manure management, e.g. introducing anaerobic digestion.	Albania, Algeria, Egypt, Tunisia
Biofuels	Production of alternative fuels (to displace fossil fuels), using agricultural crops and residues (including animal waste)	Albania, Egypt, Montenegro, Tunisia,

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

3.2.5 LULUCF Sector

Regional circumstances

Forest ecosystems represent only about 4% of the SEMed countries' area, or equal to 24 million ha. Although this number might seem very low, these ecosystems are very important for poverty alleviation, socio-economic development, food security and the preservation of a healthy environment. Also, it is important to keep in mind the differences in the percentage of forest area per country, especially when it comes to the differences between the different sub-regions. Forest ecosystems represent 40% of the total area in the West Balkan countries, 2% in the Maghreb countries and 6% in the Eastern Mediterranean countries. Figure 14 gives an illustration of the share forestry area in relation to the country area per country.

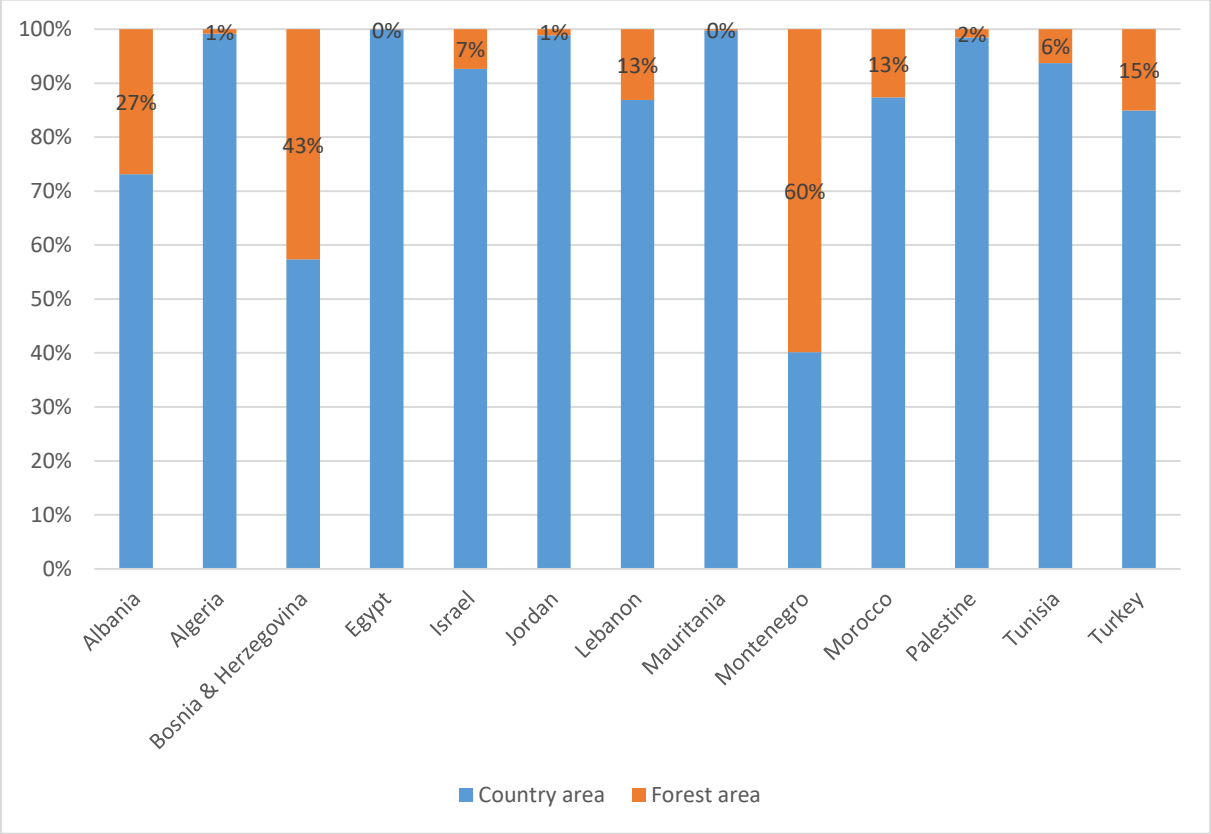


Figure 14: Share of Forest area in % per country (Source. Authors' elaboration[53])

According to the analyzed data, there were no significant changes in forest cover since 1990 across the SEMed countries. Only Tunisia, Morocco and Turkey show a slight increase of approximately 2% from 1990 to 2014. Table 17 shows forest evolution across the SEMed countries.

[53] Data is gathered from FAOSTAT

Table 17: Forest area evolution in % per country (Source. Authors' elaboration[54])

Country	1990	2000	2014
Albania	29	28	27
Algeria	1	1	1
Bosnia & Herzegovina	43	43	43
Egypt	0	0	0
Israel	6	7	7
Jordan	1	1	1
Lebanon	13	13	13
Mauritania	0	0	0
Montenegro			60
Morocco	11	11	13
Palestine[55]	n/a	n/a	n/a
Tunisia	4	5	6
Turkey	13	13	15

Compared to other regions of the world producing large amounts of wood products, forest-related activities and products across the SEMed countries represent a small share of the national GDP: 0,93% in Lebanon, 0,50% in Turkey, 0,40% in Morocco, 0,06% in Tunisia, 0,02% in Algeria. Also, contribution of labor force is low: the forestry sector in Northern Africa contributes less than 1% of labor force.[56] However, it is important to take into consideration, that many of the goods and services provided by forests are not traded in traditional markets and hence are not included in official statistics or national accounts. Some of the goods and/or services provided by forests are: landscape quality, soil and water protection, erosion and desertification control, carbon sequestration, biodiversity conservation, wild-life hunting and recreational activities among others. Table 18 illustrates the primary designated function of forest across the SEMed countries.

[54] Data is gathered from FAOSTAT, except for the State of Palestine
[55] No comparable set of data is avaiable. However, based on desk research it was found that forest area in the State of Palestine was representing 5% of the total land in 1970 and decreased to 1.5% in 2008 (Source. Ministry of Agriculture of the State of Palestine, 2014)
[56] Plan Bleu. Methods and tools for socio-economic assessment of goods and services provided by Mediterranean forest ecosystems. Retrieved from http://www.fao.org/forestry/40011-03b4431fea5475c3d5b7d9ad39e1ab9fd.pdf

Table 18: Primary designated functions of forest in %, 2010 (Source. Authors' elaboration[57])

Country	Production	Protection of soil and water	Conservation of Biodiversity	Social services	Multiple use	Other	None or unknown
Albania	79	17	4	0	0	0	0
Algeria	35	53	12	n.s.	0	0	0
Bosnia and Herzegovina	56	0	1	0	0	0	43
Egypt	2	49	3	0	46	0	0
Israel	0	15	18	3	64	0	0
Jordan	0	98	1	1	0	0	0
Lebanon	6	25	3	0	66	0	0
Mauretania	0	7	20	0	73	0	0
Montenegro	64	10	5	0	0	0	21
Morocco	21	0	12	0	67	0	0
Palestine	-	-	-	-	-	-	-
Tunisia	24	41	4	0	32	0	0
Turkey	70	17	8	n.s.	6	0	0

Forest in the SEMed countries do not have the capacity to fix as much carbon as tropical forests, such as in Guyana or Indonesia. Nevertheless, they do not only store carbon in biomass (living and dead), but they also provide energy resources biomass or renewable materials.

Climate change will affect forest across the SEMed countries in various forms such as higher evapotranspiration, water stress and vegetation dieback and mortality, more frequent and intense wildfires, insects and diseases outbreaks and spread of invasive exotic species among others. Also, it will have considerable effects on the provision of forest ecosystems goods and services.

Governments are aware of the climate change impacts affecting forest resources as well as other sectors related to it (i.e.: agriculture, energy, tourism, water, etc.). Thus, LULUCF is included in the NDCs of 9 of the 13 SEMed countries subject of this study. Only Albania, Egypt, Israel and Montenegro do not mention the LULUCF sector under their mitigations actions.

Mitigation measures

The LULUCF sector is also one of the most important areas for mitigation across the SEMed countries. In particular, with respect to the mitigation measures Afforestation, Reforestation and Sustainable Management of Forests. Table 19 provides a list of measures prioritized by countries in this sector.

[57] Data is gathered from FAOSTAT

Table 19 Prioritized measures on LULUCF sector in SEMed countries[58]

LULUCF		
Measures grouping	**Measures**	**Potential Countries**
Afforestation and reforestation, and biosphere conservation	Increase/Introduce Afforestation projects	Algeria, Bosnia and Herzegovina, Jordan, Lebanon, Mauritania, Montenegro, Morocco,
	Increase/introduce Reforestation projects	Algeria, Lebanon, Mauritania, Palestine, Tunisia,
	Promote and increase the practice sustainable forest management, for example through: - improve utilization of technology in forest harvesting - provision of sustainability certification following a set of strict requirements - Demining existing mined forest areas that have the additional option to increase storage potential for carbon	Albania, Algeria, Bosnia and Herzegovina, Lebanon Mauritania, Montenegro, Morocco, State of Palestine, Turkey
	Biosphere conservation projects (including payments for ecosystem services) targeting reducing emissions from the deforestation or degradation of ecosystems	Albania, Algeria, Bosnia and Herzegovina, Lebanon Mauritania, Montenegro, Morocco, Turkey
	Allow or encourage the reversion of cropland to another kind of land cover, typically one similar to the native vegetation	Albania
	Improve forest fire management, potentially shall include the mechanisms of permanent monitoring and surveillance, and rapid and effective intervention in cases of their occurrence	Algeria, Bosnia and Herzegovina

[58] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Implementation of silviculture to maintaining the existing increment and increasing the future increment of carbon density per hectare (tC/ha).	Bosnia & Herzegovina
	Increasing generation of energy using biomass, to replace more carbon intensive fuels that have high greenhouse effect.	Bosnia and Herzegovina
Research and Development	Provision of monitoring, scientific research and training of staff in forestry to enhance protection of forests and wildlife,	Bosnia and Herzegovina
Support to national, regional or local policy, through technical assistance or policy lending	Implementing Action Plan on Forestry Rehabilitation and National Afforestation Campaign	Turkey
	Finalize land demarcation and registry of forested areas and establishment of effective mechanisms for prevention of all illegal activities in the forestry	Morocco, Bosnia and Herzegovina

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4 Adaptation

4.1. Climate-related Hazards and impacts

Climate related key hazards are well reflected in the SEMed countries NDCs of all 13 countries. They are mainly associated with higher temperature, increased frequency and intensity of drought, decreased frequency of rain (but potentially of higher intensity when it occurs). Please refer to technical maps of Plan Bleu. 2018. Climate Change in The Mediterranean Region: Some maps on the major stakes. (Plan Bleu. Retrieved from https://planbleu.org/sites/default/files/upload/files/Poster_CC.pdf). The aforementioned map gives an illustration of the climate related hazards for the whole of the Mediterranean region.

Various modelling scenarios issued by the IPCC show a clear trend in terms of rainfall pattern. Decrease of precipitation in the Mediterranean region (including the SEMed countries) will vary between -4% and -27%, in the period of 2080-2100.[59] Long-term trends show warmer and drier tendency[60] (including expected longer dry spell)[61], with increasing frequency and intensity of droughts.[62] The IPCC AR5, European and African region chapters, shows a general high confidence concerning changes in temperature extremes (toward increased number of warm days, warm nights, and heat waves), including SEMed countries. This rapid warming, especially during the summer, combined with drying tendency, will result in heat stress, associated with poor air quality in the urban environment, as well as increasing water scarcity.

Drought is deemed by the SEMed countries as one of the key hazards that will not only affect other sectors such as water, food security (e.g. declining food production), energy (e.g. higher vulnerability of the existing power plants) and health (e.g. higher death rates due to heat stress), but will accelerate the desertification process. As presented in the global desertification map, published by the United State Department of Agriculture, SEMed countries are highly and/or very highly vulnerable to desertification[63], particularly for coastal areas.[64] Algeria is one of the SEMed countries that makes a special reference in their NDCs to desertification as one of the key hazards in the country.

Desertification is usually associated with poor land use practices. Increased temperature and dry spells would extend the risk of desertification to other areas, which are currently not at risk. The rate of desertification could increase along with erosion, salinization and fire hazard as well as reductions in soil quality. As an example, the Tunisian Institute for Strategic Studies has predicted that 96% of Tunisia will be directly or indirectly affected by desertification and may lose 50% of its agricultural land by 2050, resulting in serious economic, food security, and socio-political implications,[65] accentuating countries' vulnerability to the changing climate. Figure 16 presents desertification vulnerable areas in the Mediterranean region, including SEMed countries.

[59] IPCC. 2014. Assessment Report 5: Climate Change 2014: Impacts, Adaptation, and Vulnerability
[60] Plan Bleu. 2009. State of the Environment and Development in the Mediterranean. UNEP/MAP. Athens, Greece
[61] Schleussner et al. 2016. Differential climate impacts for policy-relevant limits to global warming: the case of 1.5 °C and 2 °C. Earth System Dynamics 7.
[62] Vicente-Serrano et al. 2014. Evidence of increasing drought severity caused by temperature rise in southern Europe. Environmental Research Letters
[63] Map is available at: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/?cid=nrcs142p2_054003
[64] The formulation as such meant to be applied only for SEMed countries in this context
[65] MEMO. 2017. Tunisia threatened by loss of half of its agricultural lands by 2050

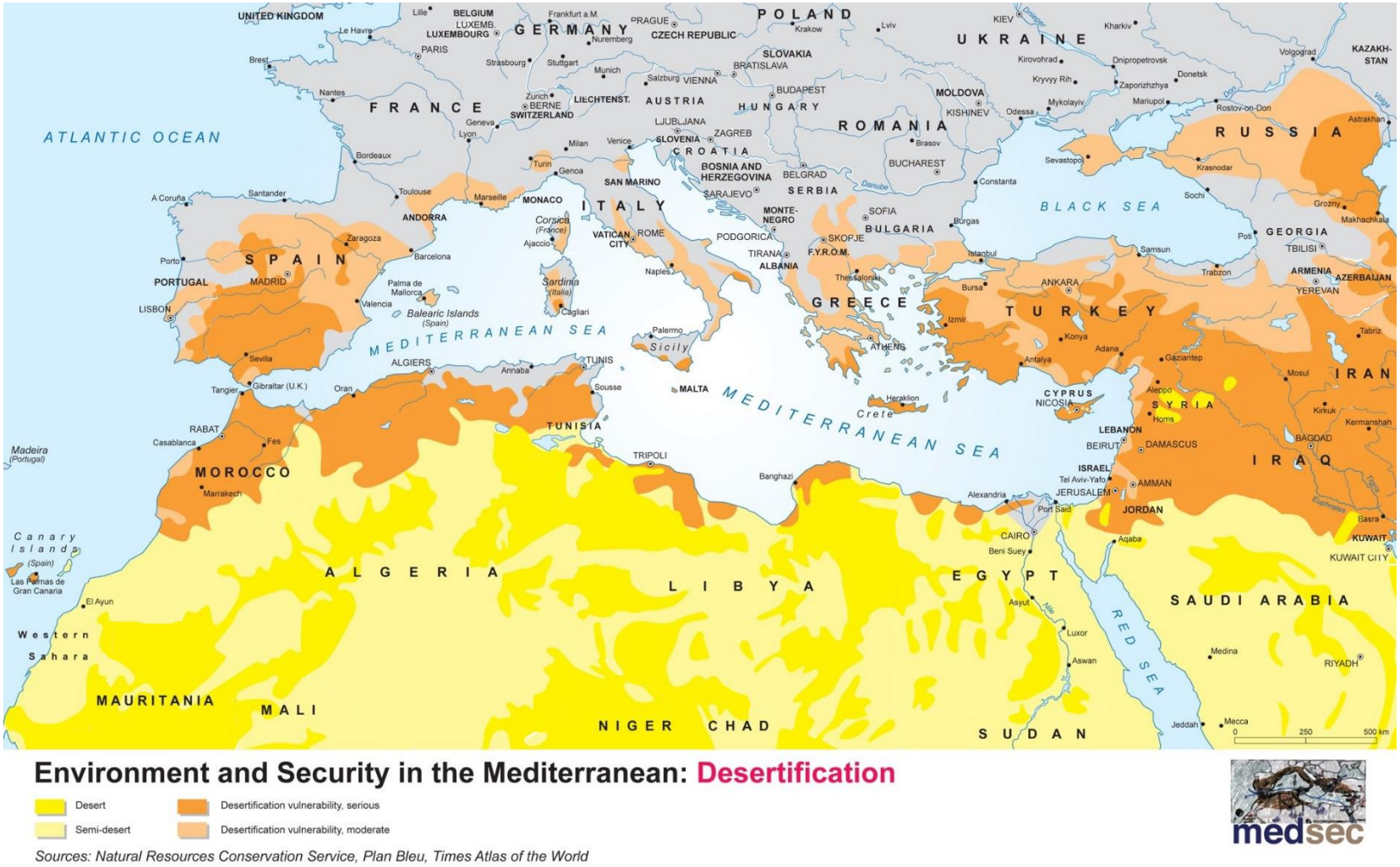


Figure 15: Desertification vulnerable areas in the Mediterranean region, including SEMed countries[66]

[66] Plan Bleu. 2018. Times Atlas of the World. Natural Resources Conservation Service, Plan Bleu.

