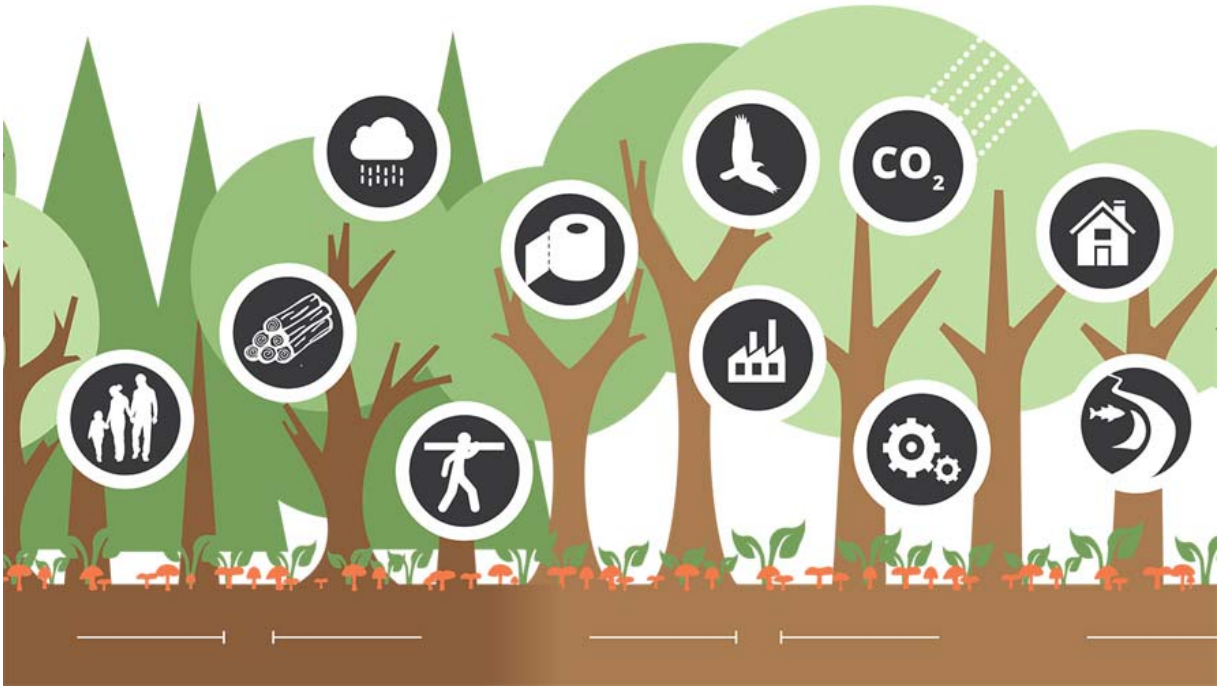
Contribution of Mediterranean Forests and Rangeland to Green Economy



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Abbreviations

CSAW	Centre for Sustainable Agriculture with Wood
EC	European Commission
GSDR	Global Sustainable Development Report
ITC	International Trade Centre
IUCN	International Union for conservation of Nature
IEA0	International Energy Agency
MITSMED	Ministry of Industrialization, Trade and SME Development
OECD	Organization for Economic cooperation and Development
SOMF	State of Mediterranean Forests
SEMC	South-East Mediterranean Countries
TEV	Total Economic Value
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UN	United Nations
USEPA	United Sates Environmental Protection Agency
UNRISD	United Nations Research institute for Social Development
WFP	Wood Forest Products
WHO	World Health Organization

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"**There is no beauty better than intellect"**

Prophet Muhammad (P.B.U.H)

Abstract

Green economy as defined by UNEP is the one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. Green economy is further divided into six sectors Building, transportation, Energy, Agro forestry, water and Tourism. The growing interest in green economies provides opportunities to demonstrate how forests and rangelands can provide more of these benefits and increase the visibility of the forest and rangelands sectors in public policies. Therefore it is important to explore what different aspects of the green economy do Mediterranean countries see as most important and where forests, rangelands and related activities could make the greatest contribution to the green economy. Mediterranean forest represents approximately 25 percent of world forest area and an estimated forest area in Mediterranean countries is over 85 million hectares. Sustainably managed forests play an essential role in the carbon cycle, releasing oxygen, while locking up carbon dioxide in the trees and soil. The wood and forestry sectors in Mediterranean can make a significant contribution towards meeting green economy objectives, linked to climate change policies, mainly through the abatement of greenhouse gas emissions and expansion of renewable energy and efficient building objectives. Apart from Timber and firewood there are arrays of public goods and externalities provided by Mediterranean forests including Watershed protection, landscape quality, soil conservation, carbon sequestration and recreation resources but they are seldom recognized and therefore are difficult to evaluate and price. The objective of this thesis work is to improve the understanding that how can Mediterranean forests better contribute to low carbon economy, sustainable development, economic activity and job creation and how far can they contribute to different sectors of Green economy.

Keywords: Green Economy, Mediterranean Forest, Green economy and Mediterranean Forests

Chapter 1: Introduction

The Mediterranean Region is home to 507 million inhabitants on three continents and therefore has an extremely rich natural and cultural heritage (SOMF, 2013). Due to growing populations in Mediterranean region environmental pressures are arising, especially in the south and east. Some of these challenges includes energy crisis, unemployment, the increasing exploitation of natural resources particularly water and biodiversity, and intensified natural risks associated with climate change. Even though the average HDI in the Mediterranean is 0.76, higher than the global HDI (0.68) poverty levels are still high in Egypt, Morocco, Palestine and the Syrian Arab Republic (SOMF, 2013).

In year 2012 United Nations Conference on Sustainable Development (UN CSD) took place and was agreed on Rio+20 Declaration that focuses on ***green economy*** in the context of sustainable development and poverty eradication (UN, 2012). The concept of green economy aims towards revenue growth and employment reducing carbon emissions and pollution enhance the rational use of resources and energy efficiency and prevent loss of biodiversity and environmental services. Since Economic behavior is not succeeded in bringing benefits to large parts of society in Mediterranean, therefore green economy promotes a triple bottom line: sustaining and advancing economic, environmental and social well-being (Eco-Union, 2016). Green economy therefore recognizes that there are many and diverse pathways to environmental sustainability based on *sharing*, *circularity*, *collaboration*, *solidarity*, *resilience*, *opportunity* and *interdependence* (UNEP, 2015).

The green economy focus on 10 main sectors, which includes *buildings*, *fisheries*, *Forestry*, *Transport*, *Water*, *Agriculture*, *Energy*, *Tourism*, *Waste* and *Manufacturing Industries* (UNEP, 2016). It has been argued that forests, Sustainable Forest management and forest based industries can make a significant contribution to the green economy and its different key sectors. This includes the provision of wood, non-wood products and ecosystem services in a sustainable way.

The Rovaniemi Action Plan (RAP) for the Forest Sector in a Green Economy is an initiative of the UNECE Committee on Forests and Forest Based Industries (COFFI). It was adopted in Rovaniemi (Finland) in December 2013. It identifies the main contribution of forests and forestry to the green economy. Providing renewable climate-friendly products (e.g. timber for buildings,

wood for energy), creating employment, also in rural areas are identified as main contributions, along with the provision of other ecosystem services that help, for example to minimize the consequences of climate change (dust storms, severe droughts, etc.) and support the protection of soil and water, leading to improved food security. Accordingly, the RAP proposes a check list of actions to maximize those contributions. Those actions are structured in 5 pillars:

- Sustainable wood consumption and production.
- The low-carbon forest sector.
- Decent green jobs in the forest sector.
- Valuation of and payment for forest ecosystem services.
- Policy development and monitoring of the forest sector.

Although this RAP includes several European Mediterranean countries, its pertinence for the Mediterranean context is not self-evident. This is mainly because of the limited forest area and wood volume and because, in relative terms, the array of non-woods products and services are highly valuable but still remains intangible and not priced in the market. These Ecosystem services include: Watershed protection, biodiversity conservation and adaptation to climate change, whose importance can easily exceed that of timber and tangible non-wood forest products (NWFPs).

