First Mediterranean Assessment Report – Chapter 5.1: Society – Development

Maria Dos Santos, Stefano Moncada, Antonietta Elia, Manolis Grillakis, Nathalie Hilmi

5 SOCIETY
1-DEVELOPMENT

Coordinating Lead Authors:
Maria dos Santos *(Portugal),* **Stefano Moncada** *(Malta)*

Lead Authors:
Antonietta Elia *(Spain/Italy),* **Manolis Grillakis** *(Greece),* **Nathalie Hilmi** *(Monaco)*

Contributing Authors:
Shekoofeh Farahmand *(Iran),* **Walid Marrouch** *(Lebanon),* **Alain Safa** *(France),* **Brice Teisserenc** *(France)*

This chapter should be cited as: Dos Santos M, Moncada S, Elia A, Grillakis M, Hilmi N 2020 Development. In: Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report *[Cramer W, Guiot J, Marini K (eds.)] Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, pp. 469-492, doi:10.5281/zenodo.7101111.*

Table of contents

5.1 Development

Executive summary

Sustainable development seeks to address the needs of current and future generations with the objective of increasing well-being by balancing economic, social and environmental dimensions. Current unsustainable development patterns, such as poverty, increasing population pressure, agricultural intensification, land degradation, and air, land, rivers and ocean pollution, will be further exacerbated by climate change impacts.

Environmental and climate change impacts are likely to have an effect on all economic sectors in the Mediterranean Basin, increasing production challenges and costs, affecting low-income cohorts increasingly disproportionally, and generally delaying the achievement of the Sustainable Development Goals (SDGs).

Rising temperatures, with more intense and longer heatwaves, and decreasing rainfall patterns, can exert a further strain on important sectors, such as agriculture and tourism, which represent important cultural, economic and heritage assets for Mediterranean economies and societies.

The existence of poverty, inequalities and gender imbalances relate both directly and indirectly to the challenges faced by Mediterranean countries in achieving the SDGs, with current and predicted environmental and climate change impacts threatening the progress made to date in many areas of the Mediterranean Basin. To address these challenges, a new approach to development must be sought in order to eliminate poverty, sustain economic growth and ensure social protection, while safeguarding environmental standards and integrating mainstream climate change adaptation into policy making.

The growing challenges of environmental and climate change impacts on economies and societies require an enhanced institutional response, at a local, national and international level. Effective preventive and restorative policies, including the promotion of context-specific climate change mitigation and adaptation measures, and economic instruments encouraging behavioral changes, can ensure long-term sustainable development in the Mediterranean Basin.

5.1.1 Past trends and current situation

5.1.1.1 Sustainable development

Sustainable development seeks to address the needs of current and future generations, making it possible to access and use natural resources in an equitable manner both now and in the years to come (Zidanšek 2007; Szopik-Depczyńska et al. 2017; Kilkiș 2018). It sets the framework for securing viable and lasting development and decent livelihoods for all. It aims to promote a dynamic economy with high levels of employment and education, health protection, social and territorial cohesion and environmental protection in a peaceful and secure environment, while respecting cultural diversity (Bontoux and Bengtsson 2015, 2016). Successful societies are known to be built on economic, social and environmental sustainability (Dos Santos 2018; Dos Santos and Mota 2019), ensuring long-term sustainable development.

Traditionally, development has been associated exclusively with increases in income levels, and the conventional manner in which countries, including those located in the Mediterranean Basin, measure progress in development represented by Gross Domestic Product (GDP). While this measurement gives a good indication of the monetary value of the goods and services produced in a specific year, it fails to sufficiently capture other important dimensions of development, especially social and environmental ones. This is mostly due to the fact that GDP, among other things: i) does not capture inequalities in the distribution of income; ii) leaves out some activities (volunteer work) and does not record harmful activities (pollution, climate change); and iii) does not seem to improve well-being beyond certain levels of income (Briguglio 2019). The concept of development, and its measurement, vary. Among these, there is the Human Development Index (HDI), which captures three dimensions: income per capita, health and education (UNDP 2019). Another approach is the OECD better-life index which, along with traditional economic measurements includes other aspects such as quality of health and environmental services (OECD 2017). A further approach is that of measuring happiness. The United Nations Sustainable Development Solutions Network publishes the World Happiness Report annually (Helliwell et al. 2018). The report considers variables for measuring Gross National Happiness (GNH) which are: GDP per capita, social support, healthy life expectancy, freedom to

make life choices, generosity, and freedom from corruption. Its ultimate goal is happiness and to ensure a good quality life for the people through people-centric development initiatives. Each variable measured reveals a populated-weighted average score on a scale running from 0 to 10 that is tracked over time and compared against other countries. The ranking of Mediterranean countries for their GNH in 2018 varies significantly, from the highest for Israel (7.190), Malta (6.627) and France (6.488) to the lowest for Tunisia (4.592), Egypt (4.419) and Syria (3.466).

Using sustainability development indicators, it appears that for sustainable development, no sacrifices in happiness are required in the interest of future generations, as it is possible to design strategies that improve happiness and sustainability simultaneously (Zidanšek 2007).

The United Nations defines the sustainable development goals as the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The 17 Goals are all interconnected, and share the goal "to leave no one behind" (UN 2015).

All the European Union (EU) Member States (MS) in general, and all the countries around the Mediterranean Basin in particular, are facing increasing economic, social, environmental and institutional challenges. The way in which countries are responding to these challenges vary, also according to resource and governance levels. The EU has a considerable set of laws and regulations aimed at addressing environmental and climate change concerns, often making them a priority for all MS (Queralt et al. 2017). The heavily regulated environmental legislation within the EU has often been replicated in bilateral and regional agreements with countries in the Mediterranean Basin, in an attempt to commonly address transboundary concerns. Furthermore, the EU carbon emission reductions targets of 40% by 2030 and 80% by 2050, are increasingly producing spillover effects in other countries in the Mediterranean Basin, prompting the adoption of newer technology and the overall efficient use of energy and an improvement in carbon efficiency (Queralt et al. 2017).

5.1.1.2 The institutional framework

The growing challenges to harmonious development in the Mediterranean Basin have been duly recognized by national and international bodies, prompting an institutional response that eventually led to the creation of the Mediterranean Commission for Sustainable Development (UNEP-MCSD) in 1996. The aim of the MCSD is to provide a bridge between the desire to pursue sustainable development and its effective implementation. It offers a framework in which to define a Mediterranean Strategy for Sustainable Development (MSSD). The MSSD has the objective of pursuing sustainable development goals so as to strengthen peace, stability, and prosperity. The strategy is structured around objectives and interlinked priority fields of action. Specific indicators are also identified to properly monitor and evaluate the strategy. The strategy is regularly reviewed by the parties, and renewed every five years.

5.1.1.3 The economic dimension of sustainable development

Economic development and employment

Two out of three people are already living in the urban areas of Mediterranean countries, which is higher than the global average. The United Nations Human Settlements Programme predicts that by around 2050, the urban population will grow to around 170 million in the countries on the northern shore (140 million in 2005) and to over 300 million to the south and east where they the population was 151 million in 2005 (UNEP/MAP 2016).

Studies demonstrate several projected negative impacts of climate change on economic growth in Mediterranean countries. For instance, based on the severity of the Spanish drought of 1990, it is estimated that economic damages caused by droughts will exceed damages caused by earthquakes or floods (Handmer et al. 2012). Summer crops are particularly vulnerable (Giannakopoulos et al. 2009). As winters become milder while summers become warmer and longer, more cooling by air conditioning is needed in summer, that would increase the demand for electricity generation in most Mediterranean countries *(Section 3.3.3.6)* (Jacob et al. 2014; Kovats et al. 2014). Given that the existing infrastructure was implemented assuming a stable climate around the Mediterranean Basin (Scott et al. 2016a), climate change is making it a challenge for the economic infrastructure to adapt fast enough. This fact points out to the need for investments in adaptive infrastructure in the coming decades. Research and development might reduce the cost of adaptation (Arent et al. 2014).

The main economic sectors driving development in the Mediterranean coastal regions are resource-based activities (i.e., fisheries, aquaculture, forestry, agriculture, and primary industries), secondary industries (e.g., food processing, housing and construction) and services, especially tourism (UNEP/MAP-Plan Bleu 2009). Current and predicted environmental and climate change impacts are expected, especially in the absence of adaptation measures, to increase production costs and reduce productivity (Teotónio et al. 2020) in key sectors, exerting further pressure on economic development trajectories and employment levels in all countries of the Mediterranean Basin.

Tourism

The Mediterranean has a rich history as well as exceptional natural and cultural landscapes. Over 360 million tourists travelled to the Mediterranean region in 2017 – more than double the number recorded in 1995 (Mediterranean Growth Initiative 2017). In the past 20 years the contribution of the tourism sector to GDP has steadily increased by 60% in Mediterranean countries. It should be mentioned that while most Mediterranean countries have experienced significant economic growth in the sector, the vast majority of economic growth corresponds to north-western Mediterranean countries, such as Spain, France and Italy. However, the countries where the tourism sector contributes the highest percentage to the national GDP are Malta, Montenegro, Greece and Morocco (UNEP/MAP 2016). France, Spain and Italy account for 17% of inbound tourism worldwide, corresponding to 234 million people for these three countries alone, as they remain the most attractive of the Mediterranean in terms of numbers of visitors (UNWTO 2019).

In the recent past, Mediterranean coastal regions have been characterized as ideal in terms of climate comfort for outdoor activities, especially during the June to August period (Amelung et al. 2007; Grillakis et al. 2016b). Changes in climate can impact tourism flows, directly by affecting the thermal comfort for outdoor recreational activities (Salata et al. 2018), or indirectly by affecting the natural resources of the destination, such as coastal erosion due to sea level rise (Jiménez et al. 2017), or the reduction of freshwater availability. Given that most Mediterranean tourism is based, and marketed, on the basis of the "sun, sea and sand" model (Koutra and Karyopouli 2013), the socio-economic consequences of a drop in tourist numbers due to climate change impacts can be severe. As sea-level rise leads to coastal retreat, anticipation is needed in order to adapt to, and mitigate the economic impacts of sea-level rise on tourism and populations living in the affected areas (Enríquez et al. 2017).

Environmental degradation caused by climate change and human pressure can have serious impacts on Mediterranean tourism and, eventually decrease the economic benefits arising from this sector (Dogru et al. 2016). Some Mediterranean countries have started to adapt to the changes brought about by these negative impacts, by, for example, developing tourism strategies that try to attract visitors in the "shoulder months", and not focusing entirely on periods (i.e., Summer) where these impacts can affect demand (Niavis 2020). Overall, the vulnerability of tourism is higher in countries with lower adaptive capacity in terms of economic, social and political conditions (Dogru et al. 2016).