Flood disaster in the region, under the climate change regime, has been influenced by higher intensity of rain (when it occurred) and the rise of sea level. Recurring rainfall induced floods, for example, have been experienced by Algeria and resulted in the death of 715 persons and thousands of disaster victims, adversely impacting public financial resources.[67] Moreover, the latest Assessment Report (AR5) from the International Panel on Climate Change (IPCC) highlights the Mediterranean as one of the most vulnerable regions in the world to the impacts of global warming. Impacts of climate change to the Mediterranean region includes the increasing seawater temperatures and coastal erosion. Sea level rise for the next century (2100) is projected between 30 and 100 cm. Increase of sea water temperature between 0.05-0.1°C in the deep sea and these impacts will induce changes in species ocean biodiversity as well as fish stocks. The rise of sea temperature leads to coral destruction and migration of fish, affecting the tourism sector (one of the most lucrative sources of income in the countries) as well as food security.

In Egypt, coastal areas are expected to suffer from sea level rise and the corresponding inundation effect of low-laying areas. Sea level rise is estimated to have serious impacts on low-laying areas in the Nile Delta and adjacent highly populated cities. Such disasters will consequently result in a more significant challenge, such as migration of people from affected areas to other areas, affecting the efficiency of different services and increasing the financial cost required for their development.[68]Disaster records show the multiplication of number and intensity of extreme events and the possible rise in sea level overlap and amplify the already existing pressures of anthropogenic origin on the natural environment.[69]

Increased temperature results in higher electricity consumption, i.e. from the use of air conditioner. In urban areas, heat islands are formed by hot air arising from the increasing use of energy in buildings representing the main concern in hot arid climates.

On the whole, climate change will have impacts particularly on: agriculture and fishery (reduction of yields), tourism attractiveness (heat waves, water scarcity), coastal areas and infrastructures (significant exposure to the action of waves, coastal storms and other extreme weather events, rise in sea level), human health (heat waves), the energy sector (water needs for power plants, hydropower and increased consumption).[70]

4.2. Inclusion of adaptation component in the NDC and NAP status

Nine, out of 13, SEMed countries include an adaptation component in the NDCs. Five countries make reference to the development of National Adaptation Plans (NAPs) in the NDCs, i.e. Algeria, Israel, Mauritania, State of Palestine and Morocco. But only the NAP document from the State of Palestine is accessible on the UNFCCC NAP central platform, posted on November 11th, 2016.[71] To date there is 13 countries that have submitted their NAP to UNFCCC, and the State of Palestine was one of the first six countries that did so. Moreover, despite not being mentioned in their NDCs, more countries are currently developing their NAPs (See. Table 20)

In responding to the identified key hazards, countries selected more priority sectors in countries' adaptation component than in the mitigation component. Priority sectors are ranging from Agriculture, Coastal area, Biodiversity, Tourism, Health, Water, and Energy. In addition, countries also identified cross-sectoral issues such as gender and urban planning/development.

[67] Government of Algeria.2015. Nationally Determined Contributions. Algeria
[68] Egypt NDCs
[69] EIB. 2008
[70] Ibid.
[71] UNFCCC. 2018. National Adaptation Plans from Developing Countries. UNFCCC NAP Central. Retrieved from http://www4.unfccc.int/nap/Pages/national-adaptation-plans.aspx

Table 20 SEMed Countries NDCs and NAPs, as well as the prioritized adaptation sectors[72]

Countries	Ratification of Paris Agreement	Adaptation Component in NDC	Reference of NAPs in NDCs	Status of NAPs Development	Prioritize Sector in NDCs/NAPs (and/or any relevant national adaptation strategy)
Albania	21.09.2016	No	No	Under Development	Water, Tourism, Agriculture, Biodiversity and Ecosystem
Algeria	20.10.2016	Yes	Yes	(National Climate Plan)	Water, Agricultural, Health, Biodiversity and Ecosystems, Housing and Settlement, Disaster Risk Reduction
Bosnia & Herzegovina	16.03.2017	No	No	Under Development	Agriculture, Biodiversity and Sensitive Ecosystems, Energy, Forestry, Health, Tourism, and Water
Egypt	29.06.2017	Yes	No	Under Development	Energy, Water, Agriculture, Coastal, Health, Infrastructure and Transport, Tourism, Disaster Risk Reduction and Energy
Israel	22.11.2016	Yes	Yes	(National Climate Change Adaptation Plan)	Energy, Water, Agriculture, Infrastructure and Transport (including Urban Development), Health, as well as Biodiversity and Ecosystems
Jordan	04.11.2016	Yes	No	Under Development	Water, Agriculture, Biodiversity and Ecosystem, Energy, Health, Coastal, Tourism
Lebanon	-	Yes	No	Under Development	Water, Agriculture and Forestry
Mauritania	27.02.2017	Yes	Yes	Under Development	Water, Agriculture, Urban Development, Biodiversity and Ecosystem, Fisheries, as well as Health
Montenegro	20.12.2017	No	No	-	Water, Agriculture, Forestry, Coast and Health
Morocco	21.06.2016	Yes	Yes	Under Development	Water, Agriculture, Fisheries, Forestry, Biodiversity and Ecosystem, Infrastructure and Transport (including Urban Development), Marine economy as well as Tourism

[72] Derived from Countries NDCs/NAPs as well as Tool for Assessing Adaptation in the NDCs

State of Palestine	22.04.2016	Yes	Yes	Available	Water (and wastewater), Agriculture, Health, Biodiversity and Ecosystems (Terrestrial ecosystem), (Urban and) Infrastructure and Transport (including Urban Development), Energy, Coastal Protection and Marine, Tourism, and Waste. Additionally also Gender, Food and Industry.
Tunisia	10.02.2017	Yes	No	Under Development	Water, Agriculture, Health, Biodiversity and Ecosystems, Coast, Forestry, and Tourism,
Turkey	-	No	No	Turkey's national climate change adaptation strategy and action plan	Water, Agriculture, Forest, Disaster Risk Reduction, Urban Development), as well as Health

4.3 Adaptation contribution

4.3.1 Water Sector

Regional circumstances

National governments across the 13 SEMed countries are very well aware that their water supply will be impacted by climate change. This awareness is backed by scientific analysis of regional impacts, as well as experience with drought impacts on the water supply in the recent past. Most of the SEMed countries already suffer from low freshwater availability with most of the countries' renewable water per capita falling not only below the global average of around 6.000 m^3/capita/year, but also below 1.700 m^3/capita/year describing a water stressed country. A 'red line' of water scarcity is 1.000 m^3, implying severe challenges for domestic production of food and socioeconomic development in general. 9 out the 13 SEMed countries have to cope with a water reality far below the 1.000 m^3/capita/year as seen in the table 21:

Table 21: Water resources across the 13 SEMed Countries[73]

	Rainfall (mm/year) 2014	Renewable water (m3/capita/year) 2014
Albania	1,485	10,425
Algeria	89	294.2
Bosnia & Herzegovina	1,028	9,843
Egypt	51	637.1
Israel	435	220.7
Jordan	111	123.4
Lebanon	661	769.6
Mauritania	92	2,802
Montenegro		
Morocco	346	843.6
State of Palestine	402	179.3
Tunisia	207	410.1
Turkey	593	2,690

The shortage of freshwater across the SEMed countries is expected to become more severe over the next century due to impacts of climate change on regional precipitation patterns. At the same time, despite the declining freshwater availability, water productivity remains at low level, indicating the lack of efficiency in water usage.

Despite the difficulty in producing reliable precipitation projections, there is strong agreement of global climate models regarding the projected gradual reduction in precipitation in the Mediterranean region in

[73] Author's elaboration based on Aquastat database, 2018

the coming decades. According to the report Turn Down the Heat published by the World Bank (2014), projections show a decrease in annual rainfall in North Africa. In a 2°C scenario, this is expected to result in 10 to 20% less rain in countries such as Algeria, Morocco, Tunisia, Egypt, Jordan, Lebanon and Syria compared to the 1951-1980 average. In a 4°C scenario, the projections indicate up to 50% less precipitation compared to the same period of time. Lower annual rainfall will have consequences on water in soils available to plants and in countries such as Morocco, this could lead to the exacerbation of the overexploitation of groundwater resources for agricultural purposes.

Moreover, the World Resource Institute reported that eight of the 33 most likely water stressed countries in 2040 are located in SEMed region. The countries, in severity order, are the State of Palestine, Israel, Lebanon, Jordan, Morocco, Turkey, Algeria, and Tunisia. With Israel and the State of Palestine being extremely highly stressed with a score of 5.0 out of 5.0.[74] The region is the least water-secure in the world, draws heavily upon groundwater and desalinated sea water, and faces exceptional water-related challenges for the foreseeable future.

The effects of climate change on weather and precipitations will result in more frequent and severe droughts. In addition to increased drought periods, the trend is expected to be aggravated by higher variability and more extremes such as flooding, leading to a loss of reliability and increasing uncertainty in water management.

Taking into consideration the population growth estimates of the SEMed countries, a decline in per capita availability of water is expected and water shortages across the countries will be a key challenge in the near future. Projections of per capita freshwater availability indicate a decline of more than 50% by 2050. In Egypt, for example, growth of population is expected to decrease per capita water availability to reach around 500 m^3 per year by 2025. Furthermore, in Turkey, where a relatively high level of freshwater availability per capita is currently still observed, population growth is expected to decrease available water per capita by as much as 1.100 m^3 per year.

Disturbances on the water cycle will lead to economic, social, and political consequences in the countries. In this context, vulnerable population are at most risks from:

- **Access to water resources in physical terms due to drought and/or salinization of water resources**
- **Changes in rainfall patterns during the growing season of crops will affect the farming calendar and undermine food security for the populations of the countries**
- **Health issues due to poor water quality is also expected to have serious consequences for vulnerable populations**
- **Transboundary security issues due to population displacement connected with the increasing scarcity of the water resource**

Adaptation measures

The analysis of the countries' NDCs and NAPs shows that the water sector is mentioned by all countries. This confirms the strong focus on water in climate change adaptation policies. In addition to the fact that it is the most cited sector, the strong links between water and other sectors such as agriculture and food security as well as health, make it an essential issue for development of adaptation actions for the region.

Given the close linkages of water to other sectors, the reviewed documents do not always consider water as an exclusive 'water sector', but it also often appears transversally across other sectors (agriculture, ecosystems, fisheries, etc.). Relevant adaptation measures for the water sector are oftentimes mentioned in five priority areas:

[74] WRI. 2014. Measuring, Mapping and Understanding Water Risks Around the Globe. World Resource Institute. Retrieved from: https://www.wri.org/our-work/project/aqueduct

1. **Agriculture: The identified measures are mainly related to improving irrigation systems.**
2. **Risk Management (flood/drought management): With the increasing occurrences of water related extreme weather, such as flood, drought and desertification, water related measures feature under the risk reduction topic. Accordingly, the identified measures will be presented in the Disaster Risk Reduction Sector.**
3. **Water Resources Management: The measures relate mainly to maintaining different freshwater resources to assure adequate availability of clean water.**
4. **Drinking Water Supply: Improving access to drinking water is addressed in the documents reviewed. The measures focus on improving the urban distribution network though measures such as minimizing leakage, improving the water supply, etc. And few countries address water quality in rural areas.**
5. **Wastewater Treatment: Measures identified are mainly related to the development and reinforcement of waste water treatment and drainage water.**

With regards to health sector, despite its relevance, the issue of health is rarely linked to the water sector. In the documents reviewed there is little mention of sanitation issues.

All SEMed countries are making big efforts in order to adapt the water sector to climate change. In their NDCs and NAPs, all countries have set adaptation in the water sector as one of their priorities. Table 23 presents a summary of the adaptation approaches and measures in the water sector

Table 22 Prioritized measures on Water sector in SEMed countries[75]

Water		
Measures grouping	**Measures**	**Potential Countries**
Water Supply	Improvement of drinking water infrastructure. The measure can include, for example: 1. Deployment of renewable energy as the source of power to the Drinking Water Treatment Plant, 2. Maintenance and improved efficiency in the distribution networks	Albania, Bosnia & Herzegovina, Mauritania, Morocco, Tunisia, Algeria, Lebanon, State of Palestine
	Construction of sea water desalination facility	Albania, Egypt, Morocco, State of Palestine, Mauritania, Tunisia
	Increasing the use of groundwater in an efficient manner	Egypt, Jordan, Palestine
	Promoting water saving and efficiency, e.g. using smart water devices, and reducing water losses	Albania, Israel, Morocco, State of Palestine, Jordan, Lebanon
	Management of water demand through water reuse (particularly for agriculture and green spaces purposes)	Albania, Algeria, Egypt, Israel, Jordan, Lebanon, State of Palestine, Tunisia
Wastewater Infrastructure and Management	Increasing access to and capacity of wastewater treatment, including the associated maintenance required.	Albania, Bosnia & Herzegovina, Israel, Mauritania; Morocco, Tunisia, Algeria, Jordan, Lebanon, State of Palestine, Turkey
	Improving wastewater recycling technique	Egypt, Morocco, Tunisia, Jordan, Turkey, Lebanon, State of Palestine

[75] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Development/improvement of monitoring system for water quantity and quality	Albania, Egypt, Israel, Morocco, State of Palestine, Tunisia, Algeria, Turkey, Lebanon
	Exploration of new water reserves (for example through exploitation of artificial lakes and rivers)	Albania, Egypt, Morocco
Water Resources Management	Management of artesian wells	Albania
	Reducing surface water evaporation by redesigning canal cross sections	Egypt
	Commissioning of dam sand accumulation reservoirs facilitate better water management	Bosnia & Herzegovina, Morocco, Lebanon
	Rehabilitation of water sources, e.g. river, canals and spring, while increasing water storage capacity	Albania, Egypt, State of Palestine, Algeria, Lebanon, Jordan, Turkey
	Groundwater recharge, through e.g. Reforestation, injection of surface water	Algeria, Egypt, Lebanon, Morocco
	Protection of water resources against any potential pollutant (e.g. industrial waste, domestic effluent), for example through continuous monitoring of canals and pipes for the evacuation of communal and industrial waters	Albania, Algeria, Jordan, Morocco, Turkey, Israel

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

The measures presented in table 22 serve as a summary of the prioritized actions presented by the countries. These measures are however mostly technical, and it is imperative that countries' governments create enabling conditions for the implementation of the measures (See. Table 23):

Table 23: Prioritized measures on Water sector in SEMed countries[76]

Water

[76] Derived from countries' NDCs/NAPs/other national climate change strategies documents

(accompanying) Measures grouping	Measures	Potential Countries
Public Education	Awareness raising in promoting efficient water use	Albania, Bosnia & Herzegovina, Egypt, Israel, Algeria, Jordan, Lebanon
	Provision of information to public on climate change impact on water	Albania, Israel, Jordan
Cross sector Policy and Regulation	Mainstreaming climate change into regulatory and institutional framework in the water sector	Albania, Algeria, Turkey
	Development of long-term water strategy as pre-requisites in improving water regulatory framework (not only on the supply level, but also in the hydrological regime) and attract financing	Albania
	Development of national policies on water, including for example economization or rationalization of water use, access to water, national standards for water reuse, etc.	Albania, Egypt, Lebanon, Turkey
	Reformation of water price	Jordan. Turkey
	Policy measures to ensure the equity in access to water	Jordan
Institutional Capacity Support	Enhancing capacity in developing studies on climate variability and change as well as water modelling to better predict the impact of climate change on local and regional water resources by encouraging cooperation and exchange of information between research institutes and universities working on different aspects of water resources.	Egypt, Albania, Israel, Algeria
	Activate water governance mechanisms, such as inter-ministerial committees and mainstream nexus approaches between interlinked sectors, to ensure availability of good quality of water data. This measure can also include the activation of water user's association	Lebanon
Information and Communication Technology	Improve water and hydrological information system, including data collection, management system in national and regional level	Bosnia and Herzegovina, Egypt, Lebanon, Mauritania, Montenegro, Algeria
	Development of hydrology models, in line with climate models	Bosnia & Herzegovina

Monitoring and Evaluation	Development/improvement of monitoring system for water quantity and quality	Albania, Bosnia & Herzegovina, Algeria, Israel
	Improving control operation of water distribution in the dam level	Algeria
	monitoring and maintenance of embankments along the riverside through the establishment of units with qualified experts and provision of efficient monitoring devices as well as monitoring of river debits	Albania, Mauritania,

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4.3.2 Agriculture and Food Security Sector

Regional Circumstances

Agriculture sector is the countries' number one priority, beside water, to adapt to the changing climate, as communicated through their NDCs/NAPs/other national climate change strategies. It is one of the most sensitive sectors to short-term changes in weather and to seasonal, annual and longer-term variations in climate.

It must be noted that impacts of climate change on food production are not solely limited to plant production but also to livestock. To this end, discussion on agriculture in this chapter refers to both crop and livestock production.