In this context, understanding the role of Mediterranean forests in the green economy and their potential to generate employment, ecosystem services, low carbon economic opportunities becomes of vital importance.

Therefore this work, explores what different aspects of the green economy do Mediterranean countries see as most important and where forests, rangelands and related activities could make the greatest contribution to the green economy.

1.1: Objectives

General Objective: To Explore how Mediterranean Forests contribute to Green Economy

Specific Objectives:

1. To improve the understanding of Mediterranean forests contribution to low carbon economy, sustainable development, economic activity and job creation.

2. To identify main challenges and opportunities toward this contribution

Chapter 2: Methods and Methodology

2.1 Geographical Scope

Defined according to biogeography-bioclimatic definition the climate of Mediterranean region is characterized by mild winters and hot, dry summers. The Bioclimatic limits across different countries in Mediterranean are shown is (Figure 1). Although sharing common features, the regions is very diverse. Precipitation is higher on the North Coast (Europe) and lower in the South and East coasts (Gutierrez, 2016). At coastal areas temperatures rarely go below 0 °C in winters but, over the mountain ranges (Alps, Apennines, Pyrenees, North Afrin range) of the area, freezing temperature and snow are common in wintertime. (Scarascia-Mugnozza et.al., 2000). The climate of Mediterranean forests in the Thermo-Mediterranean and Meso-Mediterranean belts supports woodlands, and shrub vegetation (*macchia*, *maquis*, *dehesas*) (Mattecucci, 2012). With the increase in elevation vegetation pass from the Supra-Mediterranean to the Montane-Mediterranean and Oro-Mediterranean zones with completely different forest types (Quezel, 1985).

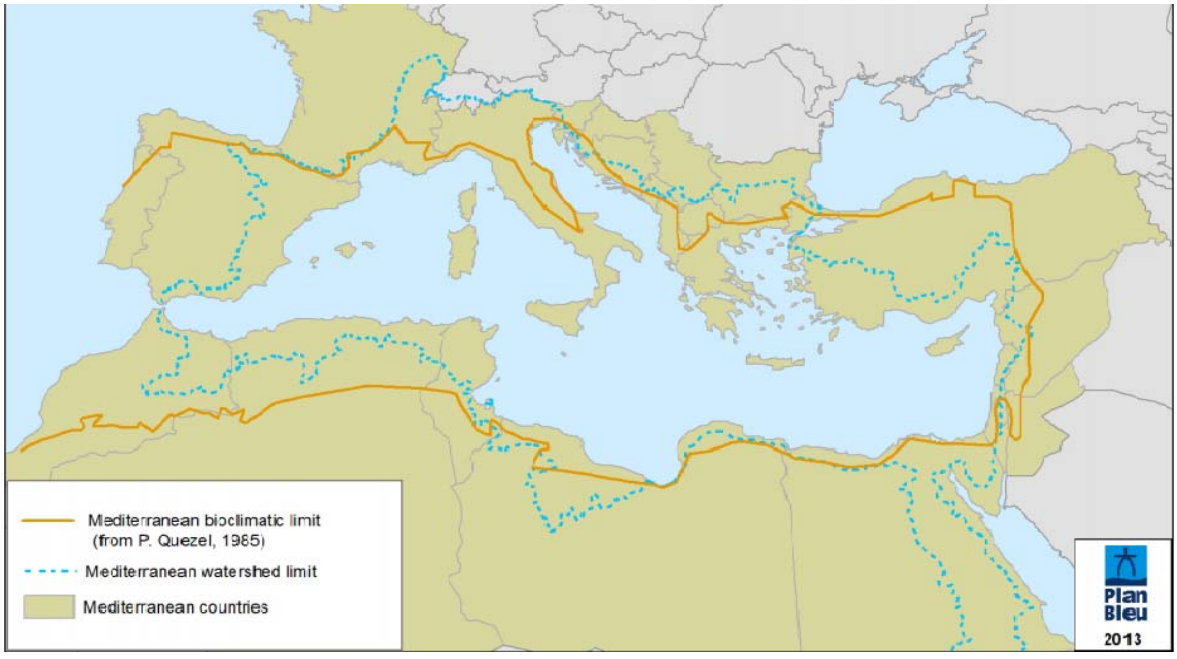

Figure 1: Countries of the Mediterranean region, Mediterranean bioclimatic and watershed limits. (Source: Plan Bleu from Ewing et al., 2010)

The bio-geographic Mediterranean region does not follow national frontiers and most countries belong to different biogeography regions. Since statistical data and national reports are mainly country based, in this report the Mediterranean region is represented by the countries and territories surrounded by the Mediterranean Sea (Merlo, 2005). The Mediterranean is a highly diverse region in cultural, economic and political terms. It is composed of many sub regional groups such as *members of the European Union, EU accession candidates, and members of the Arab League or the Arab Maghreb Union* (WEF, 2011).

In this report, the Mediterranean region includes 24 countries grouped into three subdivisions as shown in (Figure 2) following the State of Mediterranean Forest (FAO, 2013).

- The Southern European region includes Morocco, Algeria, Tunisia, Libya and Egypt
- The Eastern includes: Palestine, Israel, Lebanon, Syria, Turkey and Cyprus.
- And the Northern includes Albania, Bosnia and Herzegovina, Croatia, Slovenia, Italy, Spain, Portugal, France, Malta, and Serbia-Montenegro.

Figure 2: Sub-division of Mediterranean Region (Source: State of Mediterranean Forest, 2013)

2.2 Literature review

This research work is entirely based on a literature review that has been conducted in several phases. Through literature review it was investigate whether topic of Green economy is relevant to forests and if yes then how this topic is linked with Mediterranean Forests and rangelands. A literature review was conducted from March to June in order to find out the main publications and studies about these interlinking concepts.

Firstly, the concept of Green economy was analyzed in order to adopt a working definition. And also to identify which are the key economic sectors that green economy is targeting. The starting point was UNEP report (UNEP 2008) where it launched its *green economy initiative* to provide analysis and policy support for investment. In addition, Other reports from international organizations were also reviewed, including: Putting green growth at the heart of development (OECD, 2012), Towards green economy (UNEP, 2011), United Nations Conference onSustainable Development Rio+20 (WHO, 2012) and Our common future (UN, 1987). In addition, the Scopus database was searched for the following keywords, in the title and abstract: "Green economy", "green growth", "Green Economy and sustainable development" to have more deepen and interlinked analysis of the concepts. Scopus is a multidisciplinary indexing and abstracting database, covering citations from journals, the Web, patent databases and other sources in the sciences, social sciences and the arts & humanities publications.

Secondly, the key sociological and environmental issues in the Mediterranean, were described, based on reports from international organizations such as, The Mediterranean: A biodiversity hotspot under threat (IUCN, 2008), Gender and rural development. (GIZ, 2013) and **Fourth Assessment Report of the Intergovernmental Panel on Climate Change** (IPCC, 2007), The Water Issue in the Mediterranean (Ferragina, 2010), State of Mediterranean Forest (SMOF, 2013) and other web sources such as Mediterranean Growth Initiative.

Thirdly, state of forest resources in the Mediterranean was described based on FAO reports including Global Forest Resource Assessment Report (FAO, 2010), State of Mediterranean Forest (SMOF, 2013) and Global Forest Resource Assessment Report (FAO, 2015).

Finally, the relationships between Mediterranean forests and green economy were analyzed. The SCOPUS database was searched again for: "Green Economy" and "Mediterranean Forest". In addition case studies and best practices where extracted from grey literature. The potential of forest resources to impact the different priority sectors of the Green economy was analyzed. Six out of ten sectors of green economy were selected, which were relevant and can be contributed from Mediterranean Forest resources, including *building (construction)*, *water*, *agro forestry*, *transportation*, *tourism*, *energy*. This analysis was primarily based on the Total Economic Value of forest in the region. In order to have the most homogeneous vision on the VAT, the work of Merlo & Croitoru (2005) was preferred over more recent but also fragmented and heterogeneous research work. A series of graphs and tables of forest resources contributing in different sectors of green economy were created. All the information gathered was analyzed to evaluate the worth of Mediterranean forest and how and to what extent Mediterranean forests and rangelands can contribute to different sectors of green economy.