Tourism can also directly or indirectly be a driver of environmental and climate change impacts. This is the case, for example, when the lack of energy and water efficiency measures are put into place, exerting further pressure on local ecosystems (Drius et al. 2019) and increasing the cost of infrastructural maintenance. However, tourism could potentially play an important role in both creating jobs and fostering sustainable development in the Mediterranean, assuming that the right set of policies are adopted and well implemented for comprehensive achievement of the SDGs. According to the World Tourism Organization (UNWTO 2018), 64 countries submitted their Voluntary National Reviews (VNRs) in 2016 and 2017 on the SDGs. In these reports, tourism appears to be largely recognized as a high-impact sector with potential to advance all SDGs. 41 VNRs (64%) make one or more direct references to tourism. Tourism is most commonly mentioned in relation to SDG 8 (Decent work and economic growth), SDG 12 (Responsible consumption and production) and SDG 17 (Partnership for the goals) in VNRs on the SDGs among which Mediterranean Cyprus, France, Italy, Monaco, Slovenia, Montenegro and Egypt (UNTWO 2018).

Agriculture, fisheries and food security

International political and economic organizations have become aware that high and volatile food prices and deregulated markets put food security at risk and seriously affect global economic, social and political stability (FAO / IFAD / WFP 2011). The financial crisis in 2007 in the USA affected Mediterranean countries in 2008 and has led to instability in agricultural markets and a rise in

the prices of these goods (Dos Santos 2018; Dos Santos and Mota 2019).

Climate change is expected to threaten food security (see *Section 3.2*), especially livestock production and fisheries. Livestock production is an important contributor to the economy. Countries with a higher risk of livestock production being impacted by climate change (e.g., increase in diseases and consequences of higher temperature on animal health) are those which have lower adaptive capacity (Godber and Wall 2016).

Fisheries play an important role in the economy of Mediterranean countries. Total fish landings account for more than €3 billion yearly in the Mediterranean Sea, and including all the ancillaries services, this industry can reach an estimated value of around €10 billion yearly (Sacchi 2011). These values are likely to have been underestimated as significant portion of Mediterranean fish catches are not sold through regulated market outlets (Piante and Ody 2015), not to mention the cultural and tourism value that such an industry adds to local economies.

Economic activities and their impact on inequality, gender and poverty

The presence of poverty and income inequality is interconnected with economic growth (Galor and Zeira 1993; Ncube et al. 2014; Bruckner and Lederman 2015). According to the expectations of the UN SDGs, poverty, in both developed and developing countries, should be abolished by 2030. A priority of governments in this direction is the implementation of policies that enhance economic growth. However, given the tendency of the economic growth process to disproportionally exclude the lower income cohorts from accessing the benefits of new wealth, more equitable approaches to such wealth and social protection systems should be implemented, or enhanced.

These tendencies are confirmed by the data from the UNDP HDI (2019) when adjusted for inequality *(Box 5.1.1; Table 5.1),* showing that when considering the distribution of income, the HDI ranking for some countries drops and for others improves, which is likely to be associated with policies that try to address the problem of inequality.

The World Bank (2018) has used poverty lines to determine the headcount ratio and poverty gap. Four bases have been considered for poverty lines in order to determine the headcount ratio and poverty gap: 1.90 USD income per day, 3.20 USD income per day, 5.50 USD income per day, in addition to national poverty lines. Since there are many missing poverty data for some national poverty lines, the data are interpreted and countries are compared using standard poverty lines. Firstly, considering 1.90 USD a day as the poverty line, on average about 0.6% of the Mediterranean people are poor. The highest percent of the poor are in Italy, while the highest poverty gap is in Syria. Regarding this poverty line, there are no poor people in countries like France, Malta, Montenegro, Slovenia, Cyprus, and Lebanon. By increasing the poverty line to 3.20 USD, the highest percentage of the poor is in Egypt (16.1%), Syria (15.3%), and Albania (7.7%). In contrast, Slovenia and Cyprus have no such poor people and the percentage of people under this poverty line is low in France and Malta (0.2%). The largest poverty gaps are seen in Syria, Italy, and Albania. When 5.50 USD is used as the poverty line, both poverty percentages and poverty gap increase considerably in the region. Accordingly, the highest percentage of the poor lives in Egypt, Albania, and Morocco. Figures show that more than 60% of Egyptians have income of less than 5.50 USD per day. Also, most poverty gaps belong to the same countries. However, the percentage of people under the poverty line is low in France, Malta, and Slovenia.

Gender inequality indicators for Mediterranean countries, listed in UNDP human development reports, show a varied and complex situation. In the sample countries of the Mediterranean *(Box 5.1.2; Table 5.2),* Slovenia has the highest Gender Development Index (GDI), at 1.003 in 2017, which ranks it 18th out of 164 international countries in the 2017 index. This means that men and women have relatively the same achievement in three basic dimensions of human development. Croatia, France, and Cyprus are in the next positions in the region and have ranked 31st, 39th and 45th in the world. The last rank in the region belongs to Syria (ranked 159th in the world). The GDI value for Syria demonstrates that there is inequality in human development in favor of men. In fact, the human development index for Syrian men is almost 21% higher than for Syrian women.

For the Gender Inequality Index (GII), the highest value in the region is Slovenia (0.054), ranking it 7th out of 160 countries in the 2017 index. After Slovenia, Spain and France have the least gender inequality in the region and are ranked 15th and 16th in the world. According to the indicator, Syria has again the lowest place in the region and shows the highest gender inequality.

	HDI		INEQUALITY			
Country	HDI Value[a] (2018)	HDI Rank[a] (2018)	IHDI Value[a] (2018)	20:20 Ratio[b] (2010-2017)	Palma Ratio[b] (2011-2017)	Gini Index[b] (2011-2017)
SOUTHERN EUROPE						
Albania	0.791	67	0.705	4.25	1.0	29
Bosnia and Herzegovina	0.769	75	0.656	5.43	1.3	33
Croatia	0.837	46	0.768	5.26	1.1	31.1
France	0.891	26	0.809	5.18	1.3	32.7
Gibraltar	-	-	-	-	-	-
Greece	0.872	32	0.766	7.09	1.5	36
Italy	0.883	29	0.776	7.00	1.4	35.4
Malta	0.885	28	0.815	4.48	1.1	29.4
Monaco	-	-	-	-	-	-
Montenegro	0.816	52	0.746	4.77	1.2	31.9
Portugal	0.850	40	0.742			
Slovenia	0.902	24	0.858	3.66	0.9	25.4
Spain	0.893	25	0.765	7.26	1.5	36.2
Turkey	0.806	59	0.675	8.47	2.1	41.9
LEVANTINE REGION						
Cyprus	0.873	31	0.788	5.33	1.4	34
Israel	0.906	22	0.809	8.50	2.0	38.9
Jordan	0.723	102	0.617			
Lebanon	0.730	93	..	5.06	1.2	31.8
Palestine	0.690	119	0.597	..	1.4	34.4
Syrian Arab Republic	0.549	154	..	..	..	..
NORTHERN AFRICA						
Algeria	0.759	82	0.604	3.96	1.0	27.6
Egypt	0.700	116	0.492	4.56	1.3	31.8
Libya	0.708	110	-	-	-	-
Mauritania	0.527	161	0.358			
Morocco	0.671	121	-	7.02	2.0	39.5
Tunisia	0.739	91	0.585	5.24	1.5	32.8

Table 5.1 | Inequality indicators for Mediterranean countries
[a] Source: UNDP 2019 - [b] Source: World Bank 2019

The existence of poverty, inequalities and gender imbalances relate both directly and indirectly to the achievement of sustainable development goals in Mediterranean countries. Significant theoretical and applied research has shown that the presence of these imbalances, both relative and absolute, are obstacles to the expansion of economic development, de facto blocking parts of society from potentially enjoying the benefits of higher standards of living (Sen 1999; Sachs 2005). Moreover, the traditional way of measuring economic progress by only taking GDP into account, does not capture the problem in the first place, and the extent to which these imbalances permeate societies. The absence of this specific indicator, especially when measuring economic progress, does not bring about reaction or prevention from policy systems, therefore, overlooking the problems related to these distortions of the market economy.

	GDI			GII		
Country	Value[a] (2017)	Rank in Med	Rank in the world	Value[b] (2017)	Rank in Med	Rank in the world
SOUTHERN EUROPE						
Albania	0.970	7	67	0.238	13	52
Bosnia and Herzegovina	0.924	13	117	0.166	10	37
Croatia	0.991	2	31	0.124	8	29
France	0.987	3	39	0.083	3	16
Gibraltar	-	-	-	-	-	-
Greece	0.964	9	80	0.120	7	26
Italy	0.967	8	73	0.087	5	18
Malta	0.960	10	83	0.216	12	45
Monaco	-	-	-	-	-	-
Montenegro	0.956	11	88	0.132	9	32
Slovenia	1.003	1	18	0.054	1	7
Spain	0.979	5	51	0.080	2	15
Turkey	0.922	14	118	0.317	15	69
LEVANTINE REGION						
Cyprus	0.984	4	45	0.085	4	17
Israel	0.975	6	62	0.098	6	21
Lebanon	0.889	16	129	0.0381	16	85
Palestine (Gaza Strip)	0.877	17	132	-	-	-
Syrian Arab Republic	0.788	21	159	0.547	20	136
NORTHERN AFRICA						
Algeria	0.861	19	142	0.442	17	100
Egypt	0.873	18	135	0.449	18	101
Libya	0.929	12	112	0.170	11	38
Mauritania						
Morocco	0.838	20	151	0.482	19	119
Tunisia	0.897	15	125	0.298	14	63

Table 5.2 | Gender indicators for Mediterranean countries (UNDP 2019).
[a] Source: UNDP 2019 - [b] Source: World Bank 2019

5.1.1.4 The social dimension of sustainable development

Education is a fundamental prerequisite for addressing all issues related to Sustainable Development (SD). It creates the necessary enabling environment to enhance skills as well as individual and collective social commitment for the desired transformations, by also allowing for the creation of more sustainable societies (Voegtlin and Scherer 2017). Education can also support the development of better strategies for mitigating and adapting to climate change, thus promoting sustainable development (Anderson 2012).

Education for sustainable development (ESD) is an approach to teaching and learning based on the ideals and principles that underlie sustainability and applicable to all types, levels and settings of education. As such, ESD promotes multi-stakeholder social learning, emphasizes the empowerment of communities and citizens, engages with key issues such as human rights, poverty reduction, sustainable livelihoods, environmental education and gender equality in an integral way and encourages changes in behavior that will create a more sustainable future (Voegtlin and Scherer 2017).