The FAOSTAT database shows that, despite the lower share of GDP, compared to service and industry sector (See. Table 3, Chapter 2), agriculture consumed most water in all 13 SEMed countries, followed by municipal and industrial use. Combination of climate change and deforestation has caused major changes in surface runoff, erosion and groundwater availability, forcing transformations in agricultural practices. In Mauritania, for example, extensive agriculture used to be a common practice, but due to growing needs coupled with the impact of climate change, in the recent years it has shifted to more intensified practices, relying on suburban agriculture and creation of artificial insemination. And yet, this shift still covers only 40% of the food needs of the population.[77]

The situation is even more alarming in countries with arid/semi-arid climate, i.e. the middle east and north African part of the Mediterranean. The projected changes in rainfall will put tremendous pressure on national water security, with the spillover effects on sectors such as agriculture.[78] Not only in terms of irrigation capacity, but climate change is also expected to increase desertification rates and thereby negatively affecting feedstock levels.

The occurrence of more frequent and/or intense weather extremes, such as droughts, floods, lead to failure of harvest. It reduces the level of resilience that small farmers have, and most importantly contributes to food insecurity. In Tunisia, for example, droughts will particularly affect rainfed cereal farming, which would decrease from a current average land area of 1.5 million hectares to about 1 million hectares in 2030, i.e. a reduction of approximately 30 per cent.[79] And if the situation continues as it is, countries could suffer from reduction of agricultural GDP and significant trade deficit due to food imports. The situation as such is already happening in Montenegro, with an annual trade deficit of around 150 million €.[80]

To date, crop production index shown in the 13 countries still increases in most countries, except Bosnia and Herzegovina, Lebanon and Montenegro.[81][82] (See. Table 24 below)

[77] Government of Mauritania. 2017. Mauritania's Nationally Determined Contribution (NDC).
[78] Based on countries communication on theri circumstances on the NDCs
[79] Government of Tunisia. 2017. Intended Nationally Determined Contribution Tunisia.
[80] Government of Montenegro. 2015. The Second National Communication on Climate Change. Montenegro
[81] UNSD. 2018.
[82] Crop production index shows agricultural production for each year relative to the base period 2004-2006. It includes all crops except fodder crops. Regional and income group aggregates for the FAO's production indexes are calculated from the underlying values in international dollars, normalized to the base period 2004-2006.

Table 24 Crop Production Index in SEMed Countries (Source. Authors' elaboration[83])

	Crop Production Index (2004-2006= 100)	Trends
Albania	134	increasing
Algeria	160	increasing
Bosnia & Herzegovina	96	decreasing from 2010
Egypt	120	increasing
Israel	112	increasing
Jordan	134	increasing
Lebanon	95	decrease from 2005
Mauritania	125	increasing
Montenegro	66	drastic decrease from 2005
Morocco	130	increasing
Palestine	90	increasing from 2005
Tunisia	108	increasing
Turkey	120	increasing

The decline of crop production in Bosnia and Herzegovina, Lebanon and Montenegro has various reasons, ranging from countries' political situation, land distribution, to countries' evolution of economic structure and activities. In Montenegro, for example, 37% of the country's total surface is suitable for agriculture, but only 16% is used for agricultural purposes. And although climate change cannot solely be blamed for the decline, projection shows that its impact will further exacerbate the reduction of agriculture production.

In Bosnia and Herzegovina, forecasts for the potential yield of rainfed maize for 2025 and 2050 show that over time the most important regions for maize growing, in the north of the country, could experience drop in yields of 10 – 25%.[84] In Lebanon, the cost from impacts of climate change on agriculture production in 2020 was calculated and presented in the country's 2nd National Communication. Climate change would reduce farm production by 80 million US$ in 2020, without any anticipated changes. This reduction would ripple through the economy, with the manufacturing and services sectors combined, experiencing a reduction in production of about USD 220 million, resulting in the overall reduction in GDP of a total 300 million US$.[85]

Adaptation Measures

The impacts of climate change are severely affecting the agricultural sector. Furthermore, the level of agriculture production is compounded by effects on soil characteristic, seed genetics, pests and disease and agronomic practices. Therefore, measures prioritized by countries (See. Table 25) are ranging from

[83] Data is gathered from UNSTAT
[84] Government of Bosnia and Herzegovina. 2016. Third National Communication and Second Biennial Update Report on Greenhouse Gas Emissions of Bosnia and Herzegovina.
[85] Government of Lebanon. 2016. Lebanon's Third National Communication tot he UNFCCC.

improving land distribution/allocation for agricultural purposes to management of water resources to improving seeds and breeds which are more resistant to the changing climate.

Table 25: Prioritized measures on Agriculture sector in SEMed countries[86]

Agriculture (Crop and Food Production and Other Agricultural and Ecological Resources)		
Measures grouping	**Measures**	**Potential Countries**
Primary agriculture and food production	Development of an agricultural map to ensure allocation adequate land, in order to improve crop production. The mapping process shall include land-use planning and management greening, afforestation and rangeland development. And whenever appropriate, the map shall also define and scale the breakdown of agricultural lands into irrigated and non-irrigated	Algeria, Palestine, Tunisia, Israel
	Protect/adapt agriculture against Sea-Level Rise, through restoration of agricultural areas and wetlands and/or upgrade of Flood Embankments	Albania, Bosnia and Herzegovina
	Changing cultivars to those that are more tolerant to heat, salinity and pests, ensuring to activate genetic diversity of plant species with maximum productivity.	Albania, Egypt, Jordan, Mauritania, Lebanon. State of Palestine, Tunisia
	Promoting environmentally friendly agricultural practices and permaculture designs as well as conservation and sustainable utilization of plant and animals' genetic resources for food. This can be done through provision of support of organic farming and obtaining quality certificates. Such measure will contribute to improve rural sector adaptive capacity and enhance food security	Albania, Bosnia & Herzegovina, Egypt, Jordan, Mauritania, Lebanon, State of Palestine, Tunisia
	Change in cultivation techniques, including for example: - **Application of Crop diversification and rotation** - **Optimize timing of operations (planting, inputs, irrigation, harvests** - **Mixed farming systems (crops, livestock, and trees)** - **Promotion of agro-forestry practices**	Albania, Bosnia and Herzegovina, Egypt, Israel, Jordan, Mauritania, Montenegro, Tunisia, Turkey

[86] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Shifting crop cultivation from areas that are vulnerable to drought, and/or improve the utilization of greenhouses and similar protected areas, to keep plants moist and protected from soil erosion	Albania, Bosnia and Herzegovina, Israel, Montenegro
	Implementation of new regime of using pesticides, insecticides and fertilizer in responsible and sustainable manner, supported by provision of legal basis.	Albania, Montenegro
Agricultural Irrigation	Orientation towards the use of non-conventional source of water in agriculture (e.g. utilization of rainwater, wastewater, desalination)	Albania, Algeria, Israel, Jordan, Mauritania, State of Palestine,
	Promotion of dripping irrigation	Mauritania, Jordan, Albania, Algeria, State of Palestine
	Improving the efficiency of irrigation networks through the strengthening of maintenance and rehabilitation programs. And whenever possible enhance the involvement of the local community for irrigation scheme and infrastructure maintenance.	Albania, Algeria, Egypt, Israel, Mauritania, Lebanon, Montenegro, Morocco, State of Palestine, Tunisia, Turkey Bosnia and Herzegovina, Jordan
	Intensification of water conservation by using crops which require less water, and have a higher productivity per m3 of water added	Israel, Jordan, State of Palestine
	Model development of the soilless and hydroponic agriculture for medicinal and herbal plants and vegetables for water saving	Jordan
	Implementation of integrated water resource management, including for example: - **Climate smart agriculture** - **Restoration of environmental balances and sustainable management of natural resources to improve agriculture production Control and enhancement of surface water to facilitate the development of irrigated crops** - **Construction of micro hydraulic dams** - **Development of hydro-agricultural infrastructure around dams**	Albania, Jordan, Mauritania, Morocco, State of Palestine

	- **Enhance flood plain management (wetland management)** - **Construction of Levees**	
Livestock Production	Improve livestock management, through for example: - **Use of better breed choice, i.e. less sensitive to warmer weather and to possible thermal stress** - **Increase shelter and water points for animals, e.g. through installing windbreak planting to provide shelter for animals)**	Albania, Montenegro, Israel, State of Palestine
	Improve capacity and modernization of livestock farming to improve productivity, for example through: - **Rangeland rehabilitation land management** - **Use of updated technology** - **Improvement of pasture management, e.g. rotational grazing, etc.**	Albania, Egypt, Mauritania, Montenegro, State of Palestine
	Improving feeding programs, for example through multiplication of fodder seeds feeding for livestock	Albania, Mauritania, Egypt
	Match stocking densities to forage production	Albania, Mauritania
	Improve livestock health monitoring, for example through sustainable provision of regular vaccination and supplemental feed	Albania, Mauritania, State of Palestine,

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

It must be understood that the impact of climate change on crop and livestock production is subject to high uncertainty due to the complex interaction between technical progress, political, institutional and financing measures. Table 26 below, presents the accompanying measures for agricultural sector in adapting to climate change, as prioritized by the 13 SEMed countries.

Table 26: Prioritized measures on Agriculture sector in SEMed countries[87]

Agriculture (Crop and Food Production and Other Agricultural and Ecological Resources)		
(Accompanying) Measures grouping	**Measures**	**Potential Countries**
Cross-sector policy and regulation	Conducting research on the impact of climate change on agriculture and livestock, allowing formulation of adequate DRR and DRM strategy. Moreover, such study shall be able to provide information on improving agricultural mapping as well as formulation of nation/region wide agricultural/food security strategy and action plan, with emphasis on socio-economic strategies intended to meet the agricultural costs of climate change	Albania, Algeria, Jordan, Montenegro
	Develop systems, programs and policies to protect rural community and support its adaptive capacity to the expected trend in land use change, plant and animal production, and internal migration due to climate change	Egypt
Monitoring and Evaluation	Establish and strengthen an integrated national monitoring center for climate information and data based linking weather and climate information from all deployed centers for forecasting and monitoring agricultural sector. This mechanism can also serve as an early warning system for agriculture.	Algeria, Egypt, Jordan, Morocco
	Developing an early warning system for forest fires, pests and pest invasion to agricultural crops	Lebanon, Israel
Institutional capacity, support or technical assistance,	Enhance research and cooperation to improvement work on crops, animals and husbandry to produce drought resistant varieties and practices.	Bosnia & Herzegovina, Israel

[87] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Provision of direct support to actors involved in agricultural activities, through: - **Provision of technical assistance packages for pilot project** - **Improved and responsive to climate change (farmer trials, research trials, technical assistance)** - **Provision of advice and trainings in topics such as: improving fodder seeds practice, agro-pastoralism, new approaches for land cultivation and hot weather livestock management** Support can be provided through close cooperation with universities and other research institutions, in the country or region.	Albania, Bosnia & Herzegovina, Israel, Mauritania, Jordan, Montenegro,
Education	Raise awareness and promote utilization of renewable energy in agricultural and food production sector for cooling and heating purposes	Jordan
	Increased public awareness of the effects of climate change on agriculture and education among farmers and families (communication plan, leaflets, roadshow, radio broadcast, website, etc.).	Bosnia and Herzegovina, Jordan
Financial services	Develop Public-Private Partnership to delegate irrigation services	Morocco
	Introduction of insurance mechanism against climate risk. Such mechanism must be based on sound monitoring- and early warning- system.	Morocco, Tunisia
	Provision of direct financial support to farmers, e.g. subsidies or grants/loans	Albania, Bosnia and Herzegovina, State of Palestine
Information and Communication Technology	Develop and/or improve Information Systems related to crop cultivation and prices, new technologies for plantation, conservation and processing, establishment of communication networks	Albania
	New Agro-climatic zoning models, with consideration of potential climate change scenarios (technical assistance, software)	Bosnia and Herzegovina

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4.3.3 Coastal Sector

Regional Circumstances

More than a third of the Mediterranean's population are living in coastal regions, which constitute only 12% of the surface area of the Mediterranean countries. Main threats to coastal and marine ecosystems as identified by these countries encompass urbanization, pollution, unsustainable fishing practices and climate change.

Climate change is expected to:

1. **Increase seawater temperature, resulting in coral bleaching. This will affect the marine biodiversity-based tourism industry in the region, e.g. Red Sea in Egypt.**
2. **Ocean warming and acidification will change the circulation patterns on coastal areas, affecting fish distribution. In some SEMed countries such as Mauritania and Morocco, sea water fish industry makes a substantial contribution to GDP (10% in Mauritania and 2.3% in Morocco) through trade. The sector creates significant employment and it is important for the countries' nutrition security.**
3. **Rise of the sea level at an alarming rate of 3cm/decade[88]. And the future total Mediterranean basin averaged sea-level rise has been estimated to be between 9.8 and 25.6 cm by 2040–2050 depending on the scenario[89]. Sea level rise will inundate highly populated cities along the coast, such as Alexandria and Port Said in Egypt, inducing migration of people and thus affecting the efficiency of different services and increasing the financial cost required for their development.**

[88] Tsimplis et. al . 2013. The effect of the NAO on sea level and on mass changes in the Mediterranean Sea. Journal of Geophysical Research: Oceans,
[89] Galassi G and Spada G. 2014. Sea-level rise in the Mediterranean Sea by 2050: Roles of terrestrial ice melt, steric effects and glacial isostatic adjustment. Global and Planetary Change,

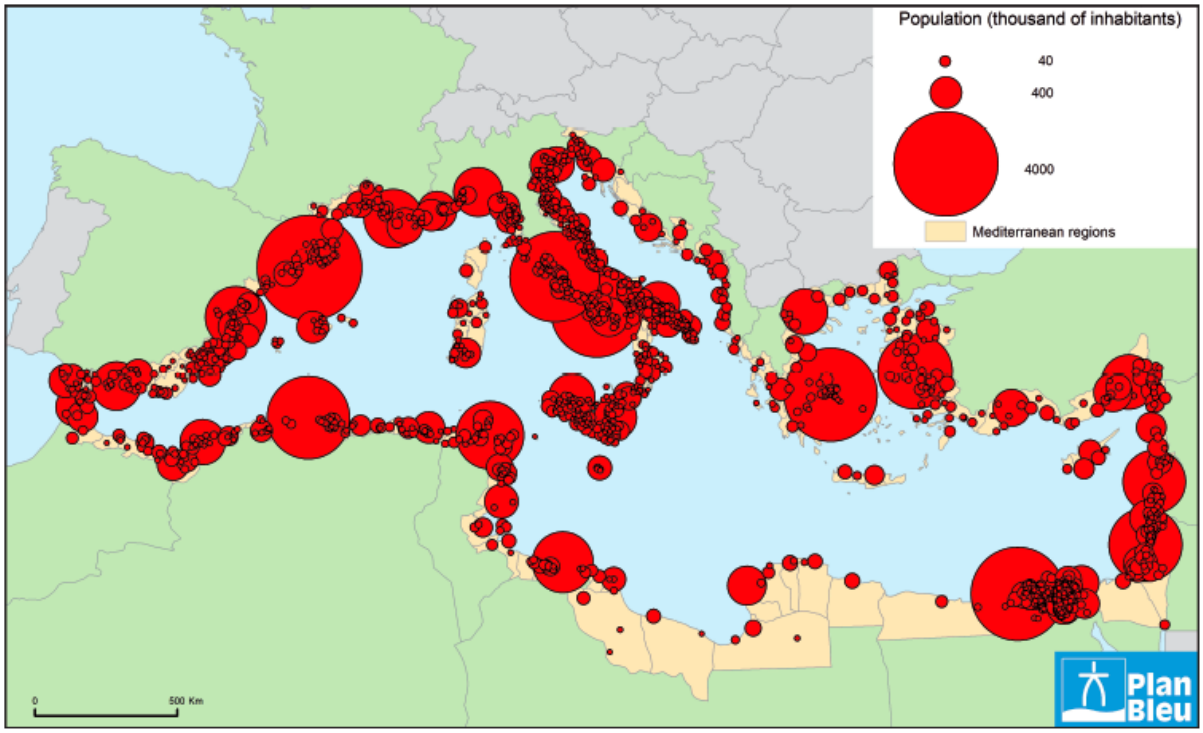


Figure 16: Population of Coastal Mediterranean cities (Source: Plan Bleu)[90]

Moreover, coastal inundation and erosion are not only threatening human lives, property, arable and agricultural lands (through increased salinity) and the infrastructure, but also coastal and marine biodiversity. It could impede countries' socioeconomic development and lead to consequential environmental impacts, if appropriate measures are not taken immediately. In Tunisia, for example, impacts of climate change in coastal region caused the loss in annual production of approximately 0.5% of the current GDP, mainly in the areas of tourism and agriculture. In Morocco, sea-level rise may submerge half of the land area of beaches by 2050 and 72% by 2100. Currently, numerous beaches along the Mediterranean shorelines face severe erosion, and some have already disappeared entirely, despite measures taken by the public authorities.

Adaptation to climate change in coastal sector is prioritized by six SEMed countries, namely Egypt, Jordan, Montenegro, Tunisia, Palestine and Morocco. Although in Morocco focus was mainly given to the improvement of marine economy, i.e. marine fisheries.

Adaptation Measures

The measures presented in table 28 are collected from countries' NDCs/NAPS/other national adaptation strategy documents. It is understood that Adaptation options for coastal zones are highly site-dependent. However, to allow categorization of measures for joint approach, formulation has been done in a general manner. Detailed area for implementation of the selected measures, must be done in a later stage, i.e. during project preparation phase.