In addition, country reports and actions plans from four selected countries where analyzed to understand what type of role they envision for forests in the green economy. These are listed in Table 1.

Table 1: List of national reports and action plans for Green Economy

Country	Document	Year
Portugal	Green Growth Commitment	2015
Morocco	The Green Economy in Morocco	2012
Turkey	Turkey Green Growth Policy Paper	2013
Lebanon	National Report to the United Nations conference on Sustainable Development (Rio+20)	2012

Finally, the relevance of Rovaniemi action plan in the Mediterranean context is discussed and policy recommendations to better insert these forests in the green economy are presented.

Chapter 3: Results

3.1 Sociological, Economical and environmental challenges in Mediterranean

The Mediterranean basin as a 'historical region': The Mediterranean basin offers a mosaic of societies and cultures that influence one another (UNIFR, 1980). Due to the diversity of religions, cultures and climatic condition around the Mediterranean region, it is therefore subject to several sociological, economic and environmental challenges. Mediterranean forest plays a vital role in green infrastructure of the region, but they are threatened by events such as forest fires, over-exploitation, deforestation and degradation. These pressures are related to the following drivers (Palahi et al., 2008):

3.1.1 Climate change

The last report from the International Panel on Climate Change (IPPC, 2013) highlights the Mediterranean as one of the most vulnerable regions in the world to the impacts of global warming. In this respect, the Mediterranean area represents a transition zone between arid and humid regions of the world, which is why it is highly sensitive to global warming (Scarascia-Mugnozza et al., 2000). Climate change scenarios that primarily cause increase in temperature can create high uncertain changes in the precipitation patterns. For example a forecasted increased precipitation over northern Europe can cause an expected 20% decrease for the south of Europe. In summer this pattern across different sub regions in Mediterranean can result in frequent and intense drought periods, putting adverse effects on water resources, forestry and agriculture.

The Mediterranean Ecosystem transpires around 80% of precipitation and the evaporative demand of atmosphere can increase due to higher temperatures and lower precipitation during summer (Palahi et al., 2008). The end of the century, on average, a temperature increase of about 4-6 °C can be expected in Mediterranean region according to the IPCC 4th Assessment report (2007). The report also predicts 20-50% less rainfall during the summer. The Mediterranean Ecosystem transpires around 80% of precipitation and the evaporative demand of atmosphere can increase due to higher temperatures and lower precipitation during summer (Palahi et al., 2008).

Apart from Climate Change, increased areas of unmanaged forest in the north and deforestation and overexploitation in the south will increase the level of biotic (pests and diseases) and abiotic (fires, droughts, etc.) risks reducing the possibilities for adaptation to climate change. Their conservation and appropriate management have crucial impacts on the sustainability of the region's most strategic resource: water. Currently, 60% of the water-poor-countries (with < 1,000 m^3 $capita^{-1}$ $year^{-1}$) of the world are in the Mediterranean region and it is expected that, by 2050, 290 million people will face water shortages (with < 500 m^3 $capita^{-1}$ $year^{-1}$) (Plan Bleu, 2006). According to an estimate by Plan Bleu (2008) an increase of the sea level could reach 0.35 meter in the Mediterranean by the end of this century. In southern Mediterranean countries since 1970, global warming of nearly 2 °C is recorded (specifically, the Iberian Peninsula and southern France). As shown in Figure 2, the projected changes will strongly increase in the Mediterranean region by 2100, with most significant temperature increases in the Machrek (Egypt, Jordan, Lebanon, Palestine and the Syrian Arab Republic) (SOMF, 2013).

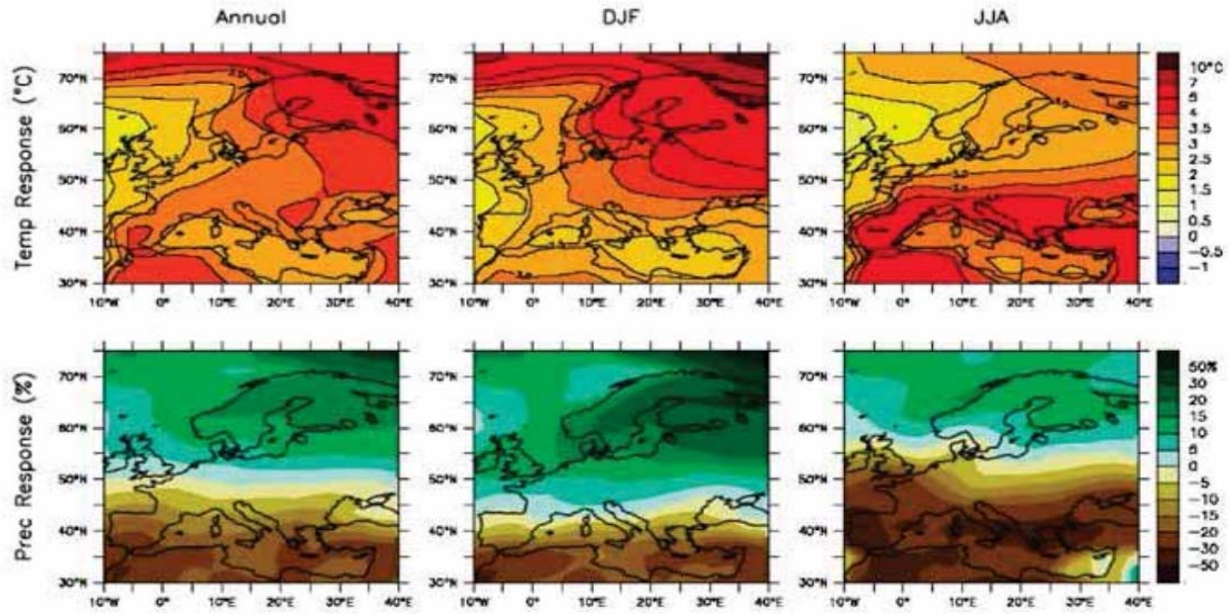

Figure 3: Comparison of current temperatures and rainfall, with projections for 2100
Note: DJF= December, January, February; JJA = June, July, August.(Source: IPCC, 2007)

3.1.2: Water Scarcity

Mediterranean ecosystem is fragile and possesses limited water resources, and those available are either low quality or fragile and sometimes unevenly distributed in space and time. Tourism, industries and agricultural lands are putting pressure on water resources and depleting the resource in the end. The Mediterranean basin has arid and semi-arid conditions resulting in the various forms of land degradation, particularly erosion and Stalinization (Collins, 2009). The Water Exploitation Index (WEI), which is defined as annual total water abstraction per year as a percentage of renewable freshwater resources calculates variety of situation in Mediterranean area. (EC, 2002). The assessment is based on threshold values/ranges for the water exploitation index that are as follows:

(a) Non-stressed countries < 10%

(b) Low stress 10 to < 20%

(c) Stressed 20% to < 40%

(d) Severe water stress ≥ 40%

Northern Mediterranean countries show a low percentage, except Spain (33%), however the exploitation index greater than 100% are Libya, Egypt, Jordan, Gaza, Israel and Jordan as shown in Figure 4. The aquifers across the region are also threatened with Technological progress and the improvement of pumping techniques, as they are low cost and can cause overuse of renewable freshwater resources (Llamas, 2005). An exploitation index equal in some countries in Mediterranean are greater 0058 than 100% like Palestine indicates that all renewable water resources are already being utilized, in order to meet there water demand they rely on non-renewable sources (Ferragina, 2010).