A further important factor in the social dimension of sustainable development is participation. More active participation of the community, especially children and youth, as agents of change, can increase public authorities' understanding of problems, and facilitate the implementation of solutions among communities (Anderson 2012).

The removal of social imbalances, such as gender gaps in education and in salaries, can increase productivity and facilitate economic growth. The main results highlight that the educational gender gap hinders economic growth and development as a whole (Tansel and Güngör 2016; Minasyan et al. 2019). The majority of the results confirm a positive effect of female education on economic growth and development (Forbes 2000; Tansel and Güngör 2016).

5.1.2 Economic vulnerabilities and risks

Expected extreme climate conditions and pollution can enhance economic vulnerabilities and risks in the Mediterranean Basin *(Chapter 2).* In recent decades, a growing number of publications have identified and assessed how natural hazards occurring in the Mediterranean Region interact with its society and economy. This evidence is being produced on a sectoral level, with assessments of biodiversity, agriculture and cultural heritage systems (Palatnik and Lourenço Dias Nunes 2015; Fatorić and Seekamp 2017), according to the type of hazard (Llasat et al. 2013; Iglesias and Garrote 2014; Oliveira et al. 2018), or with a specific geographical scope (Schilling et al. 2012; Radhouane 2013; Monioudi et al. 2017). An underlying common denominator in the available literature seems to point towards the Mediterranean region experiencing a higher intensity of, and associated risks related to specific natural hazards than other European regions.

This seems to be the case of disastrous flash-floods, which are much more recurrent in some areas of the Mediterranean Basin, when compared to the rest of Europe *(Section 3.1.3.3)* (Llasat et al. 2010). These trends are confirmed by research that looked at flood event mortality in the eastern Mediterranean, which, when accounting for "high" number of causalities is higher, and for "no-deaths" is lower, than central Europe (Doocy et al. 2013). In selected areas of the Mediterranean Basin, the economic sectors more prone to be directly affected by floods are agriculture, followed by commerce and artisan trades, tourism, and industry (Llasat et al. 2013).

Current observations show an increase in drought events, and reduced soil moisture and groundwater availability (*Sections 3.1.3.1* and *3.1.3.4*). These impacts interact negatively, especially with the agricultural sector in the Mediterranean, threatening food security in rainfed yields (Tigkas and Tsakiris 2015) *(Section 3.1.2.2),* economic performance in terms of reduced wheat exports (Dellai and McCarl 2010) and livestock production (Blauhut et al. 2015). Combined with increasing population in Mediterranean countries, these impacts could intensify the problem of food security.

Changes to precipitation patterns and increased temperature *(Section 2.2.5.3),* can also affect the quantity and quality of grazing areas, directly impacting farmers' income, with a higher negative impact in non-EU Mediterranean countries, especially at the small-scale level (Abdul Malak et al. 2017).

The increase in sea temperatures and ocean acidification will likely have a negative impact on the fishery industry *(Section 3.2.2.2),* with these phenomena already linked to mass mortality events in the Mediterranean (Coma et al. 2009), affecting aquaculture by reducing available space to operate businesses (Bird et al. 2016), and potentially increasing mortality rates of the species cultivated, especially due to the increase in heat waves in summer (Rodrigues et al. 2015).

The economic vulnerabilities associated with sea-level rise and coastal erosion have received considerable attention in the Mediterranean region, also given the economic implications of tourism, which for some economies represents more than 30% of the aggregate GDP (Koutroulis et al. 2018a). Summer tourism in Mediterranean countries, which is based on beach holidays, can be threatened by hotter and drier summers, in turn affecting the comfort levels of tourists (Koutroulis et al. 2018b). However, the degree to which Mediterranean countries' tourism sectors might be affected by climate change is often a function of income levels, with the highest levels of vulnerability coming from the lowest income and least resilient countries (Dogru et al. 2019). The effect of sea level rise, together with changes in storm features can seriously affect port operations, slowing down trade operations and productivity levels (Sánchez-Arcilla et al. 2016).

Climate change is expected to cast a shadow of uncertainty over tourism in the Mediterranean. Uncertainties in the assessment of tourism de-

mand under future emission and socio-economic trajectories are subject to factors that affect the visitors' sensitivity to thermal comfort (age, type of tourism, country of origin) (Dubois and Ceron 2006; Dubois et al. 2016). Additional uncertainties stem from the adaptation and mitigation response to climate change (Koutroulis et al. 2018a), as well as the lack of integrated assessment that considers cross sectoral interactions to climate change (Scott et al. 2016b). Mediterranean summertime thermal comfort is expected to generally negatively affect tourism flows in the core summer tourism months of June to August (Amelung et al. 2007; Grillakis et al. 2016a). Improvement in the climate resource is expected for the same regions in the spring and autumn season (Amengual et al. 2014; Grillakis et al. 2016b).

Limited research has quantified the effect of global warming on the net economic impacts on tourism in the Mediterranean. A tourism climate index has been correlated to the total overnight stays in European summer tourism, quantifying the effect of climate change on future overnights stays under 1.5°C and 2°C of global warming above preindustrial levels (Jacob et al. 2018). It was found that 1.5°C of global warming will have an impact on European Mediterranean summer tourism comfort in the July to August period. For the May to October period, marginal positive changes are projected over the majority of the European region, while for the June to August period, a negative effect over southern Spain and Cyprus and for most coastal regions of the Mediterranean is projected. These comfort changes may have a direct impact on the number of overnight stays, with Cyprus and Greece to face a potential decrease of 8% and 2%, respectively. In Spain and Italy, the decrease in comfort over the southern regions of the countries could be compensated by an increase in the north, with a possible northward shift of tourism activity. At 2°C of global warming, this pattern of change is expected to augment further. From an economic perspective, northern Mediterranean regions could exhibit climate induced tourism revenue decreases up to –0.45% of their GDP per year by 2100 (Barrios and Ibañez 2015). A regional temperature increase of 2.2°C in selected regions of Sardinia and Tunisia (Cap Bon) is expected to improve in the shoulder (spring - autumn) season, while increased heat stress may cause a decline in tourism demand in summer (Köberl et al. 2016). The annual net effect is expected to be marginally positive in terms of overnight stays, however the net profit might be less than the present due to the potential increase in the cost of water.

5.1.3 Adaptation

Climate change adaptation can be defined as the process of adjustment to actual or expected climate change and its effects (Smit and Wandel 2006). Climate change adaptation has been identified by the international community as an essential policy response, and its integration into development planning is a key measure for the effective achievement of sustainable development goals. However, the limited resource base of some countries tends to hinder climate change adaptation measures, which are also unlikely to occur automatically in response to observed or expected changes. This kind of response is highly dependent on the specific characteristics of a system, or community, affected by the impacts. The overall long-term adaptive capacity of a population is, in fact, shaped by existing developmental deficits, by exposure to sensitive risks, and by the strategies employed by individuals and communities to cope with these deficits and risks. Existing developmental deficits in some Mediterranean countries, such as endemic poverty, limited infrastructure and technology, ecosystem degradation, conflicts and poor health, among others, challenge the capacity to cope with emerging climate change, in turn affecting the way socio-economic adaptation strategies are applied.

Promoting climate change adaptation is believed to be a win-win strategy. The concept of adaptation has become increasingly associated with what can be considered good development. Such actions to improve climate change adaptation span over a spectrum of initiatives involving investments in, for example, human capital, such as increasing levels of education, skills, and the health status of poor households, or physical capital, such as climate proofing infrastructure projects and investing in self-sustaining renewable energy projects. A lack of human capital, or having poor infrastructure status, can also have a direct impact on labor productivity, and the related capacity to provide secure livelihoods, both in more industrialized Mediterranean countries by slowing down economic development, and in less developed Mediterranean countries by also increasing inequalities. Predicted climate change impacts will only exacerbate such circumstances, especially if nothing is done to account for these impacts (Mavromatidi et al. 2018).

Although applied research is increasing (Cramer et al. 2018), how specific regions or communities in Mediterranean countries may be affected by climate change is still partially unknown. A lack of data and research capacity remains a major

problem in some Mediterranean countries. Generally, the most impoverished and vulnerable communities are frequently neglected in impacts and adaptation research (Satterthwaite 2013; Moncada et al. 2018). Additionally, any available data is frequently interpolated over large spatial or temporal scales. While such data can provide some initial insight into potential risks, the data may not be meaningful at the scale at which people live. Failure to identify specific local impacts may lead to adaptation activities that are poorly targeted, inadequate, or even maladaptive (Albizua et al. 2019). Maladaptation refers to actions that might lead to increased risks of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future (adapted from Agard et al. 2014).

The promotion of climate change adaptation can be achieved by either acting on those constraints that impede the attainment of human needs (Sen 1999), or by directly improving the management of specific climate stressors (Pelling 2011). In this regard, a study by McGray et al. (2007) screened more than 100 projects considered to be climate change adaptation initiatives that mostly occurred in low- and middle-income countries. They subsequently found that the beneficial outcomes of the projects had little difference to what can be considered as good development (Klein 2010). McGray et al. (2007) identify a continuum of actions that can be undertaken in order to address climate change impacts. These range from pure development actions, with usually no intentions to tackle climate change adaptation, to purposely designed adaptation efforts. When the first set of actions, aimed at addressing vulnerabilities, can have a positive effect on adaptation, this is known as no-regret, win-win options (Kelly and Adger 2000). On the other hand, the actions targeted to tackle specific climate change impacts might not have any effect on development, unless they are effective at tackling climate change adaptation. In between "lies a broad spectrum of activities with gradations of emphasis on vulnerability and impacts" (Bapna and McGray 2008).

An additional aspect in which climate change adaptation affects development relates to the financial implications for countries to invest in climate change adaptation. External financial and technical assistance is needed in order to cope with the impacts of climate change. Interestingly, the tendency of the majority of the international community has been to finance adaptation mostly through tackling climate change impacts, and largely ignoring the benefit of addressing baseline vulnerabilities/deficits, and effectively enhancing long-term adaptive capacities. Increasing the adaptive capacity of a given system, thus raising the overall level of development, reduces the undesirable impacts of climate change, by allowing a system to better cope with changing conditions, risks or opportunities related to climate change (Smit and Wandel 2006). It has therefore been argued that supporting short-term adaptive capacity, especially in poor communities, is an urgent priority (McGray et al. 2007), as well as being increasingly recognized as an essential element of development (Ayers and Dodman 2010).