[90] https://planbleu.org/sites/default/files/upload/files/Poster_CC.pdf

Table 27: Prioritized measures on Coastal and Riverine Infrastructure sector in SEMed countries[91]

Coastal and Riverine Infrastructure		
Measures grouping	**Measures**	**Potential Countries**
Sea defenses/flood protection barriers	Improve protection of infrastructure located in the coastal zone against the risk of climate change, through rehabilitation of coasts (e.g. beach nourishment, reclamation and beach drift rehabilitation) and establishment of coastal protection (e.g. detached breakwaters)	State of Palestine, Tunisia,
	Climate proof existing infrastructure, farms and agricultural infrastructure in the coastal zones	Tunisia, Egypt
	Analysis and mapping of high waters in watercourses in coastal region (incl. define the erosion potential to protect against beach sedimentation), followed by organization and monitoring networks in priority watercourse by relevant authority	Montenegro
	Redeveloping and relocating industrial zones located at the coasts.	Tunisia
Marine Fisheries/Economy	Establishment of marine protected areas	Morocco
	Development of two hatcheries dedicated to restocking endangered coastal species	Morocco
	Renewal and modernization of boats fleets (using greener vessels), equipped with observation systems	Morocco, State of Palestine
	Restoration of damaged marine habitats	Morocco

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

Table 28: Prioritized measures on Coastal and Riverine Infrastructure sector in SEMed countries[92]

Coastal Coastal and Riverine Infrastructure

[91] Derived from countries' NDCs/NAPs/other national climate change strategies documents
[92] Derived from countries' NDCs/NAPs/other national climate change strategies documents

(Accompanying) Measures grouping	Measures	Potential Countries
Cross-sector Policy and Regulation	Conduct coastal vulnerability assessment with emphasis on marine ecosystem and infrastructure	Jordan
	Establishment of a national/regional Integrated Coastal Zone Management strategy and plans for coastal areas adaptation to climate change, including the associated Institutional arrangement and legal framework	Egypt, Jordan
Education	Public awareness on climate change and its associated risks as well as the corresponding adaptation actions required.	Egypt
Monitoring and Evaluation	Establish a coastal observation network, monitoring and early warning system for climate change in the coastal areas	Jordan, Morocco
Institutional Capacity	Enhance national and regional partnership in managing crises and disasters related to climate change and the reduction of associated risk (Egypt)	Egypt

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4.3.4 Energy Sector

Regional Circumstances

Although energy sector is mainly discussed under the framework of climate change mitigation, effects of climate change, such as reduced rainfall, sea level rise, and increased frequency and/or severity of natural disasters creates the necessity to adapt to the changing climate.

Based on the analysis of energy sector vulnerability in SEMed countries, impacts of climate change will affect the energy sector in the following ways:

1. **Increased temperatures, leading to scarcity or degradation of the water supply may affect power station cooling, a process which is necessary for electricity production. This phenomenon will lower efficiency of power plants. Higher temperature will also negatively affect the efficiency photovoltaic cells.**
2. **As spillover effect of the increasing temperature, electricity consumption as a result of the use of air conditioners is also increasing. In Israel, electricity consumption directly related to air conditioning is responsible for 45% out of the total consumption in the country.[93]**
3. **Decreased precipitation and changes in rainfall pattern will negatively affects power generation from hydropower plants, in spite of the fact that hydropower energy represents a promising source of renewable energy in countries, such as Albania and Bosnia and Herzegovina. Hydropower plants pose significant opportunities for 'green economy' development, with mini hydropower plants providing potential involvement of small- and medium-sized enterprises (SMEs) in their construction and operation. But nevertheless, lower rainfall will lead to a decrease in the production of hydroelectric power, which could also jeopardize energy security and electricity exports.**
4. **Scarcity of water will increase the use of desalination plants which will contribute further to the growing energy consumption. This situation particularly applies in the SEMed countries located in the southern part of the Mediterranean.**
5. **Sea level rise threatens the power plants and networks located along the coasts.**
6. **Climate change is expected to exacerbate natural disasters, such as drought and floods. In the event of severe flood, power production may not be possible due to potential (or actual) damage to the infrastructure. Whereas during drought time, production is also lower due to lack of water availability. This challenge needs to be addressed through improved management of water resources at the watershed level.**
7. **Reduction of electricity production may be compensated through seeking another renewable alternative/s or import of electricity. However, with regards to the latter economic viability and impacts to the environment must be further assessed. For example, Palestine's electricity production only fulfils 2% of the annual demand, and the rest have been imported from Israel, Jordan and Egypt.**

[93] Government of Israel. 2018. Israel's Third National Communication on Climate Change.

Adaptation Measures

Energy sector has become adaptation priority in four SEMed countries, namely Bosnia and Herzegovina, Israel, Egypt and the State of Palestine. The proposed prioritized measures by the countries are presented in Table 29 and 30 below:

Table 29: Prioritized measures on Energy sector in SEMed countries[94]

Energy		
Measures grouping	**Measures**	**Potential Countries**
Energy Generation	Exploitation of new renewable energy sources, other than hydropower, e.g. eolic, solar, water, geothermal	Albania. State of Palestine
	Conduct comprehensive studies to assess the impact of climate change on the energy sector, propose appropriate adaptation measures, and estimate the economic cost of the proposed adaptation measures. In addition, these studies should determine the safe locations for the construction of power generation projects.	Egypt,
	Integrated water resource management, considering climate change impacts, introduced and implemented (one pilot project in each entity, from the planning stage through to infrastructure and implementation).	Bosnia & Herzegovina and Palestine[95]
	Generation of solar electricity for medium-large scale commercial and industrial application for better energy security for the respective sector	State of Palestine
	Enhancing the equipment and efficiency of the Power Plant	State of Palestine
Energy Transmission & Distribution	Additional supply of energy from neighboring countries	State of Palestine

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[94] Derived from countries' NDCs/NAPs/other national climate change strategies documents
[95] The measure is not listed in State of Palestine's NC, NDCs and NAPs but interest has been communicated by the government officials as one oft he feedback to this report.

Table 30 Prioritized measures on Energy sector in SEMed countries[96]

Energy		
(Accompanying) Measures grouping	**Measures**	**Potential Countries**
Cross-sector policy and regulation	Provision of legal framework for energy conservation in buildings, implementation of green buildings and solar-powered air conditioning in large buildings.	Israel, Palestine
Monitoring and Evaluation	Improved and functioning license control for hydropower plants (revised regulations, monitoring and enforcement programme, followed by improving guidelines for the construction of hydropower plants, considering the potential impact of climate change	Bosnia and Herzegovina
Institutional capacity, support or technical assistance	Build institutional and technical capacities of national institutions related to energy sector.	Egypt, Bosnia and Herzegovina
	Develop regional cooperation on energy planning development, taking into account potential climate change impacts (technical assistance, travel, workshops)	Egypt, Bosnia and Herzegovina
Education	Provision of support and research and technological development to enable the energy sector to deal properly with climate change, for example: desalination efficiency, the effect of water quality on power stations, augmentation of water supply (not from desalination), efficient energy production technologies, paleoclimatology, and energy management in buildings.	Egypt, Bosnia and Herzegovina, Israel
	Encourage the use of high efficiency air conditioning technologies	Israel
	Promoting domestic electricity production, as a reaction to the changes in energy demand	Israel

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[96] Derived from countries' NDCs/NAPs/other national climate change strategies documents

4.3.5 Forestry Sector

Regional Circumstances

Climate change represents a significant threat to the resilience of forest ecosystems across the SEMed countries, leading to forest degradation, loss of renewable resources and loss of biodiversity. Furthermore, climate and weather events over the past years have been continuously increasing in the region in terms of magnitude and frequency exacerbating threats and risks affecting forests. This trend is expected to continue over the next decades.

Despite the difficulty of predicting the development and response of forest ecosystems to climate change, forest fires and health damage, desertification, water scarcity and loss in biodiversity will certainly intensify these adverse impacts.

In the SEMed countries, at first glance, data suggests that forest area has been stabilized since 1990 and some countries such as Morocco, Tunisia and Turkey were even able to slightly increase the area covered by forest (see chapter 3.1.5 LULUCF). However, this type of information needs to be considered with care considering that the numbers include replanted areas, even though the survival rate of planted trees is very low. Governments have recognized the importance of the services provided by forest and thus in the past years have engaged in reforestation activities, contributing to the stabilization of forest area.[97]

A closer look at natural forests shows a totally different image, indicating the decrease of naturally wooded areas and degradation of wooded land's composition. In this regard, various forest areas with tall trees, especially in the southern coast, are changing into shrublands or habitats are being fragmented by increasing large clearings. Yet, these areas are still included in the statistical category of forest land.

Wildfires represent a significant threat to forests for the entire Mediterranean region. However, wildfires or fires in general are still considered limited across the SEMed countries, due to the fact that traditional woodland grazing does not allow growth of large areas of brushwood. In case of decreasing grazing in the future, this could also result in higher risks for the SEMed countries.[98]

Adaptation Measures

The government and administrations of the SEMed countries are, on the whole, quite aware of the imperative need for conservation of forests / wooded areas, just like the modernization of farming and pastoral practices. The responses provided in the NDCs are presented in table 31 and 32 below:

[97] (Benoit and Comeau 2012)
[98] Plan Bleu. 2009. State of the Environment and Development
in the Mediterranean. Retrieved from https://planbleu.org/sites/default/files/publications/soed2009_en.pdf

Table 31: Prioritized measures on Forestry sector in SEMed countries[99]

Forestry		
Measures grouping	**Measures**	**Potential Countries**
Forestry	Reforestation, aiming at increasing the share of high natural forests	Lebanon, Montenegro
	Natural regeneration as the basis for forest growth, adequate support through afforestation (using indigenous tree types) if the natural process of forest regeneration fails	Lebanon, Montenegro
	Silvicultural improvement of low forests and shrubs, mainly in small private holdings, for bio-energy production and carbon storage	Bosnia and Herzegovina
	Rehabilitation of forest nurseries and the expansion of indigenous and multi-use species,	Tunisia; Lebanon, Montenegro
	Preservation of the forest (e.g. from deforestation, erosion, etc.) particularly through the protection of key habitats and varieties, and of trees, plants and animals.	Lebanon, Montenegro, Morocco
	Development of fire-protection measures, with an emphasis on prevention and fast response in the case of fire. Such measures must be accompanied by an improvement of logistics for fire extinction: road infrastructure, fire breaks, the removal of easily flammable material from forests; establishment of hubs with fire extinguishing materials, closer control of activities in forests during dry periods	Bosnia and Herzegovina, Lebanon, Montenegro, Morocco
	Re-establishment of forest order after harvesting; adequate and timely rehabilitation of surfaces damaged by fire	Montenegro

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[99] Derived from countries' NDCs/NAPs/other national climate change strategies documents

Table 32: Prioritized measures on Forestry sector in SEMed countries[100]

Forestry		
Measures grouping	**Measures**	**Potential Countries**
Cross-sector policy and regulation	Development and implementation of forest management strategies in the face of increased risk of fire, pest, and disease, and improving knowledge about and awareness of the ecosystem services derived from forests	Lebanon
Education	Research into species selection, particularly relating to pests and diseases, based on modeled climate change	Bosnia and Herzegovina
Monitoring and Evaluation	Establishment of monitoring plots in vulnerable eco-types to assess changes, disease, mortality and succession, to assure adequate reporting-forecasting services for forest protection. Such a measure can be accompanied by an establishment of ecological indicators indicating current changes in forest ecosystems	Bosnia and Herzegovina, Montenegro

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[100] Derived from countries' NDCs/NAPs/other national climate change strategies documents

4.3.6 Biodiversity and Ecosystems Sector

Regional circumstances

The Mediterranean Basin is the second largest biodiversity hotspot in the world[101], including the south and eastern region. The region is home to many unique reptile species and is considered one of the most important areas on Earth for endemic plants. In Bosnia and Herzegovina, for example, the ratio of the number of species to the total surface area of the country indicates that it is among the most biodiverse countries in Europe, representing 30% (or around 1,800 species) of flora endemic to the Balkans.

The marine portion encompasses the 2,500,000 km^2 of the Mediterranean Sea with a high diversity of habitats: seamounts, submarine canyons, seagrass meadows, maërl beds and coralligenous communities.[102] The Mediterranean sea hosts 4% to 18% of all identified marine species, which is considerable given that it only accounts for 0.82% of the global ocean surface.[103] Mediterranean's biodiversity has been one of the highlights of tourist attraction in the region. But at the same time tourism activities led to increased fragmentation and isolation of biodiversity hotspots to make way for resort development and infrastructure.

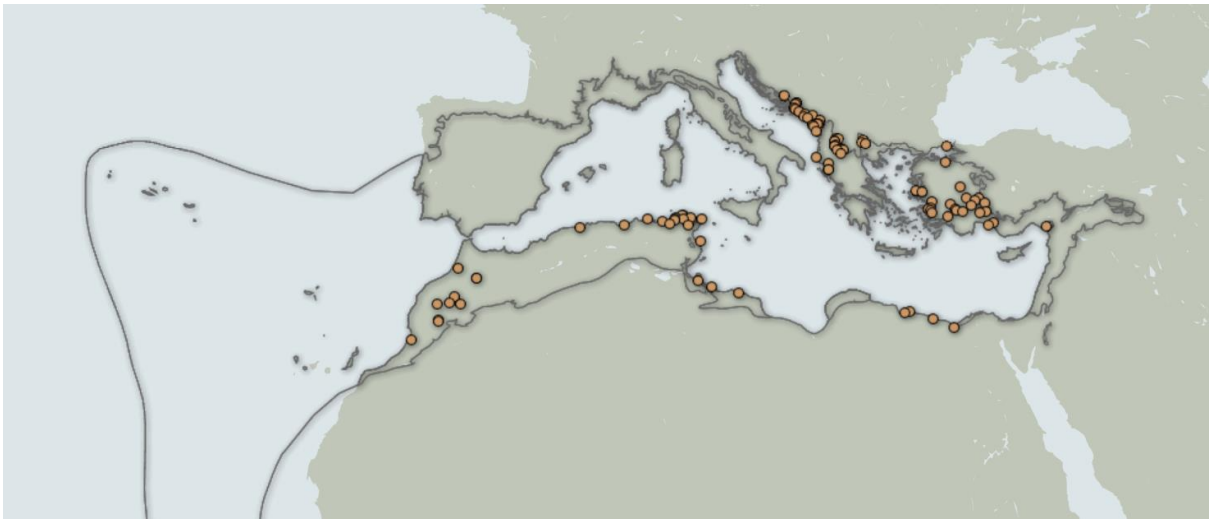


Figure 17: Mediterranean Basin Biodiversity Hotspot[104]

The Mediterranean biodiversity is currently undergoing rapid alteration under the combined pressure of climate change and anthropogenic stressors. The situation is exacerbated by the scarce measures for protection. Threat to species and ecosystems has never been so great as it is today, leading to alarming rates of species extinction.

The 13 SEMed countries are currently experiencing pressures on their biodiversity state, which can generally be categorized as follows[105]:

1. **Climate change is identified as one of the major threats for the declining biodiversity in the region. The increasing sea water temperature has affected the state of the Mediterranean coral reef. In coastal areas, impacts on climate change can be seen through the excessive flooding**

[101] Conservation International. 2018. Explore the Biodiversity Hotspots. Conservation International, Critical Ecosystems Partnership Fund. Retrieved from https://www.cepf.net/our-work/biodiversity-hotspots
[102] IUCN. 2018. The IUCN Red List of Threatened Species. Retrieved from https://www.iucnredlist.org/regions/mediterranean
[103] Bianchi. C. N. and Morri. C. 2000. Marine Biodiversity of the Mediterranean Sea: Situation, Problems and Prospects for Future Research. Elsevier. Retrieved from https://www.sciencedirect.com/science/article/pii/S0025326X00000278
[104] Conservation International. 2018. Mediterranean Basin. Conservation International, Critical Ecosystems Partnership Fund. Retrieved from https://www.cepf.net/our-work/biodiversity-hotspots/mediterranean-basin
[105] Author's elaboration based on the Biodiversity Profiles' that the SEMed countries submitted to the Convention of Biodiversity. Retrieved from https://www.cbd.int/information/parties.shtml

of large areas and erosion along the coastline. Moreover, climate-induced desertification has put more pressure on biodiversity.