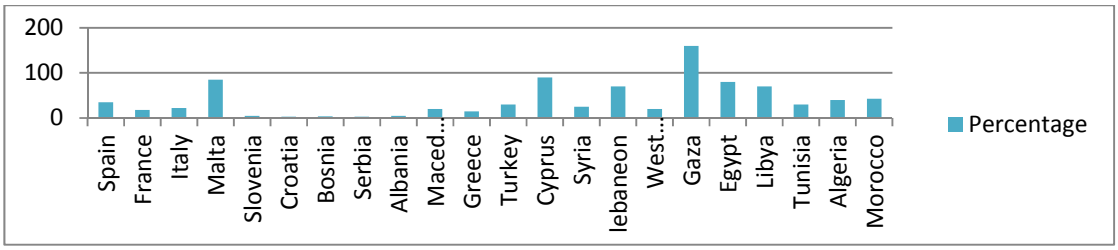

Figure 4: Exploitation Index of renewable water recourses 2007 in Percentage (Source: Ferragina, 2010)

3.1.3: Unemployment

The current unemployment rates are alarming in many Mediterranean countries that include France, Greece, Italy, Portugal and Spain. In Greece youth unemployment increased sharply after the 2008 Economic crisis, therefore by the end of 2012 youth unemployment in Greece and Spain was above 50 percent (As shown in figure 5) and almost 40 percent in Italy and Portugal (Eichhorst, 2014). According to the estimate by (Trading Economics, 2017) the highest youth employment in 2017 has been recorded in Greece and Spain, i.e., 45.50 and 38.60 percent, respectively. The youth in Arab Mediterranean countries have strong disadvantage in the labor markets and either face high unemployment rates or work in lower quality jobs. Some of the main elements behind unemployment in Arab Mediterranean Countries are instability and political turbulence, contributing to a decline in economic activity and made it difficult for governments to introduce far-reaching and comprehensive economic and labor market reforms. This in turn intensified disillusionment among the population as a whole and young people in particular (ETF, 2015). The high youth employment in Arab Mediterranean countries is indicated in Figure 6.

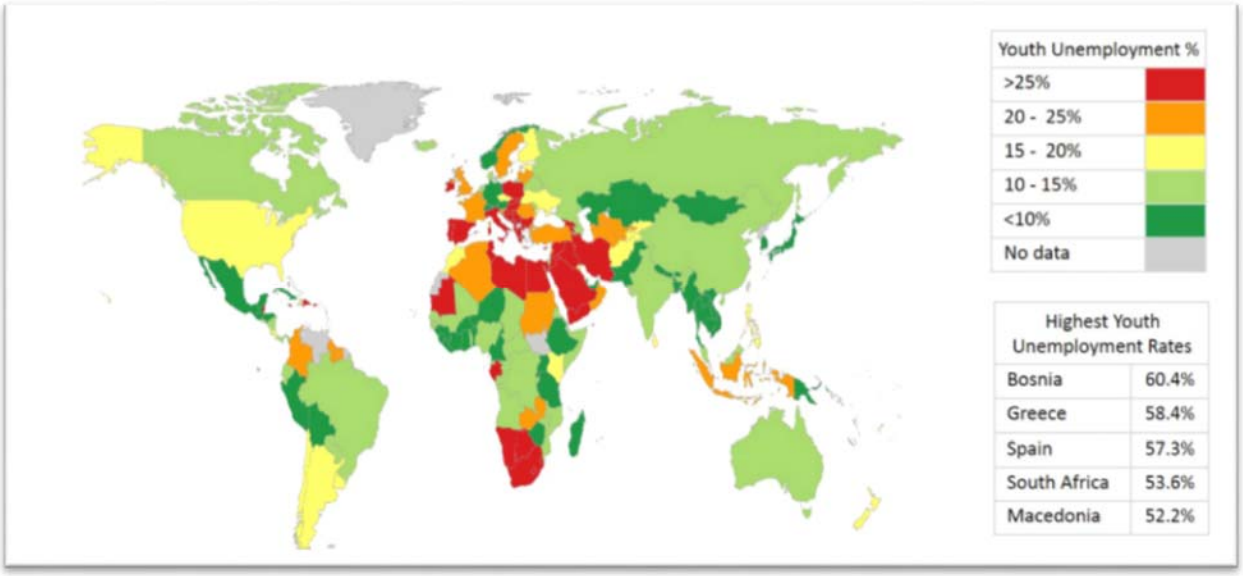

Figure 5: Youth unemployment 2013, total % of labor force ages (15-24). (Source: Dalberg analysis, 2013)

3.1.4: Energy Crisis

In terms of energy the Mediterranean region is a consumer of 8% of the world's energy and has 4.6% and 4.7% of the world's proven gas reserves respectively (OME, 2011). However, despite this concentration of reserves, the region is a net importer of energy resources and therefore imports around 45% of its consumed resources (OME, 2011). The fossil fuel consumption across Mediterranean countries as the North Mediterranean region accounts for 91% of fossil fuel dependence but the south of the region is a net exporter by -26%. (Martinez et al., 2013). In 2008, total emissions of greenhouse gases (carbon dioxide equivalent) in the Mediterranean region were 2487 million tones that indicate a 15 percent increase over 1999, as shown in Figure 6. The Northern-Mediterranean countries were responsible for 63 percent of these emissions, and France, Italy and Spain alone were responsible for 48 percent (SOMF, 2013).

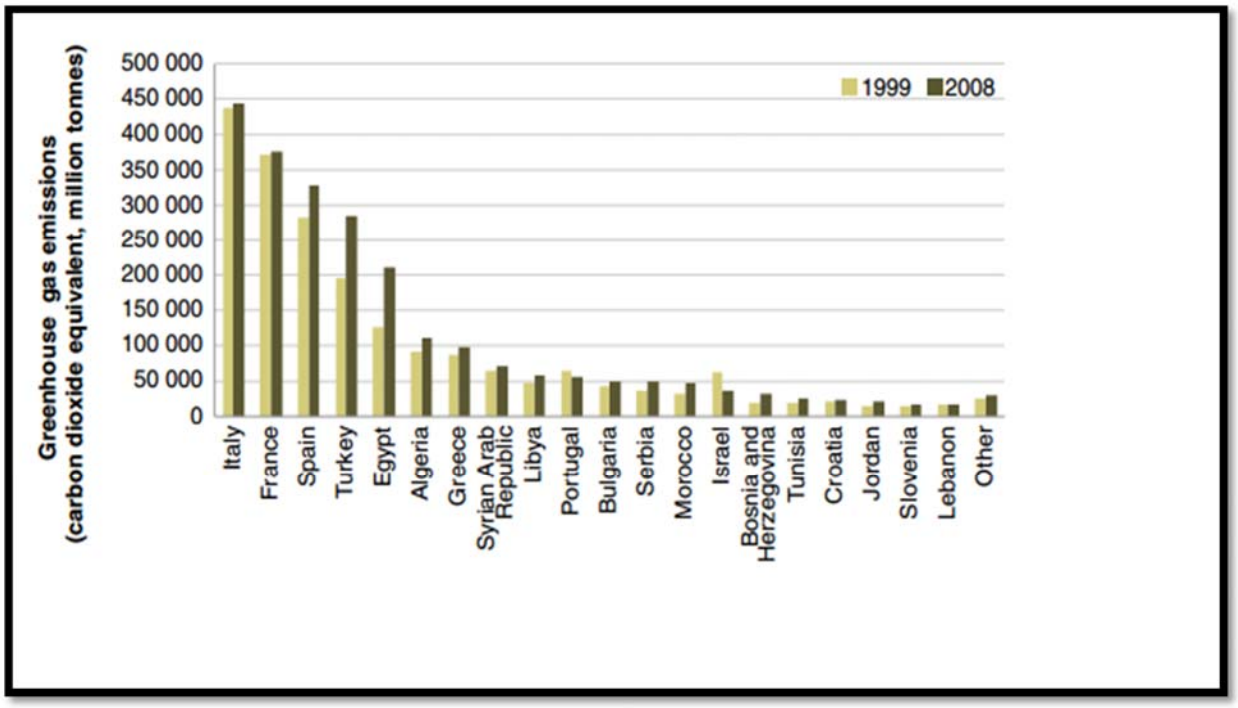

Figure 6: Greenhouse gas emissions, in Mediterranean countries, 1999 and 2008 (Source: State of Mediterranean Forest, 2013)

3.1.5: Threats to Biodiversity

With 25,000 species and about half of them endemic, Mediterranean Basin is one of the world's richest places in terms of animal and plant diversity (CEPF, 2010) . In the Mediterranean region about 2 out of 3 amphibian species and half of the crabs and crayfish are endemic. The region also provide habitat to 48% of the reptiles, a quarter of mammals, 14% of dragonflies, 6% of sharks and rays and 3% of the bird (IUCN, 2008). However, many species lies in the IUCN red list and are threatened because of many factors (Figure 7). Discarded plastic bags causing death of many marine animals and illegal trade and poaching of many species are some factors to be mentioned. Around 32% of freshwater fishes are threatened by dam construction (Smith and Darwall, 2006). Moreover Infrastructure development is strongly affecting some of the most fragile habitats in the region (Diaz and Rosenberg, 2008). Many of the species are subject to Overexploitation is driven by several causes: for example, demand for traditional medicines is threatening some plants, seahorses and mammal species (IUCN, 2008).