This is especially true for investments that address context-specific vulnerabilities, as highlighted in the previous section. Adaptation, therefore, must permeate all policy areas and not only the environment. Investment decisions that do not consider mitigation and adaptation can block regional and national development for many years. Thus, the success of adaptation strategies will also involve adapting actions to specific regional climatic conditions, in sectoral, political and socio-economic contexts by ensuring dialogue between stakeholders, through cooperative structures and knowledge transfer and monitoring progress to support regular reviews of policy objectives and the inclusion of new scientific information when it becomes available (di Gregorio et al. 2017).

Although the links between climate change impacts, climate action and sustainable development are broadly accepted, there has been limited structured investigation in terms of specific SDG Targets, synergies and trade-offs. The Intergovernmental Panel on Climate Change (IPCC) special report on Global Warming of 1.5°C features a chapter that investigates links between certain climate mitigation and adaptation actions and the 17 SDGs (Roy et al. 2018), but it does not assess the specific synergies and trade-offs between climate impacts, climate action and all 169 individual targets of the 2030 Agenda (di Gregorio et al. 2017).

5.1.3.1 National legal and policy framework for adaptation

In accordance with the existing EU framework, EU member States adopted a series of legal measures and a strategic plan of actions to promote adaptation. These measures are related to multiple sectors potentially impacting the environment and aim to reduce and/or mitigate actions affecting climate change. Between them, Spain,

Portugal, and Italy, have adopted a few relevant measures. For example, Spain adopted the Royal Decree-Law n. 15/2018, aiming to accelerate the integration of renewable energies into the economy and to promote energy efficiency. Relevant measures adopted by Portugal include the Law-Decree n. 4/2018 introducing incentives for urban electric mobility (similarly to the Spanish Royal Decree of 16th June 2017, n. 617/2017), Decree-Law n. 64/2017 creating a legal framework for the implementation of biomass plants by municipalities, the Portuguese Strategic Framework for Climate Policy was adopted through the Resolution of the Council of Ministers n. 56/2015, including the National Program for Climate Change 2020/2030 (in line with the EU law and strategy) and the National Strategy for Adaptation to Climate Change. The Italian case is more complex, because of the legislative powers divided between the central State and Regions (Art. 117 of the Italian Constitution). Even if the Italian Climate Adaptation Strategy was adopted in 2015 by Decree of the Ministry of Environment, local governments are responsible for its implementation.

Outside the EU, Israel adopted its National Plan for Implementation of the Greenhouse Gas Emissions Reduction Targets and for Energy Efficiency on 10th April 2016, by Government Decision n. 1403/2016. In relation to water resources and the public hydraulic domain, Morocco adopted Law n. 36-15 in 2016, including a total of 163 articles and 12 chapters. Other countries, like Lebanon, adopted two separate national strategies: one related to energy efficiency (with a mid-term scope) and a second broad document related to renewable energy (both in 2016).

The variants of sustainable urban growth (smart cities, green cities, resilient cities, low carbon cities, sustainable cities) have brought renewed opportunities to create pathways for sustainable urban development (Rodriguez et al. 2018). However, the proliferation of all these different concepts, often meaning the same thing, has also created competing agendas and confusion for local decision makers, planners, stakeholders, and business communities. Therefore, progress can be made by focusing on key opportunities that create precedents for transformative and sustainable urban development.

According to the IPCC Fifth Assessment Report (AR5) the majority of cities' adaptation plans and strategies are based on the construction of defensive infrastructure. Although defensive infrastructure is a relevant element of Climate Change Adaptation (CCA) pathways and building resilient cities, making it the center of adaptation plans limits opportunities (Mimura et al. 2014). According to Rodriguez et al. (2018), SDGs can help create recognition for the wider social, cultural, economic, political, institutional and normative elements of adaptation that can lead to the construction of multidimensional operational approaches on the ground.

5.1.3.2 Economic and financial tools to promote environmental management and climate change adaptation in the Mediterranean region

The use of economic instruments to achieve environmental goals and natural resource management (including the management of water quantity-typically extraction charges or taxes), fisheries (taxes, fees and transferable quotas), forestry (charges and subsidies) and wetlands (financial assistance to owners) has increased significantly since the 1970s. The most common market tools in the Mediterranean European countries are charges/taxes (France, Greece, Italy, Spain and Turkey), tradeable permits (France), deposit-refund systems (Italy and Turkey), non-compliance fees (Greece and Turkey) and subsidies (France, Greece and Turkey) (Bartels et al. 2016; Carreño 2019).

Pollution and climate change control instruments can be classified into three categories: 1) institutional approaches to facilitate internalization of externalities; 2) command and control instruments; and 3) economic incentive (market-based) instruments *(Table 5.3)*. Each specific category includes different approaches to achieve the goal of environmental management and climate change adaptation. The institutional approach, where institutions use pollution control instruments to prevent damages to third parties (externalities) or to charge the polluters for the damage that has been produced (internalization of externalities), comprises three specific approaches, as follows:

- Bargaining between generators and victims of pollution could reduce pollution below the critical threshold, but it requires some Institutional intervention, because bargaining often fails to alleviate the targeted pollution. In fact, it is difficult to identify all affected parties, to place importance on future generations with current generations, etc. (Perman et al. 2003).

INSTRUMENT	DESCRIPTION
Institutional approaches to facilitate internalization of externalities	
Facilitation of bargaining	Cost of, or impediments to bargaining are reduced
Specification of liability	Codification of liability for environmental damage
Development of social responsibility	Education and socialization programs promoting citizenship
Command and control instruments	
Input controls over quantity and/or mix of inputs	Requirements to use particular inputs, or prohibitions/restrictions on use of others
Technology controls	Requirements to use particular methods or standards
Output controls: Output quotas or prohibitions	Non-transferable ceilings on product outputs
Emissions licenses	Non-transferable ceilings on emission quantities
Location controls (zoning, planning controls, relocation)	Regulations relating to admissible location of activities
Economic incentive (market-based) instruments	
Emissions charges/taxes	Direct charges based on quantity and/or quality of a pollutant
User charges/fees/natural resource taxes	Payment for cost of collective services (charges), or for use of a natural resource (fees or resource taxes)
Product charges/taxes	Charges/taxes applied to polluting products
Emissions abatement and resource management subsidies	Financial payments designed to reduce damaging emissions or conserve scarce resources
Marketable emissions permits	Two systems: those based on emissions reduction credits (ERCs) or cap-and-trade
Deposit-refund systems	A fully or partially reimbursable payment incurred at purchase of a product
Non-compliance fees	Payments made by polluters or resource users for non-compliance, usually proportional to damage or to profit gains
Performance bonds	A deposit paid, repayable on achieving compliance
Liability payments	Payments as compensation for damage
Loans	Loans available to enterprises to implement pollution control projects
Subsidies	Subsidies paid by the government to firms or consumers for per unit reductions in pollution
Payment for ecosystem services	Payments for environmental services or benefits made by a beneficiary to the provider of the service
Clean development mechanism	Allows a country with an emission-reduction or emission-limitation commitment to implement an emission-reduction project in developing counties
Voluntary emission reduction	Actions that allow the polluter to take advantage of voluntary efforts to reduce greenhouse gas emissions by following certain regulations and standards

Table 5.3 | Classification of finance tools to protect the environment and promote sustainable development (Perman et al. 2003)

- The liability principle, which says that the polluter pays to prevent and remedy environmental damage, and includes the use of direct control tools over polluters, such as mandatory obligations or restrictions on the behavior of firms and individuals. It is the most dominant method for protecting the environment. It is related to property rights and is currently implemented in France (Boivin and Emorine 2019), Italy (Chilosi et al. 2019), Spain (Almenar et al. 2019), Turkey (Perman et al. 2003; Mavioglu et al. 2019), and Slovenia (Justice and Environment 2012).

- Development of social responsibility, which creates incentives for polluters to voluntarily change their behavior. In many - but not all - circumstances, economic incentive-based instruments are more cost-effective than command and control instruments (Perman et al. 2003). This approach includes raising public awareness (UNECE 2013 in Cyprus; UNEP 2015) and environmental education, which is an effective part of the European Union's environment policy (Stokes et al. 2001), and is also implemented in Slovenia (Kraus 1998), Algeria (Environmental Rights Database) and Tunisia (MESD 2018).

The command and control instruments have five key tools, as highlighted in *Table 5.3*. Regulations regarding direct control may apply to:

- outputs of emissions themselves and to the quantity of final production, e.g., fishing quotas in France, when consumption rates exceed 70%, and Spain (OECD 2003),
- the production techniques used, such as regulating industrial emissions within European Union countries, including Spain, under the Industrial Emissions Directive (IED) and Plan AIRE which regulates small installations' emissions in Spain (UNEP 2015),
- the level and/or mix of productive inputs, e.g., input laws in agriculture in Croatia (Grgi et al.); bans on the use of phthalates in toys in France, Greece, and Italy; over 60 PVC-free cities and restrictions on PVC-packing in Spain (Center for Health Environment and Justice (undated)); restrictions on the use of asbestos in 15 Mediterranean countries (Kazan-Allen 2019); restricted financial support by French banks for coal mining and coal powered generation projects (Littlecott 2015); plans to shut all of France's coal-fired power plants by 2021 (White 2018; Climate Transparency 2019), as well as reducing fossil fuel use by 30% by 2030 (Littlecott 2015); and the coal phase-out plan compatible with the limit of global warming below 1.5°C in France and Italy and completing full decarbonization by 2050 (Climate Transparency 2019),
- emission licenses (e.g., in Turkey) (Mavioglu et al. 2019),
- and even to the location of emission sources, e.g., natural regional parks (Salanié and Coisnon 2016) and Zones de Conservation Halieutique (ZCH) in France (OECD 2018); acoustic zoning in Italy (Praščević et al. 2012); and environmental zoning in Bosnia and Herzegovina (Zahumenská et al. 2015).