2. **Invasive Alien Species (IAS)**. Globalization combined with climatic change have both facilitated the introduction, spread and establishment **of species that are not native to an area,** and **create new opportunities for them to become invasive**. All countries are grappling with complex and potentially costly invasive species problems. IAS can reduce the resilience of natural habitats to climate change, and at the same time, climate change also reduces the resilience of the native habitats to biological invasions. The trend shows that IAS mainly occurs in the eastern Mediterranean basin and can spread rapidly northwards and westwards due to the warming of the Mediterranean Sea.[106]
3. **Unsustainable land use.** Accelerated development and population growth are the major forces behind the biodiversity decline in the region. It includes:
    - *Development of agricultural fields* in an unsustainable manner, combined with overuse of fertilizer and over grazing. For example, in Israel, about one fifth of the country's original ecosystems have been converted in the past to agricultural systems, using 40% of the water supply. Or in Algeria, where surface of natural steppe vegetation has decreased by 50% since 1989.
    - **Rapid infrastructure development and urbanization** leading to conversion of land for residential, tourism, commercial and recreational activities result in habitat loss, fragmentation and degradation is arguably one significant factor responsible for endangering species. Further, the conversion has reduced the area of habitat available to biodiversity, while also fragmenting and degrading remaining areas.
4. **Unregulated tourism** has been identified as a major threat to marine ecosystems. Tourism activities do not only lead to rapid infrastructure development in coastal areas, but also to exploitation of marine resources, overfishing and fishing in illegal areas (e.g. breeding grounds) and coastal pollution. Currently, 20% of Egyptians live in coastal areas which are also visited annually by 11 million tourists. In Israel, coastal sand is only 50% of the original size in the early 20th century and hosts 70% of the population.
5. **Water pollution,** which is harmful for biological diversity, is mainly caused by the excessive nutrient load and a lack of sewage treatment and coastal and surface water management. Moreover, industrial activities in many SEMed countries occur in the coastal zone.
6. **Overexploitation of resources** which are manifested in overhunting, overgrazing and overfishing have contributed to the rapid decline of biodiversity in the region.

With the growing recognition of biological diversity as a global asset of tremendous value to present to future generations and also with the realization that species extinction caused by human activities continues at an alarming rate, and has never been so great as it is today, all 13 SEMed countries have ratified the Convention on Biological Diversity (CBD).

Adaptation measures

Despite the urgency, protection measures, either for species or ecosystems, are still scarce. Out of 13 SEMed countries, eight countries named Biodiversity sector as one of the prioritized sectors.

[106] Coll M, Piroddi C, Steenbeek J, Kaschner K, Ben Rais Lasram F, Aguzzi J, et al. (2010) The Biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats. PLoS ONE 5(8): e11842. https://doi.org/10.1371/journal.pone.0011842

Identified measures evolve around building the understanding of the role and patterns of biodiversity, through comprehensive review and mapping, followed with monitoring biodiversity. It is however, important to see at the long-term horizon and integration of the whole Mediterranean scale, possibly through an internationally coordinated network for Biodiversity.

Table 33: Prioritized measures on Other Agricultural and Ecological Resources sector in SEMed countries[107]

Other Agricultural and Ecological Resources		
Measures grouping	**Measures**	**Potential Countries**
Ecosystems/Biodiversity (including ecosystem-based flood protection measures)	Conducting a comprehensive data collection/review of the physical, biological and social environment, with regard to ecosystems and biodiversity, aiming at identifying/validating/updating climate-vulnerable ecosystems, extending conservation efforts in Protected Area surroundings and designing buffer zones as deemed necessarily for strengthening the adaptive capacities of key ecological hotspots	Albania, Algeria, Bosnia & Herzegovina, Israel, Jordan, State of Palestine
	Conducting needs assessment and defining pilot national monitoring sites and species, following by developing design and action plans for implementation	Albania, Bosnia & Herzegovina, Lebanon
	Establishment of a professional committee to manage invasive species by establishing criteria for the introduction of new species and setting priorities and recommendations to deal with the current invasive populations. It must however, be accompanied by an appropriate law enforcement procedures and agencies.	Israel
	Implementation of protected and/or conservation areas in various ecosystems, e.g. coastal areas, mountain landscape, wetlands, forest, etc.	Albania, Bosnia & Herzegovina, Morocco, Mauritania, State of Palestine
	Restoration of damaged ecosystems	Albania, Bosnia & Herzegovina, Morocco, Mauritania, State of Palestine
	Enhancing the resilience of local communities impacted by climate change in areas within and surrounding Protected Areas, through integrated ecosystem-based rural development	Tunisia, Jordan, State of Palestine
	Biological consolidation of work to combat silting in the south of Tunisia and support the implementation of regional action plans to counter desertification	Tunisia, Mauritania

[107] Derived from countries' NDCs/NAPs/other national climate change strategies documents

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

In addition to the abovementioned measures, provision of the following accompanying measures is also deemed imperative:

1. **Policy framework: At the moment, it is recognized that there is a lack of intersectoral connections in the process of decision making relating to exploitation of biological and landscapes diversity. And therefore, it is of utmost importance to mainstream and harmonize sectoral strategies with strategic targets related to biodiversity management.**
2. **Capacity and Awareness: In many places, including in SEMed countries, sustainable use of biodiversity components is founded on the traditional knowledge and practice, which often is missing in a modern society. And therefore, it could be beneficial to setup centers for maintenance of old knowledge and practice and further promote it.**
3. **Data Management: Exchange of information related to biodiversity is lacking in SEMed countries resulting in an inadequate institutional framework on Biodiversity. This has led to fragmentation and retention of information at either administrative or some scientific levels. A Clearing House Mechanism, or a portal for exchange of information on biodiversity may be a valuable measure in the framework of monitoring and evaluating the state of biodiversity in the countries.**

4.3.7 Urban Development Sector (including infrastructure and transport)

Regional Circumstances

Urban areas are mainly impacted by climate change through increasing temperature, higher frequency and/or intensity of the extreme hydro-meteorological events and sea level rise. [108] Therefore, it is important to understand the key trends in urbanization to assure the implementation of Sustainable Development, taking into account climate change factor.

The South and Eastern rim of the Mediterranean are known as the socially vulnerable areas to climate change, due to the high-demographic growth, densely population cities as well as suburbs.[109] In comparison to the total population, the number of people living in urban areas in 13 SEMed countries has continued to grow, since the 1960's. Mauritania has the highest rate of urban population growth at 4.4% annually, followed by the state of Palestine at 2.8% per year.

Urbanization trends in the Mediterranean Region from 1950 to 2030 have shown rapid growth. While urbanization rate in the Southern Europe will grow from 44.2% in 1950 to 75.2% in 2030, Eastern Mediterranean and North African region will undergo an even more rapid pace of urbanization, growing from 24.7% in 1950 to 63.3% in 2030. Between 1950 and 2000, the most rapid increase in the urbanization rate occurred in Libya, from 18.6 percent to 87.6, and in Lebanon, from 22.7 percent to 89.7 percent. (WB, 2010).

[108] http://www.eib.org/attachments/country/climate_change_energy_mediterranean_en.pdf
[109] http://www.eib.org/attachments/country/climate_change_energy_mediterranean_en.pdf

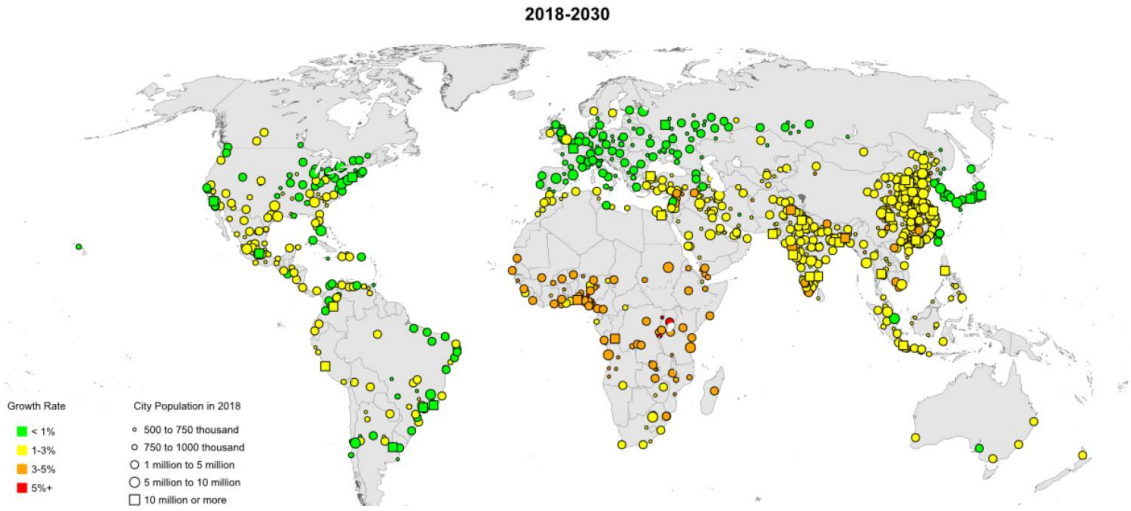


Figure 18 Growth Rates of Urban Agglomerations by Size Class 2018-2030[110]

As presented in figure x above, urban areas in the south and eastern part of Mediterranean are located at the coast. Set aside the various benefit of urbanization, in the Mediterranean region, particularly across the SEMed countries, urbanization has become a major cause of land degradation, especially in coastal areas, due to uncontrolled expansion of urban areas as well as tourism activities.

In the Mediterranean region, 50% of the urban population lives less than 10m above sea level. More specifically, the World Bank indicator database shows that percentage of urban population living in areas where elevation is below 5 meters, in the 13 SEMed countries, has grown over the years. As such, cities located in such low-lying areas (and in delta zones) are facing the threats from the rise in sea level. For example, in Morocco, 60% of the population and the majority of the economic activities are located in coastal zones. Whereas, 42% of the Moroccan coastline will be at high risk of erosion and floods by 2030.[111] Furthermore, a study on climate change in the Mediterranean, done by the European Investment Bank stated that a rise in sea level by 1 meter would affect 6% and 10% of the total population in Tunisia and in Egypt, respectively.

As urbanization continues, countries will face challenges in meeting the needs of the urban population, including housing, transportation, energy and other basic infrastructures as well as services. And at the same time impacts of climate change, such as coastal erosion, inundation and storms, pose more significant exposures to the already limited infrastructures. It will further increase the vulnerability to disasters, especially to the poorest group of society. And when infrastructure is absent or degraded, it will no longer fulfils its functions, and consequently affect the economy in countries.

And therefore, sound and inclusive policies to manage urban growth is needed, focusing on the needs of the urban poor and other vulnerable groups. Moreover, investment on appropriate climate proof infrastructures could contribute in maintaining, or even increasing countries' GDP, ensuring enhanced adaptive capacity. According to a study published by Mediterranean Prospects, funded by the European Commission, the average requirement for transport spending for the SEMed Countries is 3.2% of GDP, including both investment and maintenance[112]

[110] UNDESA 2018
[111] UNDP.2017. National Adaptation Plans in focus: Lessons from Morocco.
[112] MEDPRO. 2013. What prospects for transport infrastructure and impacts on growth in southern and eastern Mediterranean countries. Mediterranean Prospects. Retrieved from http://aei.pitt.edu/58469/1/MEDPRO_Report_No_3_Transport_Infrastructure.pdf

Adaptation Measures

Development in a sustainable manner depends increasingly on the successful management of urban growth. Particularly when countries are faced with the challenges in meeting the needs of their growing urban populations.

Five countries have chosen urban development as one of their prioritized sectors, namely, Algeria, Egypt, Israel, Mauritania, Morocco and the State of Palestine. However, it is important that urban development as a cross cutting issue is deemed important as well for other SEMed countries. The difference lies on the grouping of measures. Other SEMed countries integrate urban development issues into their sectoral strategies, and not necessarily under climate change tag. And integration of impacts of climate change has continuously been done in development (and update) of sectoral strategies in the SEMed countries.

Table 34: Prioritized measures on Energy, Transport, other built Environment and Infrastructure sector in SEMed countries[113]

Energy, Transport, other built Environment and Infrastructure		
Measures grouping	**Measures**	**Potential Countries**
Urban Development	Develop a sound spatial strategy and plans, based on the scenario for the optimal regional distribution of population and economic activities within the geographical boundaries, by taking climate change into consideration	Egypt
	Increase open space and vegetation, for shade and improved air quality	Israel
Transport	Integration of climate change impacts into sectoral strategies, including transportation sector	Algeria, Israel
	Utilization of the underground space for transportation	Israel
	Rehabilitation of road infrastructure for better resilience	State of Palestine
	Construction of housing	Mauritania
	Rehabilitation of precarious neighborhood	Mauritania
Construction	Implementation and enforcement of green building practices e.g. Use reflective building materials that absorb less heat, utilization of less water.	Israel, Palestine
	Strengthen adaptation of infrastructure, by constructing climate proof infrastructure and/or enhancing protection to important infrastructure against the impact of climate change. This is particularly important for urban infrastructures located in the coastal area, against the impact of sea level rise.	Morocco

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

[113] Derived from countries' NDCs/NAPs/other national climate change strategies documents

4.3.8 Tourism Sector

Regional Circumstances

Biodiversity, landscape and cultural richness around the Mediterranean Sea is exceptional, attracting close to 100 million tourists in 13 SEMed countries in 2017[114]. Major tourist countries in the SEMed region are Tunisia, Morocco, Egypt and Jordan, for tourism has been the countries' strategic sector for a long time. Whereas influx of tourist to Lebanon, Israel and the State of Palestine is highly dependent on the political situation. In the period of 2005-2010, Morocco, Egypt and Jordan gained over 10% of international tourism revenues, making tourism one of the most important sources of employment and hence income (See. Figure 20 below).

	International Arrivals[1] (in thousands)			International Tourism Revenue[1] (in millions of dollars)			Jobs in the Tourism Sector[2] (in thousands, 2010)		Tourism Losses[1] in 2011	
	2005	2010	AAGR 2005-2010	2005	2010	AAGR 2005-2010	Number of Direct Jobs	Number of Indirect Jobs	Drop in Arrivals in 2011	Drop in Tourism Revenue in 2011
Algeria	1,443	1,912	5.79	477	n/a	n/a	354	698	n/a	n/a
Egypt	8,608	14,051	10.3	7,206	12,528	11.7	1,677	3,683	-33.2	-25.7
Jordan	3,200	4,557	7.33	2,004	3,413	11.24	130	321	-15.7	-17.7
Israel	1,916	2,803	7.91	3,427	4,768	6.83	85	259	0.6	n/a
Lebanon	1,140	2,168	13.72	5,531	8,012	7.69	119	426	-24.4	n/a
Libya	n/a	34	n/a	250	60	n/a	27	51	n/a	n/a
Morocco	6,077	9,288	8.85	4,610	6,720	7.83	815	1,806	1.6	4.6
Syria	5,859	8,546	7.84	1,944	6,190	24.92	305	772	-40.7	n/a
Tunisia	6,378	6,902	1.59	2,143	2,645	4.3	256	531	-30.7	-50.7
Palestinian Territories	88	522	n/a	119	522	n/a	n/a	n/a	-11.7	n/a
Total	34,709	50,783	7.91%	27,711	44,858	10.60%	3,768	8,547	-22%	n/a

[1] UN World Tourism Organisation (UNWTO); [2] World Travel and Tourism Company (WTTC) and TSA Research (Tourism Satellite Account). AAGR: Average Annual Growth Rate. n/a: not available.

Figure 19: Contribution of Tourism sector to economic growth in most SEMed countries[115]

Tunisia, despite being the tourism pioneer in the region, has become the country with the poorest performance in the region. The sector accounted for 3.8 million direct jobs across the SEMed a countries, i.e. 7% of total jobs, and 8.5 million indirect jobs, i.e. 15% of total jobs.[116]

Mediterranean tourist attractions are mainly located in coastal areas. While tourism activities play a key role in the development of infrastructures as well as economic growth in many coastal areas in SEMed region, it is also contributing to the alarming environmental degradation and the rapidly evolving changes in consumption patterns (especially with regards to energy). The situation is exacerbated by the impacts of climate change, ranging from sea level rise leading to coastal erosion and inundation to increased heat during the summer. Major tourist attractions in the SEMed region, including UNESCO world heritage sites located at the low-laying coastal areas are under high risks of inundation, due to coastal floods and erosion.[117]

[114] Authors elaboration based on UNSTAT data.
[115] Weigert. M. 2012. The Challenges of Tourism in the Mediterranean Region. Panorama. Paris
[116] Weigert.2012
[117] Reimann. L. et al. 2018. Mediterranean UNESCO World Heritage at risk from coastal flooding and erosion due to sea-level rise. Nature Communications. Retrieved from https://www.nature.com/articles/s41467-018-06645-9

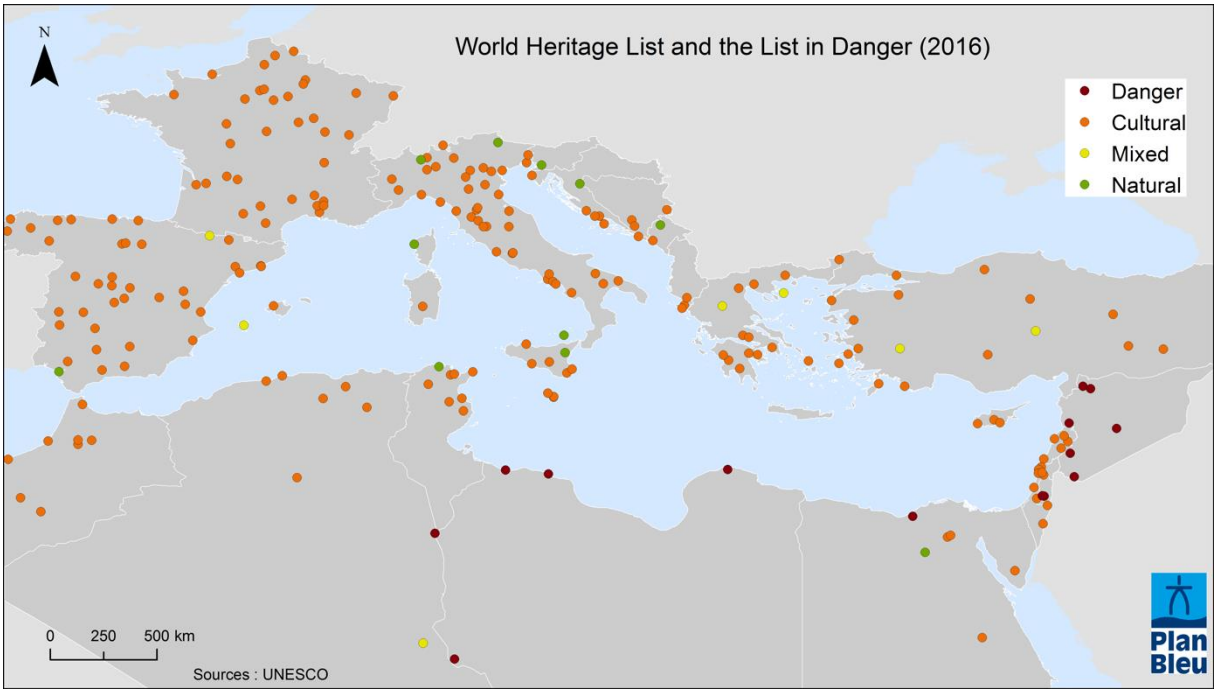


Figure 20: UNESCO world heritage sites[118]

It must, however, be noted that tourism is one of the major beneficiaries of a quality environment, sound ecosystems and the services which they provide. Environmental deterioration due to anthropogenic activities and climatic changes, coupled with political instability in the region, will result in the decline attractiveness of areas which were once tourist destinations. And accordingly, a different picture or tourist arrival from 2010 to 2017 can be seen in the Table 35 below.