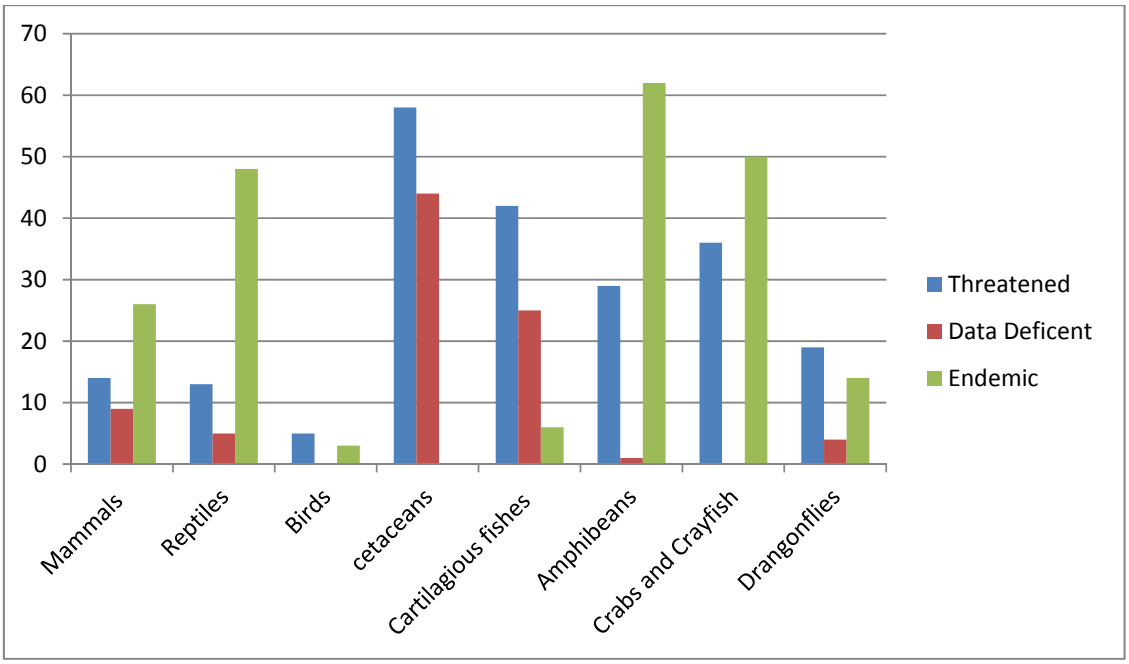

Figure 7: Percentage of Threatened, Data deficient and endemic species in Mediterranean
Source: IUCN 2008

3.1.6 Summary

The Mediterranean region is a net importer of natural resources and has an economy based in fossil fuels. With the expectation of a few countries (i.e. Algeria) this also leads to great energy dependency. It has a structural high unemployment rate that affects mainly young people. It is an area with high water scarcity risk but yet rich in biodiversity. The increase in climate change pressures on societies and on natural resources are predicted in the region. Therefore transition to green economy can offer a pathway to solve these challenges, as it aims at decarbonizing the energy sector by decoupling economic growth and resource consumption. It also offers opportunity for the creation of quality jobs based on renewable and nature based resources. In fact, several countries in Mediterranean have produced Green Economy action Plans that will be discussed later in this report.

3.2: State of Mediterranean Forest

3.2.1: Summary of Mediterranean Forest

Mediterranean forest represents approximately 25 percent of world forest area with an estimated forest area of 85 million hectares (FAO, 2010). There is uneven distribution of forest is distributed over the Mediterranean basin, as well as they are also different in their distribution in between Mediterranean countries. About 60% of the forest area of Mediterranean is concentrated in five countries, Italy, France, Spain, Greece and Portugal. The high concentration of forests in Northern Mediterranean countries is due to natural conditions allowing faster and better growth (SOMF, 2013). However, forests are scarce in southern and eastern countries, where the climate is very dry and hot. In fact, more than 95% of the forest in 17 countries in this part of the region is concentrated in only three countries turkey in the east, Morocco and Algeria in the south (Merlo, 2005). Mediterranean forests are increased by almost 12 million ha between 1990 and 2010, with average 0.68 percent per year. However the East Mediterranean countries like Albania, Algeria, Bosnia and Herzegovina and Israel had net forest loss (FAO, 2010).

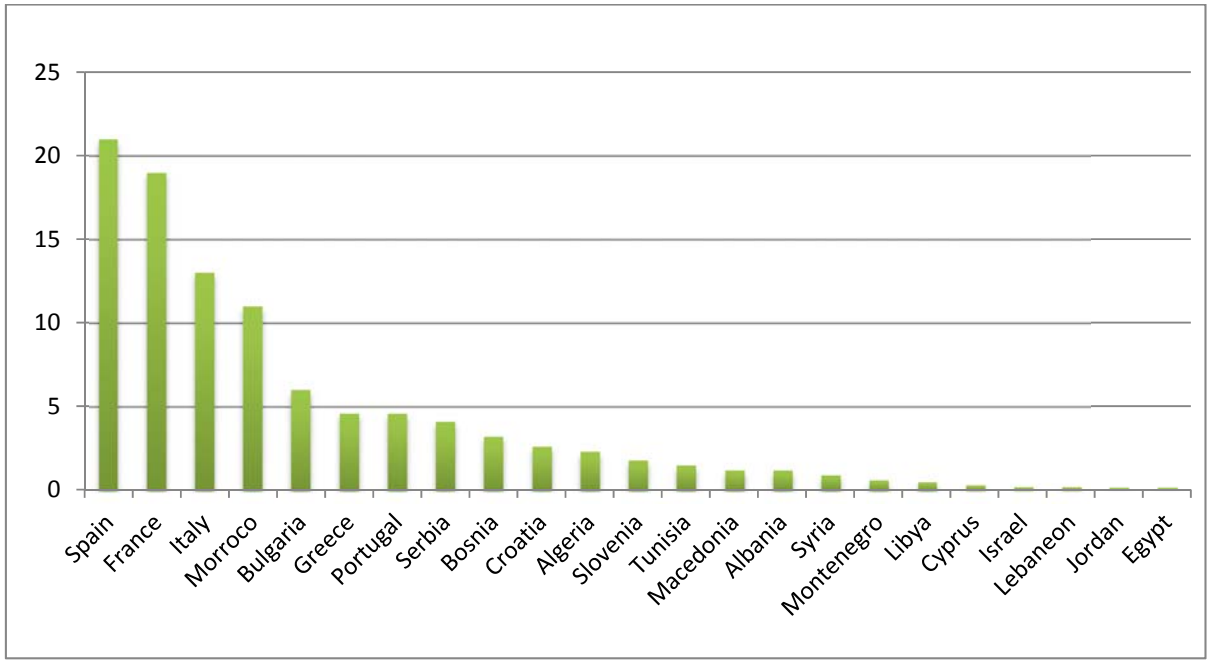

Figure 8: Percentage of total forest area in Mediterranean Countries (Source: SMOF, 2013)

3.2.2 Forest resources in Mediterranean

Mediterranean forests provide a range of environmental services and products. Some of the public goods and externalities provided by Mediterranean forests includes Watershed protection, landscape quality, soil conservation, carbon sequestration and recreation resources but they are seldom recognized and therefore are difficult to evaluate and price (Merlo, 2005). Mediterranean Forest are also the producer of Non-wood forest products (NWFPs), they contribute substantially to the welfare of many rural people such as honey in Lebanon and fodder in Algeria (GIZ, 2013). Some NWFPs goods can also play a key role in national economies, for example cork contributes about 3% of Portugal's gross domestic product (SOMF, 2013). The estimated values of NWFPs and NWTPs in the Mediterranean is about €39/ha in 2005, in which southern countries benefit (€54/ha), considerably higher than that for northern (€41/ha) and eastern (€20/ha) countries (Merlo, 2005). Some other NTFPs are believed to have a strong potential to improve welfare and rural development in many Mediterranean countries. They however fail to do so, partly because their value is not fully recognized by decision-makers.