Economic incentive (market-based) instruments, include many tools, which interface with prices and markets, which can be summarized as follows:

- Emission charges/taxes such as carbon taxes (in France and Slovenia) (CTC (Carbon Tax Center) 2018), as well as SO_2 charges and noise pollution charges (Perman et al. 2003).
- User charges/fees/natural resource taxes such as congestion pricing in France, which does not require a complex system of monitoring, enforcement and compliance, incentivize responsible use of resources and promotes investments (Milewska 2019).
- Product charges/taxes such as costs for plastic bags in Italy (Perman et al. 2003), taxes on energy products in Italy, which earns more than 0.5% of its GDP from taxation of energy products (OECD 2013), taxes on lubricants in France and Italy, and taxes on cadmium batteries in Italy (Barde 1994).
- Marketable emissions permits have been used in some Mediterranean countries like Italy (Recchini 2016). They are allocated by selling them (e.g., by auction) or by giving them away (Devlin and Grafton 1996). Permits are not financially sustainable instruments and had weak performance in the EU (Pettinger 2017).
- Deposit-refund systems are recommended as components of an overall socially optimal set of policies. They can efficiently control pollution in almost the same way as Pigouvian tax (Walls 2011).
- Non-compliance fees are implemented in Greece (Perman et al. 2003), Bosnia and Herzegovina (UNECE 2018), France (Bianco et al. 2015), and Slovenia (OECD 2012b).
- Liability payments are used in different forms in countries like France, Italy (OECD 2013), Spain (Justice and Environment 2017), Bosnia and Herzegovina (UNECE 2018), Slovenia (OECD 2012b, 2012a) and Turkey (OECD 2019). Pursuing liability claims is very costly and the outcome is highly uncertain (Anderson 2002).
- Green loans are used in France (Zakhartchouk 2019), Italy (Lewenhak 2012), Croatia (UNECE 2014), and Lebanon (SwitchMed 2017). Also, Slovenia has plans to reduce water pollutants through loans (GEF 2019).
- Payments for ecosystem services (PES) schemes are implemented in the European Mediterranean countries. While PES are a rapidly proliferating mechanism for natural resource management, their use is sometimes based on an incomplete understanding of their social and economic impacts (DIE 2014). Early PES experiences reveal some positive equity impacts like improved tenure security, community empowerment, organizational and social capital development (Richards and Jenkins 2007). Clean development mechanisms (CDM), e.g., the Concentrated Solar Power plant project in Morocco (ADB and African Development Bank 2011); and CDM or

Joint Implementation projects in several countries including Croatia, France, Greece, Italy, Spain, and Turkey (UNFCCC 2012).
- Voluntary emission reduction is a tool employed by France, Italy, Spain, and Greece, and some for-profit organizations in France, Italy, Spain, and Greece, which reported voluntary carbon offsets (Hamrick and Brotto 2017). Voluntary emission reductions of CO_2, CH_4, and N_2O have also been reported in Croatia (Delija-Ružić 2017).

BOX 5.1.1

Development indicators and terms

Poverty

There is growing consensus among development experts that poverty is multidimensional. In this context, the Multidimensional Poverty Index (MPI) was developed in 2010 by the Oxford Poverty & Human Development Initiative (OPHI) and the United Nations Development Programme (UNDP). The Multidimensional Poverty Index (MPI) provides a sound gauge of poverty. The index measures poverty in three dimensions, i.e., education, health and standard of living. This index is computed for Less Developed Countries (LDCs) and developing countries (UNDP 2018e). According to the MPI, there were 66 million poor in Arab countries in 2018 or around 15% of the total Arab population. Intricately related to poverty is income inequality, which is measured by Inequality-adjusted Human Development Index (IHDI).

The poverty headcount ratio is an index which measures the percentage of poor people whose income is less than the absolute or relative poverty line (World Bank 2018). The poverty gap is a ratio showing the average shortfall of the total population from the poverty line. In other words, it reflects the intensity of poverty in a nation (World Bank 2019). The poverty line is the minimum level of income required to secure the basic necessities for survival.

Inequality

The loss to human development due to inequality over the past few years (2010 to 2017) is consistently more significant in southern Mediterranean countries than northern Mediterranean countries (UNDP 2018d). There are many indicators for measuring income inequalities. Considering a combination of indices would help to better understand the income distribution, because each index is not complete and each of them has strengths as well as weaknesses: 20:20 ratio, Palma ratio, the Gini index, Human Development Index (HDI) and Inequality-adjusted Human Development Index (IHDI).

An inequality measure is often a function that ascribes a value to a specific distribution of income in a way that allows direct and objective comparisons across different distributions. The "20:20 ratio" compares the ratio of the average income of the richest 20 percent of the population to the average income of the poorest 20 percent of the population. In UN reports, it is called "income quintile ratio" (UNDP 2019). The Palma ratio is defined as the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40%'s share (Cobham and Sumner 2013). The Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. The Gini index measures the area between the Lorenz curve, indicating the inequality in income spread, and the hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. A Gini index of zero represents perfect equality and 100 perfect inequality (OECD 2006; UNDP 2018d).

The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. The health dimension is assessed by life expectancy at birth, the education dimension is measured by mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita. The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing Gross National Income (GNI). The scores for the three HDI dimension indices are then aggregated into a composite index using geometric mean (UNDP 2018c).

The Inequality-adjusted Human Development Index (IHDI) is a viable measure of inequality produced by the UNDP (2018c). The IHDI combines a country's average achievements in health, education and income with how those achievements are distributed among a country's population by "discounting" each dimension's average value according to its level of inequality. Thus, the IHDI is a distribution-sensitive average level of HD. Two countries with different distributions of achievements can have the same average HDI value.

Under perfect equality, the IHDI is equal to the HDI, but falls below the traditional Human Development Index (HDI) when inequality rises (UNDP 2018c). The difference between the IHDI and HDI is the human development cost of inequality, also termed – the loss to human development due to inequality. The IHDI allows a direct link to inequalities in dimensions, it can inform policy makers on how to reduce inequality, and leads to a better understanding of inequalities across populations and their contribution to the overall human development cost.

BOX 5.1.2

Gender-related development indicators and term

Gender

The Gender Development Index (GDI) measures gender gaps in human development achievements by accounting for disparities between women and men in three basic dimensions of human development—health, knowledge and living standards - using the same component indicators as in the HDI. The GDI is the ratio of the HDIs calculated separately for females and males using the same methodology as in the HDI. It is a direct measure of gender gap showing the female HDI as a percentage of the male HDI (UNDP 2018a).

The Gender Inequality Index (GII) measures the importance of gender in inequality. Gender inequality remains a major barrier to human development. Girls and women have made major strides since 1990, but they have not yet gained gender equity. The disadvantages facing women and girls are a major source of inequality. All too often, women and girls are discriminated against in health, education, political representation or the labor market—with negative consequences for the development of their capabilities and their freedom of choice. The GII measures gender inequalities in three important aspects of human development: i) reproductive health, measured by maternal mortality ratio and adolescent birth rates; ii) empowerment, measured by proportion of parliamentary seats occupied by females and proportion of adult females and males aged 25 years and older with at least some secondary education; and iii) economic status, expressed as labor market participation and measured by the labor force participation rate of female and male populations aged 15 years and older. It measures the human development costs of gender inequality. Thus, the higher the GII value the more disparities between females and males and the more loss to human development (UNDP 2018b).

BOX 5.1.3

Vulnerability

The term vulnerability relates to the negative consequences of natural hazards, and is used in economics, hazard and disaster management in different ways (Karagiorgos et al. 2016). Economic vulnerability, at country level, may be defined as inherent proneness to exogenous shocks over which the country can exert little or no control (Briguglio et al. 2009). A widely used measurement of economic vulnerability has been proposed by Briguglio (2010), through an index which attempts to quantify the factors that lead to exposure to economic shocks, which include, among other variables, proneness to disasters, or natural hazards. There are few comprehensive studies on natural hazards for the entire Mediterranean Region (Lionello 2012; Lionello et al. 2014), and the fragmentation of available data does not always allow comparative studies that can extend applications to the whole Basin (González Tánago et al. 2016).

References

Abdul Malak D, McGlade K, Pascual D, Pla E 2017 *Adapting to Climate Change. An Assessment of Vulnerability and Risks to Human Security in the Western Mediterranean Basin*. First. SpringerBriefs in Environmental Science. doi: 10.1007/978-3-319-51680-6_5

ADB, African Development Bank 2011 Examples Of CDM Projects. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/P2_Examples of CDM projects_AfDB_Dba_210911.pdf [Accessed February 1, 2020].

Agard J, Schipper ELF, Birkmann J, Campos M, Dubeux C et al. 2014 Glossary, in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Barros VR, Field CB, Dokken DJ, Mastrandrea MD, Mach KJ et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), 1757–1758.

Albizua A, Corbera E, Pascual U 2019 Farmers' vulnerability to global change in Navarre, Spain: large-scale irrigation as maladaptation. *Reg. Environ. Chang.* 19, 1147–1158. doi: 10.1007/s10113-019-01462-2

Almenar J, Alcaraz C, Canseco O 2019 Environmental law and practice in Spain: overview. Thomson Reuters Practical Law. https://uk.practicallaw.thomsonreuters.com/0-521-6274?__lrTS=20200415181111583&transitionType=Default&contextData=%28sc.Default%29

Amelung B, Nicholls S, Viner D 2007 Implications of Global Climate Change for Tourism Flows and Seasonality. *J. Travel Res.* 45, 285–296. doi: 10.1177/0047287506295937

Amengual A, Homar V, Romero R, Ramis C, Alonso S 2014 Projections for the 21st century of the climate potential for beach-based tourism in the Mediterranean. *Int. J. Climatol.* 34, 3481–3498. doi: 10.1002/joc.3922

Anderson A 2012 Climate Change Education for Mitigation and Adaptation. *J. Educ. Sustain. Dev.* 6, 191–206. doi: 10.1177/0973408212475199

Anderson RC 2002 Incentive-based policies for environmental management in developing countries.

Arent DJ, Tol RS, Faust E, Hella JP, Kumar S et al. 2014 Key economic sectors and services, in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), 659–708.

Ayers J, Dodman D 2010 Climate change adaptation and development I: the state of the debate. *Prog. Dev. Stud.* 10, 161–168. doi: 10.1177/146499340901000205

Bapna M, McGray H 2008 Financing Adaptation: Opportunities for innovation and experimentation. Washington, DC.

Barde JP 1994 Economic Instruments in Environmental Policy. Organisation for Economic Co-Operation and Development (OECD). doi: 10.1787/754416133402

Barrios S, Ibañez JN 2015 Time is of the essence: adaptation of tourism demand to climate change in Europe. *Clim. Change* 132, 645–660. doi: 10.1007/s10584-015-1431-1

Bartels W, Kurznack L, Briau L, Krimphoff J 2016 Mainstreaming the green bond market: Pathways towards common standards. The Netherlands https://assets.kpmg/content/dam/kpmg/lu/pdf/mainstreaming-the-green-bond-market-kpmg-wwf-2016.pdf.