Table 35: Trends of tourist arrival in SEMed countries (Source. Authors' elaboration[119]*)*

Countries	Number of Tourist Arrivals in 2017	Trend
Albania	3,784,000	↗
Algeria	1,710,000	↘
B & H	678,000	↗
Egypt	9,139,000	↘
Israel	2,799,000	↘
Jordan	3,761,000	↘
Lebanon	1,518,000	↘
Mauritania	n/a	
Montenegro	1,560,000	↗
Morocco	10,177,000	↗
Palestine	432,000	↘
Tunisia	5,359,000	↘

[118] PlanBleu. 2018
[119] Data gathered from UNSTAT

Turkey	**39,478,000**	↗

More than 50% of the SEMed countries are suffering for the declining number of tourist arrival. Egypt is suffering the highest decrease, with 35% loss of tourist arrivals between 2010 to 2017.

A study conducted by the Mediterranean Prospect (under the framework of European Commission Seventh Framework Programme) reported potential economic impacts of climate change on Southern and Eastern Mediterranean countries. The study revealed that deterioration of the coastal ecosystem and protected areas has a major economic impact on tourism. It concludes that GDP losses, due to climate change, linked to tourism activity are greater than those related to agriculture, except for Tunisia or Morocco. The average losses of the services sector affected by the decline in demand for tourism services range, depending on the scenario, between -0.25% and -0.7% in 2050, with a peak of -1.32% in the Middle East.[120]

Adaptation Measures

At this point, tourism and climate change has become a two-pronged issue. With the climatic changes, tourism requires a special attention. It is imperative to mainstream climate change measures into the national, and even regional tourism development plans (e.g. Plan Bleu), addressing issues on increasing emission as well as the challenges of vulnerability.

Out of 13 SEMed countries, seven countries deem tourism as one of the prioritized sectors in their NDCS/NAPs. Whereas, Bosnia and Herzegovina is focusing winter tourism, Egypt, Jordan, Morocco and Tunisia are all focused mainly on tourist attraction located in the coastal areas. The following table presents the identified measures on tourism addressed by the SEMed countries, potential for joint approach.

[120] Francesco Bosello and Fabio Eboli. 2013. Economic Impacts of Climate Change in the Southern Mediterranean. MEDPRO

Table 36: Prioritized measures on Tourism sector in SEMed countries[121]

Tourism		
Measures grouping	**Measures**	**Potential Countries**
Tourism	Awareness raising and capacity building for public society to adapt to climate change and associated risks and disasters especially in the touristic areas as well as the importance of conserving and restoring cultural heritage sites.	Egypt, Bosnia and Herzegovina, State of Palestine
	Implementation of climate proof tourism development, For examples: • **Restoration of the touristic areas to protect against the impact of climate change** • **Development of climate proof infrastructures in the touristic areas** • **Management of water resources and installation of mini seawater desalination plants using renewable energies** • **Establish periodical monitoring and observations systems related to the climatic changes and the associated impacts in the touristic areas, accompanied by appointing a responsible body.** • **Mainstreaming disaster risk reduction and management to promote sustainable tourism.** • **Development of Climate proof policy to secure implementation** • **Improvement of policy, regulatory and institutional framework to protect local heritage and especially those located in highly sensitive areas.**	Tunisia, Egypt, Bosnia and Herzegovina, Jordan, Morocco, State of Palestine
	Development of a range of services that are at once alternative and complementary to tourism, particularly in terms of health, culture, sport and environment	Tunisia, Morocco

[121] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Conducting Vulnerability Assessment study to better understand the current and projected vulnerability, as well as the associated risks, of the tourism sector.	Tunisia, Jordan, Morocco,
	Launch and promotion of the concept of Eco-tourism, e.g. ecological hotels	Tunisia, Bosnia and Herzegovina, Jordan, State of Palestine,

Despite the importance, and the minimum information available, assessment of vulnerability and the associated risks in tourism sector has only been proposed by three countries. Better understanding of tourism vulnerability and the projected will be a sound basis for development of actions for Climate Proofing, Development of Tourism Strategy and Policies, Public-wide awareness raising on climate change adaptation in tourism sector, as well as assignment of eco-tourism locations and the corresponding infrastructure development.

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4.3.9 Health Sector

Regional Circumstances

Climate change is an emerging threat to human, with a long-term negative effect on public health, manifested in chronic and/or contagious disease. The changes in our climate determines the quality level of clean air, availability of safe drinking water and food (as well as nutrition) security. Globally, the World Health Organization (WHO) projected additional 250,000 additional deaths annually due to climate induced- mal nutrition, malaria, diarrhea and heat stress, between 2030 and 2050.[122] The number is augmented by the increased deaths in natural disasters such as floods.

In the Mediterranean region, it is reported that average temperatures have already risen by 1.4°C since the pre-industrial era. The number equates 0.4°C higher than the global average.[123] The higher temperature has not only Even if future global warming is limited to 2°C, as prescribed by the Paris Agreement, summer rainfall is at risk to be reduced by 10 to 30% in some regions, thereby enhancing existing water shortages and decreasing agricultural productivity, particularly in southern countries.

Nine out of thirteen SEMed countries prioritized health sector in their NDCs/NAPs, namely Algeria, Egypt, Israel, Jordan, Mauritania, Montenegro, Palestine, Tunisia and Turkey. These nine countries communicated the impacts of climate change to human health, ranging from death and injury due to extreme climate events, transmission of diseases through water as well as increased in cardiovascular and respiratory diseases due to air quality degradation. It can be summarized and categorized as follow:

1. **An increased prevalence of diseases associated with extreme heat and cold. It was found that climate change has increased occurrences of extreme heat by 200 to 500% throughout the Mediterranean region.[124] High temperatures raise the levels of ozone, pollen and other pollutants in the air that exacerbate cardiovascular and respiratory disease, particularly among elderly people. Diseases as such have reported to increase during these past decades. Plants and animals are also vulnerable to extreme heat, and thus will likely to impact crop and livestock production. For example, a study in Israel has reported that there is a 3.7% increase mortality in Tel Aviv due to heart, vascular, and respiratory diseases due to heat stress. The same report indicated a rise of 1.47% in the number of emergency hospital visits for every rise of 1°C during a heat wave.[125]**
2. **Climate-induced disasters such as floods and droughts are projected to increase in terms of frequency and intensity. Such disasters will not only claim live tolls, but also it destroys basic needs and infrastructures required for the population to survive, such as agricultural products, homes, medical facilities as well as other essential services (including provision to clean water, sanitation and save energy). Moreover, floods can heighten the risk of water-borne diseases and create breeding grounds for disease-carrying animal such as mosquitoes, rodents, snails, or other cold-blooded animals. Whereas prolonged droughts are likely to decrease the production of staple foods, contributing to increased prevalence of malnutrition and undernutrition. In Mauritania, for example, 32% of children under five suffer from chronic malnutrition and underweight.[126] Both floods and droughts will affect the supply of clean water, compromising hygiene and thus increasing the risk of diarrheal disease.**

[122] WHO. 2018. Climate Change and Health. World Health Organization. Retrieved from http://www.who.int/news-room/fact-sheets/detail/climate-change-and-health
[123] City University of Hong Kong. 2018. Climate change impact in Mediterranean region. Science Daily. Retrieved from https://www.sciencedaily.com/releases/2018/10/181026102625.htm
[124] Diffenbaugh. Noah. S. 2007. Heat stress intensification in the Mediterranean climate change hotspot. Geophysical Research Letters. Retrieved from http://climate-action.engin.umich.edu/heat_waves/Doc2007_Diffenbaugh_Heat_Waves_Mediterranean_GRL_2008.pdf
[125] Government of Israel. 2018
[126] Government of Mauritania. 2014

Table 37: Access to Drinking Water and Sanitation Facilities in SEMed countries (Source. Authors' elaboration[127])

	Access Drinking Water (2017) (% of population)		Sanitation Facilities (2017) (% of population)	
	Urban	Rural	Urban	Rural
Albania	94,9	95,2	95,5	90,2
Algeria	84,3	81,8	89,8	82,2
Bosnia & Herzegovina	99,7	100	98,9	92
Egypt	100	99	96,8	93,1
Israel	100	100	100	100
Jordan	97,8	92,3	98,6	98,9
Lebanon	99	99	80,7	80,7
Mauritania	58,4	57,1	57,5	13,8
Montenegro	100	99,2	98	92,2
Morocco	98,7	65,3	84,1	65,5
Palestine	50,7	81,5	93	30,2
Tunisia	100	93,2	97,4	79,8
Turkey	100	100	98,3	85,5

Despite the expected higher prevalence of climate change induced sickness in the future, data show that most SEMed countries have adequate access to clean water and appropriate sanitation facilities, both in urban and rural areas. Exceptions are Mauritania and the State of Palestine where percent coverage is still low, or there is a high discrepancy in terms of access between the urban and the rural areas. In Mauritania, hostile environment, combined with the lack of access to clean water and sanitation facilities leading to the emergence of infectious and parasitic diseases, in particular diarrhea and acute respiratory infections, among children under 5 years of age. Infant mortality is dominated by acute respiratory infections (21.5%), malaria (15%) and diarrheal diseases (13.5%) according to the Demographic and Health Survey (DHS). These three conditions alone account for 50% of the causes of death in children under five years of age; 35% of children over five years of age.[128]

Mental stress due to displacement, resulting from the changing climate. Human security will also be threatened due to extreme weather, such as a rise in sea level posing a higher risk of storm surges for people living in coastal areas in the region. In politically unstable countries, environmental change is an increasingly relevant factor for socio-economic risks, due to famines, migration and conflict.

Total expenditure on health as percentage to the total GDP in 13 SEMed countries are mostly increasing. This expenditure represents final consumption of health care goods and services including personal health care and collective services but exclude spending on investments. The percentage on healthcare investment is unfortunately unknown. At the same time, the number of physician available per 1000 of population is not necessarily increasing.

[127] Data gathered from UNSTAT
[128] Government of Mauritania. 2014

Table 38: Expenditure on Health and Number of Physician in SEMed countries (Source. Authors' elaboration[129])

Countries	Total expenditure on Health as % of GDP		Trend	Number of physician per 1000 population		Trend
	2000	2015		2000	2017	
Albania	6,76	6,82	↗	1,39	1,3	↘
Algeria	3,49	7,06	↗	n/a	1,2	-
B & H	7,12	9,38	↗	1,42	1,9	↘
Egypt	5,18	4,17	↘	2,12	0,8	↘
Israel	6,80	7,43	↗	3,77	3,6	↘
Jordan	9,64	6,28	↘	2,01	2,6	↗
Lebanon	10,68	7,43	↘	n/a	2,4	-
Mauritania	4,46	4,64	↗	n/a	n/a	-
Montenegro	6,74	5,97	↘	n/a	2,3	-
Morocco	3,98	5,53	↗	n/a	0,6	-
Palestine[130]	n/a	n/a		n/a	n/a	-
Tunisia	5,05	6,74	↗	0,77	1,6	↗
Turkey	4,62	4,14	↘	1,35	1,7	↗

Adaptation Measures

Climate change is likely to aggravate these emergencies, necessitating a strengthening of health systems and capacities in the region. To this end, adaptation to climate change on health sector in SEMed countries focus on the adequate intervention measures required to reduce the impact of climate change on climate-sensitive health issues. The prioritized actions as collected from the nice SEMed countries are presented in table 39 below:

[129] Data gathered from WDI
[130] Similar data set for the State of Palestine, to allow appropriate comparison, is unfortunately unavailable. However, according tot he Palestinian Central Bureau of Statistics The percentage of total health expenditure to Gross Domestic Product (GDP) at current prices for Palestine increased from 12.8% in 2011 to 13.0% in 2012.

Table 39: Prioritized measures on Health sector in SEMed countries[131]

Health		
Measures grouping	**Measures**	**Potential Countries**
Health	Conduct vulnerability assessment on Health sector, identifying potential health risks as a result of climate change, and thus strengthening the preparedness and resilience of the health sector.	Egypt, Jordan, Montenegro, Tunisia, Turkey
	Integration of the impacts of climate change on into health sector strategies, followed by formulation of benefits and the associated adaptation costs	Algeria, Montenegro, Tunisia
	Raise community awareness about climate change risks and means of adaptation in health sector. This could include provision of guidelines to the public for action in the event of possible infectious diseases, during extreme weather events.	Egypt, Israel, Jordan, Montenegro, Tunisia, Turkey
	Training health professionals and increasing the awareness of people about measures they can take to help prevent major diseases related to water, sanitation, and food	Turkey, Palestine
	Increase the efficiency of healthcare sector and improve the quality of health services in dealing with climate change, e.g: - **Provision of adequate treatment for population sectors at risk.** - **Strengthening the treatment and control, including vaccination programmes** - **Augment the number of emergency rooms (ER) capacities** - **Appropriately equipping medical institutions with air conditioning for longer term heat increases** - **Provision of training to medical workers to respond to extreme events**	Egypt, Jordan, Israel, Tunisia

[131] Derived from countries' NDCs/NAPs/other national climate change strategies documents

	Support Ministry of Health efforts to improve the social and economic status and population characteristics, ensure to strengthen nutrition and health of vulnerable households	Egypt, Mauritania
	Reduction of conventional sources of energy to improve air quality, create more green neighborhoods, and support healthy lifestyles	Israel
	Establishment of effective and efficient data and information system (including introduction of health-related indicators) to allow rapid intervention, including an early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold	Jordan, Montenegro, Turkey, Tunisia
	Introduction of a monitoring system on epidemics based on the principle vector- and water- borne diseases, as impacts from climate change	Tunisia

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

4.3.10 Disaster Risk Reduction (DRR) Sector

Regional Circumstances

The WHO defined disaster as any phenomenon, both nature- and man-made, that results in massive destruction, affecting a large number of people or livelihood and where the response to such an event goes beyond the community's capacity.[132] Climate change has exacerbate the occurrences of various type of disaster, in terms of increasing frequency or intensity, or both. Adaptation activities are implemented to reduce and manage natural disaster risks caused by climate change.

According to data published by EM-DAT (The International Disaster Database), number of occurrences of hydrological disaster, defined as a hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater (i.e. flood, landslide and wave Action), has increased since the 80's[133]. And accordingly, the numbers of people affected are also increasing.

Hydrological disasters				Date of release: January 2018					
	Occurrence			**Total deaths**			**Persons affected**		
	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016
Albania	3	4	6	15	4	3	38 500	77 884	67 400
Algeria	6	18	14	102	1 105	314	34 271	141 070	98 797
Bosnia and Herzegovina	0	5	9	0	6	29	0	290 503	1 039 240
Egypt	4	3	2	620	22	27	164 128	870	3 500
Israel	0	2	1	0	15	2	0	1 000	0
Jordan	2	1	0	17	2	0	18 029	0	0
Lebanon	1	1	0	0	0	0	1 500	17 000	0
Mauritania	1	8	5	0	41	12	600	93 419	79 400
Montenegro	0	0	4	0	0	0	0	0	7 886
Morocco	4	9	7	816	213	121	98 000	28 367	106 529
Tunisia	1	2	3	37	12	33	152 000	27 000	6 508
Turkey	9	18	13	460	261	136	325 984	1 364 291	45 032

Figure 21: Record of Hydrological Disaster occurred in SEMed countries[134]

With Meteorological disaster, defined as a hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days (i.e. Extreme temperature, Fog and Storm), while the frequencies are not necessarily rising, the number of persons affected is increasing. This could indicate the higher intensity of disaster, despite the similar or even less number of occurrences.