According to FAO (2010) the total forest growing stock in the countries of the Mediterranean region was 9 623 million m3, of which 4 062 million m3 (41 percent) was conifers and 5 550 million m3 (58 percent) was broadleaved species. Countries with the highest volume of growing stock i.e, (more than 500 million m3 each) were Bulgaria, France, Italy, Spain and Turkey (FAO, 2013). Mediterranean forests are composed of broadleaved species (mainly oaks), both evergreen and deciduous, such as *Quercus ilex, Q. suber, Q. coccifera, Q. pubescens, Q. cerris, Q. pyrenaica, Q. toza, Q. calliprinos, Q. ithaburensis and others, and conifers such as P. halepensis, P. brutia, P. pinea, P. pinaster and Juniperus species* (FAO, 2013). In the Mediterranean region, The Mediterranean forest and maquis cover about 56 Mha, representing the 75% of the total countries land. In the Mediterranean region, 52% of this forest is found northern countries, 32% in the east and 16% in south (Merlo, 2005).

With appropriate forest management models and innovation frameworks, Mediterranean forest has the potential to generate innovative, high added value and eco-friendly goods. These goods can support the socioeconomic development of rural areas and improve the welfare of urban populations, thus being a key pillar in a Mediterranean knowledge-based bio-economy (Scarascia-Mugnozza et al., 2012).

3.3: Green Economy: Terms and terminologies

It's been 25 years, since the concept of Sustainable development was formally adopted at the United Nations (UN) conference on the environment and development. The concept was initially defined by the Brundland report as "**meeting the needs of the present without compromising the ability of future generations**". (World Commission on Environment and Development, 1987). The concept of sustainable development aims to maintain economic progress and environment protection in order to provide a framework for the integration of environment policies and development strategies (United Nations General Assembly, 1987). Through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision making process, the overall goal of sustainable development (SD) is achievable (GSDR, 2015). One of the important contexts of Sustainable development is green growth (OECD, 2013), regarded by World Bank as **growth efficient** in the use of natural resources, **clean** as it minimizes pollution and environmental impacts, and **resilient** in that it utilize national capital in preventing natural disasters (Bowen, 2012). However, in this framework, *green growth* does not replace sustainable development, but is a means to achieve it (OECD, 2013). The concept of green growth was pioneered in year 2005 at the Fifth Ministerial Conference on Environment and Development (MCED) held in Seoul, Republic of Korea (ESCAP, 2011). Green growth is also known as a pre-requisite for building a green economy in the context of sustainable development and poverty reduction. The term Green economy aroused to the surface itself in 2012, as it was one of the official themes of the Rio+20 Summit (Greenpeace, 2012).

3.3.1 Definition:

There are several definitions of Green Economy in literature, according to UNEP (2011) a green economy can be thought of as one which is low carbon, energy and resource efficient, prevent the loss of biodiversity and ecosystem services and socially inclusive. In its simplicity forum the definition of Green Economy by UNEP is as follow;

"The one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities."

The definitions in literature summarize that green economy is an "umbrella" concept that encompasses different implications with regard to growth and well-being, or efficiency and risk

reduction in the use of natural resources (Loiseau et al., 2016). Green economy is therefore seen to be at the heart of renewed efforts to contribute to, or progress the broader agenda of, sustainable development and to contribute to achieving internationally agreed development goals, including the Sustainable Development Goals (SDG) (Georgeson, 2017). However it is important to consider that Rio+20 recognized that there is no 'one size fits all' approach to the green economy. In order to have impact the policies for Green economy must be adapted to fit the context of each Member State. Sustainable development requires local strategies, with locally relevant policies, based on the specific terrestrial and marine environment, culture, and social circumstances (ESCAP, 2011).

3.3.2: Green Economy and Sustainable Development Goals

Around 189 countries agreed under the umbrella of the United Nations in the year 2001 on the Millennium Development Goals (MDGs), set of eight goals by signing the Declaration (UN, 2007). The MDGs were meant to be achieved in a timeline of 15 years and therefore expired in 2015. The 8 goals had a clear measurement/monitoring mechanism and were therefore were realistic and easy to communicate which made them revolutionary in providing a common ground to all the countries to reach global agreement. Before the expiration of MDGs, the road for the new set of goals started to paved out at Rio+20 conference (the United Nations Conference on Sustainable Development) in Rio de Janeiro, June 2012 (WHO, 2012). In September 25th 2015, countries adopted to 17 goals to **end poverty**, **protect the planet**, and **ensure prosperity for all** as part of a new sustainable development agenda. (Sustainable development Knowledge Platform (SDKP[1]).

Green economy is therefore well placed to be a major contributor to attainment of the Sustainable Development Goals to **promote strong, inclusive and sustainable economic growth and decent work for all.** The thrust of green economy on **de-carbonization** supports goals and targets to deliver long-term triple wins across social, environmental, and economic areas, while at the same time addressing trade-offs across sectors and groups, including women and men, and communities living in multi-dimensional poverty (Poschen, 2015). The most relevant SDGS that fit in the framework of Green Economy are mentioned in Annex 1.

3.3.3: Characteristics of green economy

In the recent years national and international efforts to promote green economy for pressing economic and environmental challenges have been intensifying in recent years. These efforts have helped to accelerate progress towards sustainable development and poverty reduction through, for example, more sustainable use of natural resources, efficiencies in the use of energy, and valuation of ecosystem services (OECD, 2012). If designed and implemented completely the full value of natural capital and recognizing its essential role in economic growth can be archived. A green Economy model promotes a cost-effective and resource efficient way of guiding sustainable production and consumption choices by exhibiting three characteristics

- Low Carbon Emission
- Low Water Use
- Low Material Use (Sustainable resource management)

Low carbon:

Oil, gas and coal generate two-thirds of electricity, power in order to 75% of industry and fuel 95% of the global transport fleet but meanwhile they are also emitting 32 gigatonnes (Gt) of CO_2 per annum (Goldman Sach, 2015). The low-carbon alternatives to fossil fuels are a way of transitioning to a system that is a cleaner, smarter, more efficient, and reflective of the environmental costs of greenhouse gas emissions. Low carbon technologies have a vital role to play in the move towards a green economy (EC, 2014). Some of the strategically important, low carbon Technologies includes CCS (Carbon Capture and Storage), CSP (Concentrated Solar Power) and zero-carbon transport (Bolton, 2015).

Low material use:

At the most basic level, resource efficiency captures the notion of 'doing more with less'. In the world of finite resources resource efficiency and low material use are vital to sustain socio-economic progress. The resource efficiency indicates the growth of output and decrease in resource use and emissions; however it does not guarantee reduction in environmental pressures in absolute terms (Ecorys, 2014).