Bianco F, Lucifora A, Vagliasindi GM 2015 Fighting Environmental Crime in France: A Country Report. Catania. https://efface.eu/sites/default/files/EFFACE_Fighting Environmental Crime in France.pdf

Bird DN, Benabdallah S, Gouda N, Hummel F, Koeberl J et al. 2016 Modelling climate change impacts on and adaptation strategies for agriculture in Sardinia and Tunisia using AquaCrop and value-at-risk. *Sci. Total Environ.* 543, 1019–1027. doi: 10.1016/j.scitotenv.2015.07.035

Blauhut V, Gudmundsson L, Stahl K 2015 Towards pan-European drought risk maps: quantifying the link between drought indices and reported drought impacts. *Environ. Res. Lett.* 10, 14008. doi: 10.1088/1748-9326/10/1/014008

Boivin JP, Emorine A 2019 Environmental law and practice in France: overview. Thomson Reuters Practical Law. https://uk.practicallaw.thomsonreuters.com/w-010-5542?transitionType=Default&contextData=%28sc.Default%29

Bontoux L, Bengtsson AD 2015 2035: Paths towards a Sustainable EU Economy Sustainable Transitions and the Potential of Eco-Innovation for Jobs and Economic Development in EU Eco-Industries 2035. doi: 10.2760/738600

Bontoux L, Bengtsson AD 2016 Using Scenarios to Assess Policy Mixes for Resource Efficiency and Eco-Innovation in Different Fiscal Policy Frameworks. *Sustainability* 8, 309. doi: 10.3390/su8040309

Briguglio LP 2010 Defining and assessing the risk of being harmed by climate change. *Int. J. Clim. Chang. Strateg. Manag.* 2, 23–34. doi: 10.1108/17568691011020238

Briguglio LP, Cordina G, Farrugia N, Vella S 2009 Economic Vulnerability and Resilience: Concepts and Measurements. *Oxford Dev. Stud.* 37, 229–247. doi: 10.1080/13600810903089893

Briguglio M 2019 Wellbeing: an economics perspective, in *Perspectives on wellbeing*, eds. Vella S, Falzon R, Azzopardi A (Brill | Sense), 145–157. doi: 10.1163/9789004394179_012

Bruckner M, Lederman D 2015 Effects of income inequality on economic growth.

Carreño B 2019 Spain may issue green bonds to finance environmental plan. *Reuters, Environ.* https://www.reuters.com/article/us-spain-economy/spain-may-is-

sue-green-bonds-to-finance-environmental-plan-minister-says-idUSKCN1R81XT

Center for Health Environment and Justice (undated) PVC Policies Across the World. http://www.chej.org/pvcfactsheets/PVC_Policies_Around_The_World.html [Accessed May 30, 2020].

Chilosi M, Martelli A, Miranti A 2019 Environmental law and practice in Italy: overview. *Thomson Reuters Pract. Law*. https://uk.practicallaw.thomsonreuters.com/1-503-2608?transitionType=Default&contextData=(sc.Default)ac&firstPage=true&bhcp=1

Climate Transparency 2019 Managing the coal phase-out – a comparison of actions in G20 countries. Berlin, Germany.

Cobham A, Sumner A 2013 Putting the Gini Back in the Bottle? "The Palma" as a Policy-Relevant Measure of Inequality. London: King's College. doi: 10.2139/ssrn.2366974

Coma R, Ribes M, Serrano E, Jiménez E, Salat J et al. 2009 Global warming-enhanced stratification and mass mortality events in the Mediterranean. *Proc. Natl. Acad. Sci. U. S. A.* 106, 6176–6181. doi: 10.1073/pnas.0805801106

Cramer W, Guiot J, Fader M, Garrabou J, Gattuso J-P et al. 2018 Climate change and interconnected risks to sustainable development in the Mediterranean. *Nat. Clim. Chang.* 8, 972–980. doi: 10.1038/s41558-018-0299-2

CTC (Carbon Tax Center) 2018 Where carbon is taxed? *Carbon Tax Cent.* https://www.carbontax.org/where-carbon-is-taxed/ [Accessed February 2, 2020].

Delija-Ružić W 2017 Report on Implementation of Policies and Measures that Reduce Greenhouse Gas Emissions by Sources or Enhance Removals by Sinks. Republic of Croatia.

Dellai I, McCarl BA 2010 The economic impacts of drought on agriculture: The case of Turkey, in *Economics of Drought and Drought Preparedness in a Climate Change Context*, eds. López-Francos A, López-Francos A (Zaragoza), 169–174. http://om.iamm.fr/om/pdf/a95/00801342.pdf [Accessed April 7, 2019].

Devlin RA, Grafton RQ 1996 Marketable emission permits: Efficiency, profitability and substitutability. *Can. J. Econ.* 29, S260–S264. doi: 10.2307/135997

di Gregorio M, Nurrochmat DR, Paavola J, Sari IM, Fatorelli L et al. 2017 Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages. *Environ. Sci. Policy* 67, 35–43. d oi: 10.1016/j.envsci.2016.11.004

DIE 2014 Why Power Matters in Payments for Environmental Services (PES). https://www.die-gdi.de/uploads/media/BP_9.2014.pdf

Dogru T, Bulut U, Sirakaya-Turk E 2016 Theory of Vulnerability and Remarkable Resilience of Tourism Demand to Climate Change: Evidence from the Mediterranean Basin. *Tour. Anal.* 21, 645–660. doi: 10.3727/108354216X14713487283246

Dogru T, Marchio EA, Bulut U, Suess C 2019 Climate change: Vulnerability and resilience of tourism and the entire economy. *Tour. Manag.* 72, 292–305. doi: 10.1016/J.TOURMAN.2018.12.010

Doocy S, Daniels A, Murray S, Kirsch TD 2013 The Human Impact of Floods: a Historical Review of Events 1980-2009 and Systematic Literature Review. *PLoS Curr.* 5. doi: 10.1371/CURRENTS.DIS.F4DEB457904936B07C09DAA98EE8171A

Dos Santos MJPL 2018 Nowcasting and forecasting aquaponics by Google Trends in European countries. *Technol. Forecast. Soc. Change* 134, 178–185. doi: 10.1016/j.techfore.2018.06.002

Dos Santos MJPL, Mota M 2019 Sustainable and Smart Cities: The Case Study of African Cities. in *The 4th International Conference on Organization and Management. The 6th Corporate Social Responsibility (CSR), Ethics, Governance, and Sustainability.* (Abu Dhabi, UAE , UAE on 12th and 13th of June 2019: College of Abu Dhabi University).

Drius M, Bongiorni L, Depellegrin D, Menegon S, Pugnetti A et al. 2019 Tackling challenges for Mediterranean sustainable coastal tourism: An ecosystem service perspective. *Sci. Total Environ.* 652, 1302–1317. doi: 10.1016/j.scitotenv.2018.10.121

Dubois G, Ceron J-P 2006 Tourism and Climate Change: Proposals for a Research Agenda. *J. Sustain. Tour.* 14, 399–415. doi: 10.2167/jost539.0

Dubois G, Ceron J-P, Gössling S, Hall CM 2016 Weather preferences of French tourists: lessons for climate change impact assessment. *Clim. Change* 136, 339–351. doi: 10.1007/s10584-016-1620-6

Enríquez AR, Marcos M, Álvarez-Ellacuría A, Orfila A, Gomis D 2017 Changes in beach shoreline due to sea level rise and waves under climate change scenarios: application to the Balearic Islands (western Mediterranean). *Nat. Hazards Earth Syst. Sci.* 17, 1075–1089. doi: 10.5194/nhess-17-1075-2017

Environmental Rights Database Environmental Education Programme. http://environmentalrightsdatabase.org/environmental-education-programme/.

FAO / IFAD / WFP 2011 The State of Food Insecurity in the World. Rome, Italy.

Fatorić S, Seekamp E 2017 Are cultural heritage and resources threatened by climate change? A systematic literature review. *Clim. Change* 142, 227–254. doi: 10.1007/s10584-017-1929-9

Forbes KJ 2000 A Reassessment of the Relationship Between Inequality and Growth. *Am. Econ. Rev.* 90, 869–887. doi: 10.1257/aer.90.4.869

Galor O, Zeira J 1993 Income Distribution and Macroeconomics. *Rev. Econ. Stud.* 60, 35. doi: 10.2307/2297811

GEF 2019 EBRD/GEF Environmental Credit Facility (formerly entitled Slovenia: National Pollution Reduction Project). https://www.thegef.org/project/ebrdgef-environmental-credit-facility-formerly-entitled-slovenia-national-pollution

Godber O, Wall R 2016 Mediterranean goat production systems: vulnerability to population growth and climate change. *Mediterr. J. Biosci.* 1, 160–168.

González Tánago I, Urquijo J, Blauhut V, Villarroya F, de Stefano L 2016 Learning from experience: a systematic review of assessments of vulnerability to drought. *Nat. Hazards* 80, 951–973. doi: 10.1007/s11069-015-2006-1

Grgi Z, Frani R, Kisi I Country report on the present environmental situation in agriculture. *REU Tech. Ser.* http://www.fao.org/3/x3413e12.htm [Accessed May 30, 2020].

Grillakis MG, Koutroulis AG, Seiradakis KD, Tsanis IK 2016a Implications of 2 °C global warming in European summer tourism. *Clim. Serv.* 1, 30–38. doi: 10.1016/j.cliser.2016.01.002

Grillakis MG, Koutroulis AG, Tsanis IK 2016b The 2 °C global warming effect on summer European tourism through different indices. *Int. J. Biometeorol.* 60, 1205–1215. doi: 10.1007/s00484-015-1115-6

Hamrick K, Brotto L 2017 State of European markets 2017 voluntary carbon. https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf [Accessed November 1, 2019].

Handmer J, Honda Y, Kundzewicz ZW, Arnell NW, Benito G et al. 2012 Changes in impacts of climate extremes: human systems and ecosystems, in *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC)., eds. Field CB, Barros V, Stocker TF, Qin D, Dokken DJ et al. (Cambridge, United Kingdom and New York, NY, USA), 231–290.