[132] WHO. 2015. Managing disaster risks in communities. World Health Organization. Retrieved from http://applications.emro.who.int/dsaf/EMROPUB_2015_EN_1881.pdf
[133] Note that data is not available for all 13 SEMed countries
[134] Data retrieved from UNSTAT, based on EM-DAT database

Meteorological disasters				Date of release: January 2018					
	Occurrence			Total deaths			Persons affected		
	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016
Albania	0	3	2	0	11	5	0	525 000	230 150
Algeria	1	4	0	0	67	0	10 107	15	0
Bosnia and H	0	2	4	0	4	7	0	1 090	20 347
Egypt	3	3	5	84	34	198	11	207	32 813
Israel	2	2	2	5	3	4	0	410	2 003 200
Jordan	2	3	0	17	14	0	0	237	0
Lebanon	1	1	3	25	0	5	104 075	500	1 001 692
Mauritania	1	1	0	4	1	0	300	177	0
Montenegro	0	0	1	0	0	1	0	0	4 500
Morocco	1	2	4	14	1	49	0	0	874 500
Turkey	4	9	1	61	104	3	8 003	2 086	0

Figure 22: Record of Meteorological Disaster occurred in SEMed countries[135]

DRR is not necessarily mentioned as an own sector in most of the SEMed countries' NDCs, except by Algeria, Egypt and Turkey. Measures related to DRR are mostly mainstreamed directly into sectoral strategy. Moreover, most countries are still focused on Disaster Risk Management (DRM). In this case, disaster related legislation and institutions predominantly focus on the management post-disaster, rather than preparation activities for prevention of risks and reduction of probable effects.

Adaptation Measures

Table 40 presents the prioritized actions communicated by countries on their effort to reduce the risks of disaster. While, identification of threats and level of risks have mostly been mainstreamed into the sectoral measures, development of general disaster reduction plan to enable prevention of risks and minimize the effect of disaster is reflected in DRR measure, coupled with implementation of an appropriate early warning system. Countries deem it highly relevant to enhance public understanding and awareness of the projected risks, to support their DRR plan. And finally, development of insurance scheme to mitigate losses are also communicated.

[135] Data retrieved from UNSTAT, based on EM-DAT database

Table 40: Prioritized measures on Cross Cutting sector in SEMed countries

Cross Cutting Sector		
Measures grouping	**Measures**	**Potential Countries**
Disaster Risk Management	Developing disaster reduction plans for sectors affected from natural disasters caused by climate change, and mainstream climate change and its associated risk into national development plans	Turkey, Egypt
	Establishing a monitoring and early warning system and capacity building with regard to extreme climate events management. The system can utilize various modes for telecommunication, including mobile phone applications.	Algeria, Montenegro, Palestine
	Training activities to increase public awareness and participation with regard to the disaster and risk impacts that may arise due to climate change for the public. This can be done by enhancing partnership with relevant regional, national, and even international bodies in managing crises and disasters related to climate change and the reduction of associated risk.	Turkey, Egypt
	Development of an insurance sector to promptly mitigate losses, by covering risk against climatic variations through multi-risk insurance. Such insurances can for example be applied in agricultural and fisheries sector.	Albania and Morocco

The dashboard can also be used by the countries as a tool to identify gaps in the measures that have been communicated against the measures that could still be taken into account. This will also help in the process of updating the NDCs until 2020.

5 Overview of the means of implementation

Climate finance, technology transfer and capacity building are important means of NDC implementation. The provision of support to developing countries, in particular the poorer ones, is a key componen. As stated in the Paris Agreement, increasing the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway are deemed instrumental. And to do so, appropriate mobilization and provision of financial resources, transfer of new technology framework as well as knowledge must be put in place, in line with the national objectives of the receiving countries.

5.1 Financial Resources

Countries will require substantial financial resources in order to achieve the target included in their NDCs. Only six countries in the SEMed region communicated their anticipated financing needs in their NDCs, as presented in the table below. However, to present a quantitative analysis of financial resources and mechanism of the remaining countries, research to an extent beyond the scope of this study is demanded. Also, further research has provided information and numbers that are deemed to be inaccurate, even as approximations.

Table 41: Financing needs to achieve the NDCs target of SEMed countries[136] (Source: Author's elaboration[137])

Countries	Financing needs
Egypt	At least 73,04 billion US$
Jordan	To achieve 14% conditional emission reduction, financing need is totaling 5,7 billion US$. The Government of Jordan has already secured 542,750,000 US$ by its own means to meet the unconditional target
Mauritania	Mitigation: 8,2 billion US$ Adaptation: 9,4 billion US$
Morocco	Mitigation: 24 – 50 billion US$
State of Palestine	Adaptation: 3,5 billion US$ Mitigation: 10,6 billion US$
Tunisia	Mitigation: 18 billion US$ Adaptation: 2 billion US$

To this end, this section presents a summary of the major financial sources communicated by the SEMed countries, including:

1. ***National/Public Budget*** serves as the first option in financing climate projects. However, fiscal capacity of the government budget oftentimes limits the extent of the implementation of projects in mitigating and adapting to climate change. Country's budget serves as own contribution and is a prerequisite when applying for international support. Simultaneously, such contributions enhance project ownership.

[136] Information is gathered from the initial analysis of the SEMed countries NDCs

[137] Accelerating carbon market development in Southern and Eastern Mediterranean Countries (SEMED), South Pole, 2016, Retrieved from: https://www.southpole.com/uploads/media/160705-press-release-spg-semed-eng.pdf

At the present moment, substantial portion of national budget is still often allocated for infrastructural projects, but not necessarily for green infrastructure. And therefore, mainstreaming of climate change into national/sectoral plans is key. Integration of climate actions in the countries' development plans will create fiscal room to finance green projects. Moreover, it is imperative for SEMed countries to ensure a functioning climate finance governance framework and the corresponding institutional structures and processes. The absence of such a framework has proven to impede development, and later on execution, of climate related projects/programmes.

2. **Private sector contribution** (national and international investors) is being leveraged by the SEMed countries in the view of spurring investments in climate related projects. The amount of private investment for climate related project is growing in the SEMed countries, especially in the energy sector. In fact, the involvement of the private sector in energy projects in some SEMed countries, are a prove of successful private sector contribution. Enabling a better climate for private investment is imperative. This encompasses, increasing awareness of the general public of the impacts of climate change, improving business environment (i.e. ease in doing business) as well as refining regulatory framework for Public Private Partnership schemes. Moreover, private sector involvement shall not be limited in financial contribution but also in terms of technology transfer.
3. Implementation of the **international market-based mechanism for carbon trade**, is a key priority communicated by the countries in the SEMed region. These programs are mentioned in the NDCs of the countries as a tool that will support them in their transition to low carbon economies. In this context, there are some initiatives such as EBRD's Carbon Crediting Approach in SEMed directed at Egypt, Jordan, Morocco and Tunisia. However, this type of financial source still needs to be further explored.
4. **NAMAs** include a wide range of different approaches to mitigation actions, including implementation of policies, programmes and individual projects, or specific changes in the national economy to reduce greenhouse gas emissions. There are two types of NAMAs: (i) unilateral: mitigation actions are carried out using country's own efforts; (ii) supported: mitigation actions are carried out by utilizing supports from Annex 1 countries in terms of finance, technology and capacity building.
5. All SEMed countries have access to obtain **International support**, from numerous bilateral and multilateral development banks and international funds to combat climate change. The UfM publications on Climate Finance in the SEMed region provide a good overview on the international climate finance flows and options for the region. It includes, information on the funding agencies, eligibility criteria and the corresponding sectorial projects to be financed.[138] Thus, such analysis is not included in this report.

   The overall challenges in tapping funds from different sources lie mainly on the national capacity. To develop a funding proposal with well-designed climate actions (particularly large-scale (investment) projects/programmes), is deemed challenging, especially when data and information are limited. Some countries are more successful in accessing climate finance, e.g. Turkey and Morocco, potentially due to better infrastructure and governance frameworks.[139] whereas others have more difficulties.

[138] The initial report is available at: https://ufmsecretariat.org/wp-content/uploads/2017/11/UfM-Climate-Finance-Study.pdf. Whereas the updated one is available at: https://ufmsecretariat.org/wp-content/uploads/2018/12/UfM-Climate-Finance-Study-2018.pdf

[139] Climate Finance Study UfM 2016

Furthermore, it is important to establish a working system for monitoring climate actions, as well as for evaluating and adjusting them. Such systems are crucial for success and also for attracting further international investment and finance.

As follows are some recommendations for further reflection and possible action to improve actions in this area:

- **Build strong partnerships with development partners and search for innovative means of financing (i.e.: blended finance) in addition to financial assistance from external sources in the traditional manner such as grants and concessional loans from international organisations**
- **Strengthen countries' capacities to access financial mechanisms to further develop the proposed actions identified in the NDCs.**
- **Identify successful experiences that have been financed with public funds, and take measures to replicate them.**
- **Consider carbon markets and carbon pricing, including positive and negative incentives**
- **Cost out climate change measures and determine the finance gap**
- **Identify co-benefits and potential savings; integrate the cost of negative externalities and explore other incentives such as public recognition**
- **Identify ways to integrate climate risks need into the national financial strategy**
- **Integrate NDC targets and proposed actions into national development planning and strategies**
- **Raise awareness among decision makers and integrate a climate perspective into public investment seeking to achieve budgetary synergies across investments.**
- **Revisit existing portfolios of the line of credits with relevant financial institutions, such as regional banks, to analyse any adjustments that may be required to support new priorities.**

5.2 Technology transfer and capacity building

The SEMed region is characterized by large disparities across countries in science, technology and innovation, although they play a vital role in supporting sustainable development and driving growth and productivity. They are core to developing and implementing adaptation and mitigation strategies. Climate change is high on SEMEd countries' political agenda. But climate change strategies must be based on reliable scientific evidence, and therefore It is crucial to bridge these gaps and address the digital divide, to enable member member States, particularly countries with special needs, to take advantage of technologies, and to nurture an innovative environment. SEMed countries' governments are starting to reflect the scientific evidence on environmental risks across the SEMed region, but continuous improvement is still required. It is of prime importance to strengthen the capacities of scientific research and research and development institutions in various areas related to climate change.

There is a need for a greater level of awareness and knowledge about the impacts of climate change among decision-makers and the general public to enable a systemic response and build resilience. Environmental education must be improved, embracing all segments of demography, i.e. men, women, children and adults. And in targeting younger generation, topic such as climate change or climate emergencies should be incorporated to a greater extent into the primary, secondary and higher education curricula. Moreover, for the general public, focus must be given on supporting organizations and communities to respond to the impacts of climate change.

Furthermore, it is necessary to ensure that the level of qualifications, specialization and expertise of institutions and all bodies involved in major risk prevention and disaster management is raised. Setting up an information platform, training and awareness-raising activities on climate change aimed at all stakeholders (political decision-makers, economic operators and the general public) is essential. These programs are expected to improve the ability of these actors to respond to the changing climate, and

furthermore to communicate, network and formulate their needs by targeting appropriate sources of funding. Essentially, capacity building in the SEMed region is needed in the following areas:

- **Project preparation, including design and proposal writing**
- **MRV, including development and maintenance of databases**
- **Guidance of best available technologies for mitigation and adaptation**
- **Best practices for verification for quality and transparency**

Increasing the number of regional thematic meetings (exchange of information and experience) is also essential to serve the need for learning process. And aligned with its mission in enhancing regional cooperation, dialogue and the implementation of concrete projects and initiatives, UfM may facilitate this exchange processes.

6 Selected cases

The following section of the report outlines potential cases for joint approaches that could be develop in detail by the countries in order to reach their pledges and therefore the Paris Agreement. The following joint approaches are based on prioritized measures from submitted NDCs (and NAPs, when relevant) that are important to specific sectors. These measures represent potential opportunities for action for the UfM and its Member States.

The cases presented in this report, should not be considered an exhaustive list of specific sector-relevant actions that countries plan to undertake, as many countries do not fully list all potential domestic activities. Furthermore, the information included in the description of the cases is limited to the details provided in the NDCs.

The main objective of the cases in this report is to provide concrete examples of how the identified sectorial measures provided in the previous chapters can be used either by UfM and it Member States, but also by other stakeholders in order to pursuing a forward looking dialogue on action to tackle climate change in the Mediterranean region and in the context of the UN Framework Convention on Climate Change.

Consistently with the overall purpose and scope of this report, the cases presented here include actions that can be further developed to assist member countries (or a group of member countries) on initiatives favoring the climate change agenda.

In total 4 cases are presented: 2 cases showcasing only mitigation measures, 1 case including mitigation and adaptation measures and 1 case showcasing only adaptation measures. It is very important to highlight that the selection of these cases does not follow any type of preferences, priority or ranking by the UfM Secretariat nor the consultants. The selection is based mainly on:

- **the number of countries that have the same goals**
- **showcasing different lines of potential developments**
- **representing different sub-regions of the SEMed countries**

The cases should be seen only as illustrations on how to proceed with the repository of sectoral measures provided in the report. The exercise of developing a detailed initiative (either for investment or technical assistance) involving several countries, requires not only meticulous planning and analysis of information beyond the information included in the NDCs, but also and foremost the participation of the countries concerned in the case. Furthermore, it is important to take into account, that these cases could be applied to countries in different regions. Countries mentioned in the example cases are those countries which have clearly communicated these needs in their NDCs.

There are many benefits to be gained from working together in joint approaches in order to optimize synergies, such as easier knowledge transfer and partnerships, such as: (non-exhaustive list)

- **As the Governments of the SEMed region respond to the changed climate conditions and challenges there is clear potential for strong collaborative action to enhance the efficiency of the region's development as well as ensure environmental protection and ensure that sufficient and appropriate skills are in place to encourage sustainable growth.**
- **Countries that participate in initiatives based on collaboration and exchange on shared areas of interest benefit from each other's experience and help parties make optimal choices on the basis of robust regional information. Strong collaboration on the climate change front will help Governments in the SEMed region understand better the extent to which the region's climate actions work cohesively together. It will also provide the best footing to help mutually help the necessary capacity to combat climate change.**
- **Joint approaches can be designed to developed large programmatic approaches that go beyond the scope of an individual project and is implemented for a longer term. Programmatic approaches tend to be more attractive to investors and donors.**
- **Environmental co-benefits, including GHG reduction, applies to all cases in this report, considering that these are cases addressing climate change**

6.1 Energy Efficiency and Renewable Energy / Green Buildings - Mitigation

Energy has become one of the key issues of the day on the global, regional and national agenda. There are a number of factors that have contributed to the raising profile of energy: the negative consequences of climate change that are having an increasingly obvious effect on global growth and development; limited deposits of natural resources and the growing competition and prices; and regional conflicts over natural resources.

The SEMed countries, an integral part of the global and Mediterranean system, are also facing challenges to ensure sustainability, both in general development and in the energy sector. This fact is clearly reflected in the analysis presented in this report, which demonstrates that the SEMed countries choose the energy sector as their top priority. The energy sector is not only included across the NDCs of all 13 countries, but it is also covered in further documents such as NAMAS and National Communications among others. The energy section of SEMed countries' NDCs include several measures such as: promotion of renewable and safe energy, the use of local renewable sources, increased energy efficiency and the nexus of energy and transportation among others.

As presented in the table 9, among the various measures prioritized in this sector, those aiming at promoting energy efficiency and renewable energy in buildings/green buildings are among the most common. Specifically, 7 countries include them in their official documents, namely: Montenegro, Morocco, Israel, the State of Palestine, Tunisia, Jordan and Turkey.

The understanding of this need, results in the following case on this matter.

Case 1

Name of the approach:
Greening Buildings and Communities

Description of the approach:

Buildings are central to national, regional and global commitments to combat climate change as the emissions caused in this sector are major burden for the environment.

Building energy efficiency has been communicated by countries in the SEMed region and specifically call out building energy codes/ strategies/standard, indicating the importance of building energy to the climate future. Therefore, the suggested project will focus on strengthening energy efficiency building code/strategies, developing local capacities, building certification system and monitoring of energy and GHG savings.

The ultimate objective of the project is to reduce energy consumption and associated GHG emission in the respective countries' building sector and the main project outcomes could include:

- **Improve energy performance by setting up and updating building codes**
- **Improve enforcement levels of mandatory energy efficiency building codes**
- **Promote best energy efficiency design and building practices in construction sector**
- **Implement monitoring of building energy consumption and GHG emissions**

This project combines measures related to energy efficiency in new buildings and already existing buildings. Some countries such as Turkey have already advance significantly with their programs promoting energy efficiency. Israel, has a well-developed green building code set up. A regional joint approach would allow the countries involved to share their experiences and thereby learn from each other not only how to set up these strategies/codes, but also how to enforce them. Also, countries that start working in this field can gain knowledge on the actual process to implement energy efficiency related measures, how raise awareness and how to engage other actors that are relevant in the sector.

This type of approach will result not only in reduction of GHG emissions, but also will induce socio economic benefits such as:

- **creation of jobs in the construction sector and related sectors such as building materials, renewable energy suppliers, repair and service sectors, energy auditor services, and**
- **better health due to reduced levels of indoor and outdoor pollution**

Building codes are acknowledged by all countries. Also, in some countries there are already established agencies working on this subject (i.e.: Algeria, Turkey, Israel).

These are elements that should be considered as they could certainly favor the implementation of the project.