Low water-use:

Natural resources are a key factor in the transition to a green economy. As the United Nations World Water Assessment Programme (2009) observed: *'Quantifying the way that water flows through the global hydrological system, different ecosystems and economies is essential for managing water resources, maintaining ecosystem services and ultimately protecting human health and the environment."* Success of green economy depends on sustainable, integrated and resource-efficient management of water resources and on safe and sustainable provisioning of water supply and adequate sanitation services'(UNEP, 2011).

3.3.4: Sectors of green economy:

Common characteristics of a green economy in any country include, among other things: a low-carbon energy mix; reduced pollution and GHG emissions; resource efficiency; and limited of loss of biodiversity and ecosystem services. It involves an energy infrastructure with zero carbon emissions, sustainable tourism, water protection, infrastructure and the preservation and protection of the world's natural resources (OECD, 2012). Green economy agenda can be aimed at increasing investment in various economic sectors as the transformations in these sectors should be intimately linked to poverty alleviation goals, and seek positive impacts on human and environmental health, employment and foreign trade. The sectors of green economy are shown in Figure 9.

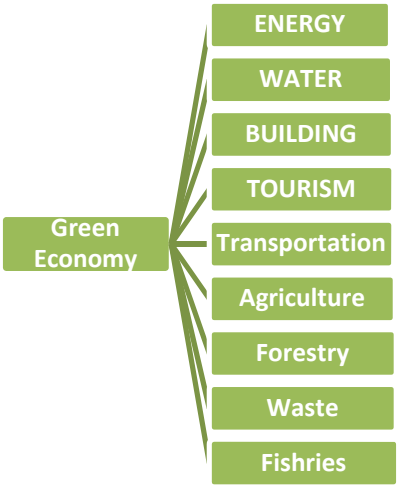

Figure 9: Sector of Green economy (Source: Eco-Union, 2016)

3.3.5: Pathways to Green economy

Sustainability requires a behavioral shift by society to change consumption patterns to reduce energy and material inputs and to reduce the impacts of goods and services on the environment (Barchya, 2016). Green economy therefore recognizes that there are many and diverse pathways to environmental sustainability based on sharing, circularity, collaboration, solidarity, resilience, opportunity, and interdependence (UNEP, 2015). All these pathways promote recirculation of goods, increased utilization of durable assets, exchange of services, and sharing of productive assets. Transition to these pathways provides a broad range of various forms of production and exchange which aims to reconnect economic activity with ethical values and social justice and aim to heighten concerns environmental protection concerns (UNRISD, 2013).

Sharing:

Through sharing require fewer goods, less energy and fewer material resources and consequently reduce waste, due to the access to sharing goods, space, skills and services. (Barchya, 2016).

Circularity:

Circularity replaces the 'end-of-life' concept with restoration. It shifts towards the use of renewable energy, eliminates the use of toxic chemicals, and most importantly eliminates waste as an end product by altering the material type use for the production of goods.

Collaboration:

Collaboration is aim not only to grant consumers temporary access to under-utilized assets but also to increase the usage of the main functionality of products (Frenken et al., 2015). It proactively supports the innovation, competitiveness and growth opportunities while ensuring fair working conditions and sustainable consumer and social protection (EC, 2016).

Solidarity:

Solidarity is an umbrella term that includes different ways in which we human beings collectively generate livelihoods by interacting through different relationship with each other and the rest of the Earth (Mances, 2015). By taking the responsibility for our relationships can result in fostering diversity, autonomy, cooperation, communication, and shared-power (UNRISD, 2013).

Resilience:

Resilience in Economy is essential to better withstand adverse shocks and reduce the economic costs associated with them (European Central Bank, 2016). Resilience requires Innovation to provoke and steer transformations through improved risk management, resilience building and adaptation to change (European Central bank, 2016).

Opportunity

Opportunities along with policy reforms are required to promote and strengthen capacities of developing countries to benefit (ITC, 2012). Another important opportunity from green economy is possibility to generate new green jobs. New green jobs will require new skills in new and emerging occupations. The action to combat climate change will become more effective through identifying those new skills and they will also help in building sustainable societies (Cedefop, 2009). It is estimated that in the next ten years the green economy will generate over 20 million new jobs, which will be a great milestone toward eliminating Unemployment. (Cedefop, 2009).

Interdependence:

An important characteristic of the global economy is the concept of interdependence. It exists across both time as well as space, as we are directly linked back in time by the oldest members of the community and forward nearly a century by those born today. One of the key concepts of sustainable development and Green economy is the interdependence of society, economy and the natural environment. Understanding the concept of interdependence will assist us in recognizing our responsibilities for the future.

Figure 10: Pathways to Green Economy (Source: UNEP, 2015)

Chapter 4: Discussion and Conclusion

4.1: Forest Contribution in sectors of Green Economy

4.1.1: Energy sector and Mediterranean Forest:

As a consequence of the worldwide economic growth and development the energy demand has increased in the past years. It is observed that total primary energy supply more than doubled between 1971 and 2011 globally and is expected to increase at higher rates in the next decades (IEA, 2016). The World Economic Outlook 2013 projects that by 2035 electricity demand will be almost 70% higher than current demand, that is driven by rapid growth in population and income in developing countries (IEA, 2013). Today the energy production rely mainly on fossil fuels. Therefore this growth in demand will cause a progressive depletion of fossil resources and make the availability of conventional oil and natural gas geographically restricted (OECD, 2011). The only issue however is not to meet the demand of energy but also the energy sector responsible of 42% of the total greenhouse gas emissions from fossil fuels (Pierobon, 2015).

Biomass is obtained from biological materials and consists of herbs which are used for bio fuel and fiber, heat and animal and plant products which are used for producing chemicals (Klass 2004). Biomass contains forest waste, agricultural waste and also includes organic or raw materials (cellulose, hemicelluloses and lignin) and contains high energy which mentioned as bio-energy (Anwar et.al., 2014). Bio-energy is a renewable source of primary energy, and its sustainable use does not emit carbon dioxide. Wood has traditionally been considered a sustainable source of energy. Several developing countries have the potential for producing wood energy safely and sustainably, with relatively low investment and risk, while developing their national economy and creating jobs in rural areas (FAO, 2010).

Beside from being a renewable energy sources Firewood also has arrays of important environmental benefits. It has very low ash contents and produces no hazardous gases upon combustion. The net production of CO2 from the combustion of firewood is only 5% because the CO2generated during combustion equals to the CO2 consumed during the lifecycle of the tree (Bascetincelik et al., 2006). The composition of the raw wood gas found by different gasification methods indicates that wood gas contains no components harmful to the environment such as sulfur dioxide or nitrogen oxides (Fengel and Wegener, 1989).

Biomass energy from Mediterranean forests: It is unbiased to say that Mediterranean forest has negligible reserve for biomass energy production in the form of wood fuel. The amount of wood fuel produce however differs across Eastern, southern and Northern Mediterranean countries as shown in Figure 11. It also differs depending on its extraction from broadleaves and conifers as shown in m3 in Table 2.

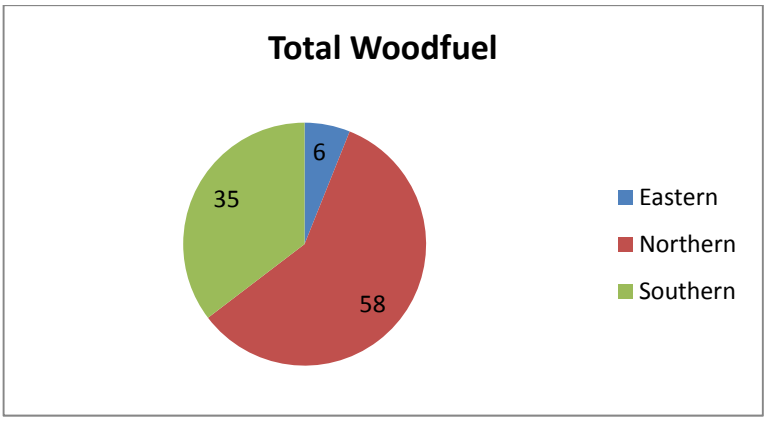

Figure 11: Percentage of wood fuel in Mediterranean region. (Source: SOMF, 2013)