Helliwell JF, Layard R, Sachs JD, Helliwell, JF, Layard, R Sachs J 2018 World Happiness report. Sustainable Development Solution Network. A global initiative for the United Nations. UN. doi: 10.18356/6aa6d28a-en

Iglesias A, Garrote L 2014 Drought in the Light of Climate Change in the Mediterranean Area, in *Hydrometeorological Hazards*, ed. Quevauviller P (Chichester, UK: John Wiley & Sons, Ltd), 203–225. doi: 10.1002/9781118629567.ch3c

Jacob D, Kotova L, Teichmann C, Sobolowski SP, Vautard R et al. 2018 Climate Impacts in Europe Under +1.5°C Global Warming. *Earth's Futur.* 6, 264–285. doi: 10.1002/2017EF000710

Jacob D, Petersen J, Eggert B, Alias A, Christensen OB et al. 2014 EURO-CORDEX: new high-resolution climate change projections for European impact research. *Reg. Environ. Chang.* 14, 563–578. doi: 10.1007/s10113-013-0499-2

Jiménez JA, Valdemoro HI, Bosom E, Sánchez-Arcilla A, Nicholls RJ 2017 Impacts of sea-level rise-induced erosion on the Catalan coast. *Reg. Environ. Chang.* 17, 593–603. doi: 10.1007/s10113-016-1052-x

Justice and Environment 2012 Slovenia. Environmental Liability: National toolkit on the practical application of the ELD and its national equivalents. 1–6. http://www.justiceandenvironment.org/_files/file/2012/2012 ELD report Slovenia.pdf

Justice and Environment 2017 Spain. Environmental Liability: National toolkit on the practical application of the ELD and its national equivalents. 1–6. http://www.justiceandenvironment.org/fileadmin/user_upload/Publications/2017/ELD_toolkit_ES_EN.pdf

Karagiorgos K, Thaler T, Heiser M, Hübl J, Fuchs S 2016 Integrated flash flood vulnerability assessment: Insights from East Attica, Greece. *J. Hydrol.* 541A, 553–562. doi: 10.1016/j.jhydrol.2016.02.052

Kazan-Allen L 2019 Chronology of asbestos bans and restrictions. *Int. Ban Asbestos Secr.* http://www.ibasecretariat.org/chron_ban_list.php

Kelly PM, Adger WN 2000 Theory and practice in assessing vulnerability to climate change and facilitating adaptation. *Clim. Change* 47, 325–352. doi: 10.1023/a:1005627828199

Kilkiș Ș 2018 Benchmarking South East European Cities with the Sustainable Development of Energy, Water and Environment Systems Index. *J. Sustain. Dev. Energy, Water Environ. Syst.* 6, 162–209. doi: 10.13044/j.sdewes.d5.0179

Klein RJT 2010 Mainstreaming Climate Adaptation into Development: A Policy Dilemma. *Clim. Gov. Dev. Berlin Work. Ser.*, 35–52. doi: 10.1596/9780821379943_ch01

Köberl J, Prettenthaler F, Bird DN 2016 Modelling climate change impacts on tourism demand: A comparative study from Sardinia (Italy) and Cap Bon (Tunisia). *Sci. Total Environ.* 543, 1039–1053. doi: 10.1016/j.scitotenv.2015.03.099

Koutra C, Karyopouli S 2013 Cyprus' image-a sun and sea destination-as a detrimental factor to seasonal fluctuations. Exploration into motivational factors for holidaying in Cyprus. *J. Travel Tour. Mark.* 30, 700–714. doi: 10.1080/10548408.2013.827548

Koutroulis AG, Grillakis MG, Tsanis IK, Jacob D 2018a Mapping the vulnerability of European summer tourism under 2 °C global warming. *Clim. Change* 151, 157–171. doi: 10.1007/s10584-018-2298-8

Koutroulis AG, Papadimitriou L V., Grillakis MG, Tsanis IK, Wyser K et al. 2018b Simulating Hydrological Impacts under Climate Change: Implications from Methodological Differences of a Pan European Assessment. *Water* 10, 1331. doi: 10.3390/w10101331

Kovats RS, Valentini R, Bouwer LM, Georgopoulou E, Jacob D et al. 2014 Europe, in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Barros VR, Field CB, Dokken DJ, Mastrandrea MD, Mach KJ et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), 1267–1326. doi: 10.1017/cbo9781107415386.003

Kraus H 1998 Environment Policy in Slovenia. https://www.europarl.europa.eu/workingpapers/envi/pdf/brief6en_en.pdf

Lewenhak S 2012 The Role of the European Investment Bank (RLE Banking & Finance). doi: 10.4324/9780203108246

Lionello P 2012 *The Climate of the Mediterranean Region: From the Past to the Future*. Elsevier Science doi: 10.1016/C2011-0-06210-5

Lionello P, Abrantes FG, Gačić M, Planton S, Trigo RM et al. 2014 The climate of the Mediterranean region: research progress and climate change impacts. *Reg. Environ. Chang.* 14, 1679–1684. doi: 10.1007/s10113-014-0666-0

Littlecott C 2015 Snapshot of France Coal Phase Out Progress. https://www.e3g.org/library/snapshot-of-france-coal-phase-out-progress

Llasat MC, Llasat-Botija M, Petrucci O, Pasqua AA, Rosselló J et al. 2013 Towards a database on societal impact of Mediterranean floods within the framework of the HYMEX project. *Nat. Hazards Earth Syst. Sci.* 13, 1337–1350. doi: 10.5194/nhess-13-1337-2013

Llasat MC, Llasat-Botija M, Prat MA, PorcúPorc F, Price C et al. 2010 High-impact floods and flash floods in Mediterranean countries: the FLASH preliminary database. www.adv-geosci.net/23/47/2010/ [Accessed April 2, 2019]

Mavioglu OY, Varol P, Tamtürk D 2019 Environmental law and practice in Turkey: overview. *Thomson Reuters Pract. Law*. https://uk.practicallaw.thomsonreuters.com/Document/I203079191cb611e38578f7ccc38dcbee/

Mavromatidi A, Briche E, Claeys C 2018 Mapping and analyzing socio-environmental vulnerability to coastal hazards induced by climate change: An application to coastal Mediterranean cities in France. *Cities* 72, 189–200. doi: 10.1016/J.CITIES.2017.08.007

McGray H, Hammil l. A, Bradley R, Schipper ELF, Parry J 2007 *Weathering the storm: options for framing adaptation and development*, ed. World Resources Institute Washington, DC.

Mediterranean Growth Initiative 2017 Tourism in the Mediterranean. https://www.mgi.online/content/2017/8/4/tourism-in-the-mediterranean

MESD 2018 Education for sustainable developement in Tunisia. http://www.environnement.gov.tn/index.php?id=101&L=1

Milewska M 2019 Resource Taxation as an Alternative Method for Diversifying the Revenue of Developing Countries. https://www.progress.org/articles/resource-taxation-as-an-alternative-method-for-diversifying-the-revenue-of-developing-countries

Mimura N, Pulwarty RS, Minh Duc D, Elshinnawy I, Redsteer MH et al. 2014 Adaptation Planning and Implementation, in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), 869–898. doi: 10.1017/CBO9781107415379.020

Minasyan A, Zenker J, Klasen S, Vollmer S 2019 Educational gender gaps and economic growth: A systematic review and meta-regression analysis. *World Dev.* 122, 199–217. doi: 10.1016/j.worlddev.2019.05.006

Moncada S, Briguglio LP, Bambrick H, Kelman I 2018 Guest editorial for the special issue on 'Development and Climate Change in Small Island Developing States'. *Int. J. Clim. Chang. Strateg. Manag.* 10, 214–216. doi: 10.1108/ijccsm-03-2018-184

Monioudi IN, Velegrakis AF, Chatzipavlis AE, Rigos A, Karambas T et al. 2017 Assessment of island beach erosion due to sea level rise: the case of the Aegean archipelago (Eastern Mediterranean). *Nat. Hazards Earth Syst. Sci.* 17, 449–466. doi: 10.5194/nhess-17-449-2017

Ncube M, Anyanwu JC, Hausken K 2014 Inequality, Economic Growth and Poverty in the Middle East and North Africa (MENA). *African Dev. Rev.* 26, 435–453. doi: 10.1111/1467-8268.12103

Niavis S 2020 Evaluating the spatiotemporal performance of tourist destinations: the case of Mediterranean coastal regions. *J. Sustain. Tour.* 28, 1310–1331. doi: 10.1080/09669582.2020.1736087

OECD 2003 *Review of Fisheries in OECD countries: Policies and summary statistics*. OECD Publication Service.

OECD 2006 Glossary of statistical terms. https://stats.oecd.org/glossary/detail.asp?ID=4842.

OECD 2012a Liability for environmental damage in Eastern Europe, Caucasus and Central Asia (EECCA): Implementation of good international practices. http://www.oecd.org/env/outreach/50244626.pdf

OECD 2012b OECD Environmental Performance Reviews: Slovenia 2012. *OECD Publ.*

OECD 2013 OECD Environmental Performance Reviews: Italy 2012. *OECD Publ.*

OECD 2017 Measuring wellbeing and progress wellbeing research. http://www.oecd.org/ statistics/measuring-well-being-and-progress.htm

OECD 2018 OECD Review for Fisheries 2017: General Survey of Fisheries Policies. http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=TAD/FI(2017)14/FINAL&docLanguage=En

OECD 2019 OECD Environmental Performance Reviews: Turkey 2019. *OECD Publ.*

Oliveira S, Félix F, Nunes A, Lourenço L, Laneve G et al. 2018 Mapping wildfire vulnerability in Mediterranean Europe. Testing a stepwise approach for operational purposes. *J. Environ. Manage.* 206, 158–169. doi: 10.1016/J.JENVMAN.2017.10.003

Palatnik RR, Lourenço Dias Nunes PA 2015 Economic valuation of climate change-induced biodiversity impacts on agriculture: results from a macro-economic application to the Mediterranean basin. *J. Environ. Econ. Policy* 4, 45–63. doi: 10.1080/21606544.2014.963165

Pelling M 2011 *Adaptation to climate change: from resilience to transformation*. First edn. Routledge, New York, USA.

Perman R, Ma Y, McGilvray J, Common M 2003 Natural Resource and Environmental Economics. *Mar. Resour. Econ.* 7. doi: 10.1086/mre.7.4.42629040

Pettinger T 2017 Pollution Permits. https://www.economicshelp.org/micro-economic-essays/marketfailure/pollution-permits/

Piante C, Ody D 2015 Blue Growth in the Mediterranean Sea: The Challenge of Good Environmental Status. http://www.developpement-durable.gouv.fr/

Praščević M, Cvetković D, Mihajlov D, Holoček N 2012 The acoustic zoning - a comparasion of legislation and experiences in Italy and Serbia. in *23rd National Conference & 4th International Confrence: Noise and Vibration, 17-19.10.2012* (University of Nis (Serbia), "Politechnica" University of Timisoara (Romania). http://www.mfkv.kg.ac.rs/urbanoise/media/1210 Nis Prascevic 21-28.pdf

Queralt A, Llasat MDC, Serena JM, Pont I 2017 The 3rd Report on Climate Change in Catalonia: a joint initiative to bridge the gap between Science and Decision-Making. In EGU General Assembly. in *EGU General Assembly Conference Abstracts 19:14658*

Radhouane L 2013 Climate change impacts on North African countries and on some Tunisian economic sectors. *J. Agric. Environ. Int. Dev.* 107, 101–113. doi: 10.12895/JAEID.20131.123

Recchini E 2016 Estimating emission permits in Italy. in *Joint OECD/UNECE Seminar on Implementation of SEEA, 3-4 October 2016* (Geneva, Switzerland). https://uk.practicallaw.thomsonreuters.com/1-503-2608?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1

Richards M, Jenkins M 2007 Potential and challenges of payments for ecosystem service from tropical forests.