Potential countries involved:

Albania, Algeria, Egypt, Montenegro, Morocco, Israel, State of Palestine, Tunisia, Jordan and Turkey

Contribution to Global and Regional Agreements

- **SDG 13, SDG 9, SDG 8**
- **UfM Ministerial Declaration on Energy**
- **UfM Ministerial Declaration on Environment and Climate Change**
- **Barcelona Convention, Mediterranean Strategy for Sustainable Development**
- **Covenant of Majors (support to sustainable energy access and climate action plans in the MED)**
- **Corresponding regulatory requirements and legislation of each country involved**

Financial resources • **Public budget** • **Leveraging private sector investment** • **Multilateral funds and programs such as, for example, the Clean Technology Fund, GEF Trust Fund, Global Climate Partnership Fund, Green Climate Fund (GCF) etc.** • **Bilateral funds and programs such as, for example, International Climate Initiative (ICI), French Global Environment Facility, International Climate Fund (ICF), etc.** • **Further bilateral and multilateral financial instruments such as, for example, technical assistance grants, project development grants, loan softening programs, concessional loans, etc.** Further details on the various financing options in the region can be obtained from the publications 'Climate Finance Study' and 'Improving access to climate finance flows' published by the UfM Secretariat
Aspects that need to be considered for the implementation • **The building market is diverse and characterized by fragmentation into various players like builders and developers. The complexity of interaction among those players represents a significant challenge** • **Limited availability of energy efficient equipment/materials in the local marketplace** • **Initial high cost of energy efficient materials and technology. High upfront investment.** • **Limited technical skills** • **Limited knowledge on innovative and appropriate technologies and their performance** • **Lack of awareness** • **Need for in-country certified energy auditors and required energy related data management**

6.2 Waste collection, recycling and reuse - Mitigation

Solid waste generation is a major problem in the developed and developing countries over the world. In addition, poor waste management is considered a major environmental problem, also in the SEMed region. The challenge of waste management is exacerbated in urban areas, due to the high rate of urbanization and urban population.

The analysis in the previous chapters shows the relevance of this sector for the SEMed countries. Out of the 13 countries included in this study, 12 countries (Albania as an exception) do mention the waste sector as one of their priorities in their NDCs, although this sector contributes only 7% of the total GHG in the region. This is mainly due to the increasing concern about marine litter in the last decades. The Mediterranean basin is strongly affected by the presence of litter ending up in its waters affecting ecological, social and economic domains. Hence, countries in the SEMed region strongly focus on measures related to the grouping 'waste collection, recycling and management projects that recover or reuse materials and waste as inputs into new products or as a resource'.

The following case provides an illustration.

Case 2

Name of the approach: Waste without borders – An approach on waste collection, recycling and reuse

Description of the approach:

Even though policy makers are increasingly responding to rapidly growing waste streams, especially plastics and marine litter, this response has taken shape by single country action and proposals, leading to a patchwork of different policies in place or under development.

In the first stage, this approach aims to conduct a need and policy assessment, including a stakeholder analysis, their roles and functions in correspondence to the policy framework relevant to the production, usage and disposal of waste materials. Based on this assessment it will support future developments in the field of waste policies and legislation from a holistic point of view. Key objectives of this approach include improving harmonization of the instruments used in waste management policy approaches, resulting in a reduction of marine litter as a co-benefit. Further component that will be considered are compliance and enforcement.

As a result of the need and policy assessment, in the second stage, the aim is to implement a integrated solid waste management approach tailored to needs of the countries involved in the project. The main outcomes include:

- **Improved coverage of waste collection, including the method of waste collection**
- **Improved waste sorting mechanism**
- **Improved system that incentivizes reuse, recycle as well as composting**
- **Improved landfill practices and/or establishment of new landfill facilities**
- **Methane capture, including methane gas generation from landfill**

Overall, the countries involved in this approach will look into optimizing waste policies, waste take back and collection systems, policy response to circular economy and institutional cooperation in the field of transboundary movements of waste.

In addition to the environmental benefits, this approach offers an opportunity to produce methane as an alternative energy source as well as fertilizer material from the composting process. Furthermore, the implementation of an integrated solid waste management approach can have a significant positive impact in in our effort to combat marine litter.

Countries have started to promote recycling activities. And they are aware that the collection services are not always efficient and opportunities exist to save on cost, which would also result in less energy use. These are favorable circumstances allowing the implementation of this approach to be manageable.

Potential countries involved:

Algeria, Bosnia and Herzegovina, Egypt, Israel, Jordan, Montenegro, Morocco, and Turkey

Contribution to Global and Regional Agreements

- **SDG 13, SDG SDG 12, SDG 14, SDG 3 and SDG 8**
- **Barcelona Convention**
- **UfM Ministerial Declaration on Environment and Climate Change**
- **EC Strategy for Plastics**
- **Circular Economy Action Plan**
- **Corresponding regulatory requirements and legislation of each country involved**

Financial resources • **Public budget** • **Leveraging private sector investment** • **Multilateral funds and programs such as, for example, the Clean Technology Fund, GEF Trust Fund, Global Climate Partnership Fund, Green Climate Fund (GCF) etc.** • **Bilateral funds and programs such as, for example, International Climate Initiative (ICI), French Global Environment Facility, International Climate Fund (ICF), etc.** • **Further bilateral and multilateral financial instruments such as, for example, technical assistance grants, project development grants, loan softening programs, concessional loans, etc.** Further details on the various financing options in the region can be obtained from the publications 'Climate Finance Study' and 'Improving access to climate finance flows' published by the UfM Secretariat
Aspects that need to be considered for the implementation • **There is limited awareness on waste separation itself, resulting in essentially all household waste being landfilled and very little recycling or treatment.** • **Overall, there is limited awareness about enhanced environmental responsibility among the general public, the business sector and civil society.** • **Limited technical skills and know-how and financial constraints to operate waste take back and collection facilities** • **Lack of implementation and/or compliance of legislation** • **Limited availability of good and reliable sector data**

6.3 Agriculture and Water re-use – Mitigation and Adaptation

The water sector in the face of climate change, as an interaction between the whole economy and the environment, is an example that demands action. As presented previously in the report, governments across the SEMed countries are aware of the climate change model predictions for their countries and consequently the effects to be occurring in the near and far future: water scarcity, overexploitation of groundwater resources, more frequent and severe droughts, disturbances in the water cycle. These challenges will, among other things, have a direct impact on the agricultural sector and, consequently, on the agricultural crop yields in the region. Taking that into consideration, a dynamic nexus between the water and the agricultural sector can provide a means to address the priorities included in the NDCs of the UfM member states, especially the SEMed countries.

SEMed countries recognize the relevance of the water sector in the adaptation domain and the agriculture sector in the mitigation domain. Hence, measures looking to enhance adaptation capacities and guarantee management of water demand through water reuse in particular for agriculture and green space purposes are prioritized in the NDCs and NAPs of: Albania, Algeria, Israel, Jordan, Lebanon, State of Palestine and Tunisia. Similarly, the results section from the mitigation part of the agriculture sector include measures that aim at improving cropland management to reduce emissions through water management, agroforestry, etc. The countries referring to those measures are: Albania, Algeria Egypt, Jordan, Lebanon, Tunisia and Turkey.

Following this line, the following case exemplifies a potential approach to the water and agriculture Nexus.

Case 3

Name of the approach:

Agriculture and Water re-use practices

Description of the approach:

The promotion of water and wastewater re-use techniques as an alternative source of water supply for irrigation is an important approach to face water stress, especially in the context of the agricultural sector. Also, water re-use can contribute to the reduction of pressure on water bodies.

Re-use of waste water can be especially interesting not only visa-vis the general public but also in the context of interaction between urban and agricultural water use. Waste water which is generated and also collected in the urban context, can be diverted to be used for agricultural irrigation and/or irrigation of parks, garden and public greens. Certainly, appropriate treatment is a basic precondition.

The approach involves collaboration and exchange components with other Mediterranean countries of the northern basin that count with the relevant experience in this area. Those countries can provide not only technical expertise, but also policy advise.

Furthermore, by means of targeted awareness measures, the wider public and farmers will receive the necessary information the latest information to secure their participation in the system and overcome misconceptions in relation to the approach.

The project's major objective is to define basic application methodologies from a technical point of view and to provide standards and samples for development that can assist in promoting water re-use strategies and technologies, particularly in the agricultural sector.

Specifically, this approach includes the following benefits:

- **Water reuse can provide urban areas with an opportunity for pollution abatement**
- **Wastewater includes some beneficial components for agriculture such as nitrate and phosphates**
- **Control pollution from wastewater**

At the same time special attention should be given to the fact that, wastewater re-use could entail risks such as microbial and chemical risks to public health, to plant health and environmental risks

Water re-use has become an attractive option for conserving and extending available water supplies. Wastewater is also an attractive source of water for agriculture. These are critical elements that support the implementation of this approach.

Potential countries involved:

Albania, Algeria Egypt, Jordan, Lebanon, State of Palestine, Tunisia and Turkey

Contribution to Global and Regional Agreements

- **SDG 13, SDG 15, SDG 3 and SDG 6**
- **Convention on Biological Diversity**
- **Barcelona Convention**
- **UfM Ministerial Declaration on Environment and Climate Change**
- **Ministerial Declaration on the UfM Water Agenda**
- **Corresponding regulatory requirements and legislation of each country involved**

Financial resources • **Public fund** • **Multilateral funds and programs such as, for example, the Clean Technology Fund, GEF Trust Fund, Global Climate Partnership Fund, Green Climate Fund (GCF), etc.** • **Bilateral funds and programs such as, for example, International Climate Initiative (ICI), French Global Environment Facility, International Climate Fund (ICF), etc.** • **Further bilateral and multilateral financial instruments such as, for example, technical assistance grants, project development grants, loan softening programs, concessional loans, etc.** Further details on the various financing options in the region can be obtained from the publications 'Climate Finance Study' and 'Improving access to climate finance flows' published by the UfM Secretariat. Financial contribution from the private sector could also be an option that should be explored.
Aspects that need to be considered for the implementation • **The lack of wastewater treatment plants** • **A large effort will be required to develop a cultural acceptance, as it is a key problem** • **Lack of explicit regulatory framework at regional level which would provide standards about what water can be used and with which level of treatment** • **Different uses may require different standards and not all crops may be irrigated with wastewater treated to a given standard**

6.4 Urban Development and Tourism – Adaptation

The rapid urbanization in the SEMed region requires an integrated perspective on urban planning and management, which is also able to foster synergies between sectors. In addition, countries in the SEMed region have become a tourist destination, attracting large volumes of tourists to the region. This situation, however, does only contribute to the development of the region but also results in severe environmental damage and further overexploitation of resources. In order to enhance long-term benefits for the region as well as for local communities, urban development policies need to stimulate economic development, including one of the largest income generator for the region, tourism.

Considering the measures prioritized in the NDCs for the tourism and urban development sector, an interesting approach can be combining the measures 'develop sound spatial strategy and plans, based on the scenario for the optimal regional distribution of population and economic activities within the geographical boundaries, by taking climate change into consideration' and 'conducting vulnerability assessment study to better understand the current and projected vulnerability, as well as the associated risks of the tourism sector' into an urban development-tourism nexus. Countries that prioritized these measured in their NDCs are: Egypt, Tunisia, Jordan and Morocco.

The following case illustrates an urban development-tourism nexus approach.

Case 4

Name of the approach: Mapping Climate Change Vulnerability and Impact Scenarios

Description of the approach:

Climate change is a serious challenge for cities around the world, particularly in regions, such as the SEMed region, where urbanization is happening at neck breaking speed. It threatens to increase vulnerabilities, destroy economic gains, and hinder social and economic development. At the same time, tourism is one of the cornerstones of the region's economy. The sector contributes significantly to the total GDP and accounts for a large share of employment. Egypt, Tunisia, Jordan and Morocco represent the countries that do not only receive the largest number of tourists per year, but also are among the most urbanized countries in the region.

One of the main challenges facing the tourism industry is related to the lack of urban land planning and land use regulation which results in uncoordinated, inadequate urban development, land erosion, and land use conflict. In order to design appropriate response plans that incorporate climate change (and especially adaptation options), it is necessary to know how climate change is currently impacting, and is likely to impact more in the future urban areas and ecosystems. With a proper vulnerability analysis of urban and peri-urban areas, decision makers will count on the basic tools that will allow them to assess and discuss potential adaptation options that are targeted and designed on specific populations and their livelihoods.

This approach will seek to quantify climate risks in major urban areas in Egypt, Tunisia, Jordan and Morocco by carrying out a vulnerability analysis. This analysis will form the basis for prioritizing and designing adaptation actions to increase the resilience of urban infrastructure and livelihoods in urban and peri-urban areas. The aim of this project is to provide a climate-resilient urban plan and at the same time climate-proofing for each of the selected urban areas in the four countries. The ultimate goal will be to deliver a sustainable process, which will provide a system for regularly updated vulnerability assessments and plans, a venue for public participation, and ongoing climate-informed, analytically based decision-making.

The approach offers specific benefits such as:

- **Provides suggested adaptation actions for urban areas leading to lower vulnerabilities**
- **Replicability. The approach can potentially be recommended to other areas in the same countries or other countries of the region**
- **Countries integrate climate change adaptation issues into their planning and policies related to tourism as a result of the project**
- **Countries will integrate climate change adaptation into sectoral planning in an economy-wide approach**
- **Protects the tourism sector from climate change threats**

Potential countries involved:

Egypt, Tunisia, Jordan and Morocco

Contribution to Global and Regional Agreements

- **SDG 13,**
- **Barcelona Convention**
- **UfM Ministerial Declaration on Environment and Climate Change**
- **UfM Ministerial Declaration on Blue Economy**
- **Ministerial Declaration on the UfM Water Agenda**
- **UfM Ministerial Declaration on Sustainable Urban Development**
- **Corresponding regulatory requirements and legislation of each country involved**

Financial resources • **Public funding** • **Leveraging private investment** • **Multilateral funds and programs such as, for example, the Clean Technology Fund, GEF Trust Fund, Global Climate Partnership Fund, Green Climate Fund (GCF), etc.** • **Bilateral funds and programs such as, for example, International Climate Initiative (ICI), French Global Environment Facility, International Climate Fund (ICF), etc.** • **Further bilateral and multilateral financial instruments such as, for example, technical assistance grants, project development grants, loan softening programs, concessional loans, etc.** Further details on the various financing options in the region can be obtained from the publications 'Climate Finance Study' and 'Improving access to climate finance flows' published by the UfM Secretariat
Aspects that need to be considered for the implementation • **Data is either not available (or difficult to access) or of poor quality** • **Limited effective cross-ministerial coordinating mechanisms** • **Competing mandates and poor coordination between government agencies/ministries can disrupt project activities** • **Country (ies) affected by climate extreme during project implementation** • **Risk of policy recommendations not adopted by policy makers** Lack of law enforcement – There are spots – start to develop – even though there is a high risk area

7 Final reflections

The results presented in this report clearly show that there are commonalities as well as important differences between the priority sectors and the mitigation and adaptation measures included in the countries' NDCs. A few sectors stand out in all countries, especially when it comes to sectors related to food, water and energy security, addressed through specific mitigation and adaptation measures.

The use of renewable forms of energy, in particular solar and wind, is included in almost all countries mitigation component. This is also the case, for example, for measures, such as the promotions of mass public transport, use of biofuels, introduction of policies on energy efficiency and reforestation/afforestation activities.

In the adaptation component, an apparent commonality is the focus on 'hard adaptation measures' related to the water and agriculture sector. Countries are concentrating in dealing with water scarcity issues, not only in terms of clean water supply and agricultural irrigation, but also to assure continuous supply of energy through hydropower plant. Furthermore, there is also an apparent interconnectedness of the development (or even the decline) of tourism sector with urban development and state of biodiversity in the region.

Moreover, strong linkages are not only shown among sectors, but also among different measures within one sector or even cross sectoral. To this end, when designing joint approaches, it is imperative to take into account how and in which way the sectors and measures are related. This will allow formulation of holistic projects or a nexus, with more sustainable results, and providing wider effects to human and nature. Furthermore, given the different state of countries' experiences on the various measures, it is

important to advocate cooperation and promote the sharing of experiences, lessons learned and good practices among the countries.

This report focuses on the sector analysis of NDCs documents and illustrates the situation of each sector, providing information about current sectoral measures to reach national contributions. The results provide an overview to UfM and other stakeholders on what kind of measures are prioritized and where are the potentials for regional cooperation. Also, gaps in the reported measures by the Parties can be seen as opportunities for updating the NDCs until 2020.

The cases developed to exemplify potential regional joint approaches aim at demonstrating the need for regional and transboundary cooperation in the areas of mitigation and adaptation as well as within the context of increase in energy efficiency and use of renewable energy, agriculture, water, tourism, urban development and reduction of waste materials.

Common visions, strategies and partnerships are needed in order to achieve truly integrated and successful approaches that promote low emissions growth and build climate-resilient societies. This can be done through technical assistance with regards to capacity development and technology transfer, but also through investments and public-private-partnerships. And in accordance with the Paris Agreement (Article 9,10 and 11) developed countries are obliged to support the efforts of developing country Parties to build clean, climate-resilient futures, while encouraging voluntary contributions by other Parties, through provision of finance, technical assistance, technology development as well as transfer and building capacity.

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