Rodrigues LC, Van den Bergh JCJM, Massa F, Theodorou JA, Ziveri P et al. 2015 Sensitivity of Mediterranean bivalve mollusc aquaculture to climate change, ocean acidification, and other environmental pressures: findings from a producer survey. *J. Shellfish Res.* 34, 1161–1176. doi: 10.2983/035.034.0341

Rodriguez RS, Ürge-Vorsatz D, Barau AS 2018 Sustainable Development Goals and climate change adaptation in cities. *Nat. Clim. Chang.* 8, 181–183. doi: 10.1038/s41558-018-0098-9

Roy J, Tschakert P, Waisman H, Abdul Halim S, Antwi-Agyei P et al. 2018 Sustainable development, poverty eradication and reducing inequalities, in *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change,* eds. Masson-Delmotte V, Zhai P, Pörtner H-O, Roberts D, Skea J et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), in press.

Sacchi J 2011 Analysis of economic activities in the Mediterranean: Fishery and aquaculture sectors. Valbonne https://planbleu.org/sites/default/files/upload/files/analyse_activites_econ_pecheEN.pdf

Sachs J 2005 *The End of Poverty: How We Can Make It Happen in Our Lifetime*. Penguin Bo. Wiley. doi: 10.1111/j.1468-0351.2006.00262.x

Salanié J, Coisnon T 2016 Environmental Zoning and Urban Development: Natural Regional Parks in France. doi: 10.1787/5jlsk97vpwtd-en

Salata F, Golasi I, Treiani N, Plos R, de Lieto Vollaro A 2018 On the outdoor thermal perception and comfort of a Mediterranean subject across other Koppen-Geiger's climate zones. *Environ. Res.* 167, 115–128. doi: 10.1016/j.envres.2018.07.011

Sánchez-Arcilla A, Sierra JP, Brown S, Casas-Prat M, Nicholls RJ et al. 2016 A review of potential physical impacts on harbours in the Mediterranean Sea under climate change. *Reg. Environ. Chang.* 16, 2471–2484. doi: 10.1007/s10113-016-0972-9

Satterthwaite D 2013 The political underpinnings of cities' accumulated resilience to climate change. *Environ. Urban.* 25, 381–391. doi: 10.1177/0956247813500902

Schilling J, Freier KP, Hertig E, Scheffran J 2012 Climate change, vulnerability and adaptation in North Africa with focus on Morocco. *Agric. Ecosyst. Environ.* 156, 12–26. doi: 10.1016/J.AGEE.2012.04.021

Scott D, Hall CM, Gössling S 2016a A review of the IPCC Fifth Assessment and implications for tourism sector climate resilience and decarbonization. *J. Sustain. Tour.* 24, 8–30. doi: 10.1080/09669582.2015.1062021

Scott D, Rutty M, Amelung B, Tang M 2016b An Inter-Comparison of the Holiday Climate Index (HCI) and the Tourism Climate Index (TCI) in Europe. *Atmosphere (Basel).* 7, 80. doi: 10.3390/atmos7060080

Sen A 1999 *Development as freedom*. Oxford Uni. Oxford India paperbacks.

Smit B, Wandel J 2006 Adaptation, adaptive capacity and vulnerability. *Glob. Environ. Chang.* 16, 282–292. doi: 10.1016/j.gloenvcha.2006.03.008

Stokes E, Edge A, West A 2001 Environmental education in the educational systems of the European Union. http://ibdigital.uib.es/greenstone/collect/cd2/import/ue/ue0002.pdf

SwitchMed 2017 Lebanon: Loans available to enterprise to implement pollution control projects. https://www.switchmed.eu/en/country-hubs/lebanon/actions/policy-maker?c=policy&q=lebanon

Szopik-Depczyńska K, Cheba K, Bąk I, Kiba-Janiak M, Saniuk S et al. 2017 The application of relative taxonomy to the study of disproportions in the area of sustainable development of the European Union. *Land use policy* 68, 481–491. doi: 10.1016/j.landusepol.2017.08.013

Tansel A, Güngör ND 2016 Gender Effects of Education on Economic Development in Turkey: The Role of Socio-demographics, Entrepreneurship and Public Policies. *Women, Work Welf. Middle East North Africa*, 57–86. doi: 10.1142/9781783267347_0003

Teotónio C, Rodríguez M, Roebeling P, Fortes P 2020 Water

competition through the 'water-energy' nexus: Assessing the economic impacts of climate change in a Mediterranean context. *Energy Econ.* 85, 104539. doi: 10.1016/j.eneco.2019.104539

Tigkas D, Tsakiris G 2015 Early Estimation of Drought Impacts on Rainfed Wheat Yield in Mediterranean Climate. *Environ. Process.* 2, 97–114. doi: 10.1007/s40710-014-0052-4

UN 2015 Transforming our world: the 2030 Agenda for Sustainable Development. New York. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

UNDP 2018a Gender Development Index (GDI). *United Nations Dev. Program.* http://hdr.undp.org/en/content/gender-development-index-gdi

UNDP 2018b Gender Inequality Index (GII). *United Nations Dev. Program.* http://hdr.undp.org/en/content/gender-inequality-index-gii

UNDP 2018c Human Development Index (HDI). *United Nations Dev. Program.* http://hdr.undp.org/en/content/human-development-index-hdi

UNDP 2018d Inequality-adjusted Human Development Index (IHDI). *United Nations Dev. Program.* http://hdr.undp.org/en/content/inequality-adjusted-human-development-index-ihdi

UNDP 2018e The 2018 Global Multidimensional Poverty Index (MPI). *United Nations Dev. Program.* http://hdr.undp.org/en//2018-MPI

UNDP 2019 Human Development Report.

UNECE 2013 Strategies and Policies for Air Pollution Abatement. 2010 review prepared under the Convention on Long-range Transboundary Air Pollution. New York and Geneva. http://www.unece.org/fileadmin/DAM/env/documents/2013/air/FINAL_version_of_the_publication_as_of_19_Feb_2014.pdf

UNECE 2014 Environmental Performance Reviews: Croatia. New York and Geneva. https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE_CEP_172_En.pdf

UNECE 2018 Environmental Performance Reviews: Bosnia and Herzegovina. New York and Geneva, Environmental Performance Reviews Series No. 48. https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE.CEP.184.Eng.pdf

UNEP/MAP-Plan Bleu 2009 State of the Environment and Development in the Mediterranean. Athens, Greece.

UNEP/MAP 2016 Mediterranean Strategy for Sustainable Development 2016-2025. Valbonne.

UNEP 2015 Spain Air Quality Policies. https://wedocs.unep.org/bitstream/handle/20.500.11822/17112/Spain.pdf?sequence=1&isAllowed=y

UNFCCC 2012 Benefits of the clean development mechanism. https://unfccc.int/resource/docs/publications/abc_2012.pdf.

UNTWO 2018 UNTWO Tourist Highlights 2017. *World Tour. Organ.* https://www.e-unwto.org/doi/pdf/10.18111/9789284419876 [Accessed December 11, 2019].

UNWTO 2018 Tourism and Sustainable Development Goals - Journey to 2030. https://www.e-unwto.org/doi/pdf/10.18111/9789284419401

UNWTO 2019 International Tourism Highlights. https://www.e-unwto.org/doi/pdf/10.18111/9789284421152

Voegtlin C, Scherer AG 2017 Responsible Innovation and the Innovation of Responsibility: Governing Sustainable Development in a Globalized World. *J. Bus. Ethics* 143, 227–243. doi: 10.1007/s10551-015-2769-z

Walls M 2011 Deposit-Refund Systems in Practice and Theory. doi: 10.2139/ssrn.1980142

White HB 2018 France to shut all coal-fired power stations by 2021, Macron declares. *Independent*. https://www.independent.co.uk/news/world/europe/france-coal-power-station-emmanuel-macron-davos-shut-2021-a8176796.html

World Bank 2018 Poverty gap at $1.90 a day (2011 PPP) (%). https://data.worldbank.org/indicator/SI.POV.GAPS

World Bank 2019 World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Zahumenská V, Lemeš S, Delalić M, Zatloukalová K, Sobotková J et al. 2015 Environmental Democracy in Bosnia and Herzegovina: Limping Along. Zenica, Prague https://books.google.com.lb/books?id=RhacCwAAQBAJ&pg=PA80&lpg=PA80&dq=environmental+zoning+in+bosnia+and+herzegovina&source=bl&ots=D9RjoNpn0l&sig=ACfU3U0PTIC4LYBxjOrXMByp4Rzl34aog&hl=en&sa=X&ved=2ahUKEwjjw7_hpdPkAhXUBUIHakABXcQ6AEwCHoECAkQAQ#v=onepage&q=e

Zakhartchouk A, 2019 Scaling up green finance in France. https://www.cape4financeministry.org/sites/cape/files/inline-files/Session4-Scalingup_Green_Finance_in_France.pdf

Zidanšek A, 2007 Sustainable development and happiness in nations. *Energy* 32, 891–897. doi: 10.1016/j.energy.2006.09.016

Information about authors

Coordinating Lead Authors
Maria Dos Santos:
Polytechnical Institute of Lisbon, University Institute of Lisbon (ISCTE-IUL), Lisbon, Portugal
Stefano Moncada:
University of Malta, Msida, Malta

Lead Authors
Antonietta Elia:
University of Santiago de Compostela, Santiago de Compostela, Spain
Manolis Grillakis:
Institute of Mediterranean Studies (Institute of Technology & Research – Hellas), Rethymno, Crete, Greece
Nathalie Hilmi:
Monaco Scientific Centre (MSC), Monaco

Contributing Authors
Shekoofeh Farahmand:
Department of Economics, University of Isfahan, Isfahan, Iran
Walid Marrouch:
Lebanese American University, Beirut, Lebanon
Alain Safa:
University of Nice Sophia-Antipolis, EDHEC Business School, Nice, France
Brice Teisserenc:
University of Toulon, La Garde, France