Table 2: Production of wood fuel from Broadleaves and conifers Mediterranean region, 2010 Source: (SOMF, 2013)

Sub region	Broadleaves (000m3)	Conifers (000m3)
Eastern Mediterranean	1,964	3,246
Northern Mediterranean	4,516	43,711
Southern Mediterranean	5,878	23,357

In the Mediterranean mountains firewood collection is done for cooking and heating, by villagers and local communities (Vogiatzakis et al., 2005). Wood is the most practical fuel for serving a large number of people because of stove's burner. In Turkey fuel wood contribute 30.6% of the household sector as a major energy source (Turker, 2002). In Morocco, total biomass energy

consumption is 18.3 million m^3 per annum out of which 91.6% are consumed by households and 8.4% by socio-economic establishments (Ellatifi et al., 1998). A survey estimates that 25.6% of the Italian families use firewood for domestic heating, percentage which increases to 38.7% for the families living in the mountain areas (Monguzzi, 2008). Wood charcoal production and further processing is another promising agro-processing industries (MITSMED, 2016), and in Mediterranean region Lebanon holds some wood charcoal reservoirs (Merlo, 2005). In sub-region Morocco has the highest value from firewood, with the removal of 9 million cubic meters from the country's forest. It is at the second rank, after fuel (53%), far before electricity (9%) and mineral charcoal (4%) (Ellatifi et al., 1998).The fuel wood is extracted predominately from forest species like *Eucalyptus spp and Quercus suber* (Table 3).

Table 3: Distribution of the Moroccan fuel wood consumption among species
Source: Merlo, 2005

Forest species	**Consumption in Urban areas (% of Urban total)**	**Consumption in Rural areas (% of Rural total)**	**Total national Consumption (% of National total)**
Eucalyptus spp.	43.03	15.12	19.59
Quercus suber	17.32	22.42	21.6
Other Quercus spp	5.46	8.46	7.98
Argania spinosa	1.14	5.23	4.57
Cedrus atlantica	6.5	3.27	3.8
Other coniferous species	2.3	0.8	1.04
Other forest species	24.25	44.7	41.42
TOTAL (in millionm^3)	**1.5**	**8.1**	**9.6**

Box 1 Firewood Production and consumption in Turkey

About 27.2% of Turkey's lands (21.2 million hectares-ha) are covered with forests and annually produces 6-7 million m^3 of firewood. In addition, about 7 million m3 forest residues are formed annually in forests during cutting and maintenance operations (Ozcan et al., 2015).Despite these high potentials, these energy resources are not utilized efficiently by modern methods. Most of the produced firewood is used in rural parts of the country for household heating and cooking purposes and only 15% of the available energy forests are utilized using classical methods which result in very low product yields (Saraçoğlu, 2008; Türker and Kaygusuz, 2001). Finally, majority of the forest residues are either left in the forests due to high transportation costs or they are used by local people for household needs. There are no modern power plants which can convert the produced firewood and formed forest residues into electric and heat energies along with other biomass sources (Turker, 2012).

4.1.2: Water sector and Mediterranean Forest

In many semi-arid and arid regions green water are of immense importance because their Flows dominate the hydrological cycle. (Graham, 2006) Green water is needed not only for supporting tree's biology but to support many other important forest biodiversity including micro-organisms, insects, animals, and plants. It is also essential for the circulation of chemical elements through the ecosystem and also involved in basic ecosystem processes (Vallejo, 2011). Another major service of green water is through the role of forests in capturing blue water, regulating flows and circulating water

Mediterranean shorelines run for a total length of about (46 000 km) and cover a little more than 1 million km^2. The 221 coastal regions around the basin had a population of 145 million people in 2000, representing 34 percent of the total inhabitants of all Mediterranean countries (Jewitt, 2006). Mediterranean Forest provides water related services through designated forest areas and soil protection in many countries. In Spain the percentage for soil and water protection vary from 20 percent to 24 percent, however in Cyprus, Greece and Syrian Arab republic no forest are primarily designated for soil and water protection (FAO, 2010). Between 1990 to 2010, the area

of protective forest increased from 15.2 million ha to 15.9 million ha in western Mediterranean Europe and from 2.1 million ha to 3 million ha in southeastern Europe including Turkey (SMOF, 2013).

Box 2 Soil protection in Syria and Water Purification in Algeria

Syria: The western and north western parts of Syria (the coastal region, Idleb, Al-Ghab and other parts of hama and Aleppo), where the major natural forests are chiefly situated in foot hills are subjected to the high risk of water related hazards. The high risk area covers approximately 200,000 ha. At the cost however same land area are protected by the well managed forest stands. The average public expense of soil conservation and hydraulic works maintenance is around 210 euros /hector. Therefore it can be assumed that the well managed forests perform a watershed protection function worth 42.5 million euro. This value allows calculation of about 92 euro/hector of forests in Syria. The case study reported in Merlo (2005)

Algeria: Chréa National Park is located 50 km South-West of Algiers over an area of 26,587 ha, 85% of which is woodland. The natural vegetation includes pure or mixed forest formations, with a variety of dominant species, including the Atlas cedar (endemic species), cork oak, evergreen oak, Algerian oak, Aleppo pine and Barbary Thuja. It is estimated that the park transfers communities with drinking water 4,927,500 m3 per (Volume), as the Unit cost of purification avoided €0.29 per m3, The total cost of purification avoided €1,442,990 per year (Ouadah, 2016).

4.1.3 Build Sector and Mediterranean Forest

Wood is the naturally growing building material that is also renewable. Significant benefits can be offered from the wood extracted from sustainably managed forests, especially when compared to materials that require large amounts of fossil fuels to manufacture. Timber products require considerably less energy to produce than competitive construction materials such as plastic, metals or concrete (CSAW, 2007). A comparison between wood and steel and concrete as building material indicates that the later material requires up to two times more energy than wood-based products. Wood also contributes towards energy sector as it is a natural insulator for temperature and sound. Fire retardant-treated wood-based insulation is proving to be more economical, and more environmentally friendly than fiberglass or polystyrene (Ward and Patterson, 2012) Therefore wood-framed housing is gaining market share in Europe as a result of the many environmental and economical advantages of wood (UNECE, 2009).

Moreover most importantly considering global CO_2 emissions, the main benefits of using more timber as a building material are:

1. An increase in the pool of carbon in wood and wood products

2. Reduction of fossil fuel use in manufacturing wood rather than more energy intensive materials such as steel, concrete and aluminum (less embodied energy)

3. Displacement of fossil fuel by burning of wood waste materials (Buchanan, 2007).

The common Wood-Based building materials include Sawn wood, Wood based panels, Plywood, Fiberboard and Particle board (Kunzun, 2014). In Europe, the most commonly produced wood-based panels are particleboard and Medium Density Fiberboard (MDF), Oriented Strand Board (OSB), traditional plywood, insulation board, and hardboard. Recently introduced in the market some of the wood products for building and construction also include Laminated Veneer Lumber (LVL), light MDF (LDF), High-Density Fiberboard (HDF), and Cross-Laminated Timber (CLT) (Kuzman, 2014).

In Mediterranean Region the Northern Mediterranean countries are leading in the production wood based build products including sawnwood, plywood, particleboard, wood based panels, and Fiberboard (Figure 12) .In the Eastern Mediterranean countries due to low timber production of 1 million m^3, the wood based products have low production and therefore invisible market, similar is the case with Southern Mediterranean countries. Among SEMCs, Turkey has the highest removal of timber i.e about 10 million m^3 (Merlo, 2005). Therefore in turkey Wood processing plays a significant role in economy, especially for rural employment, with industrial wood production mainly geared towards the manufacturing of wood-based panels (plywood, blackboard, particle board, medium density fiberboard, high density fiberboard and oriented strand board) and pulp (UNECE, 2002). In terms of trade, the wood market sector in Turkey is diverse and consists of a number of products including logs, sawn timber, veneers, panels, molding, doors and door frames, windows and window frames, flooring and other building components (UNECE, 2002).

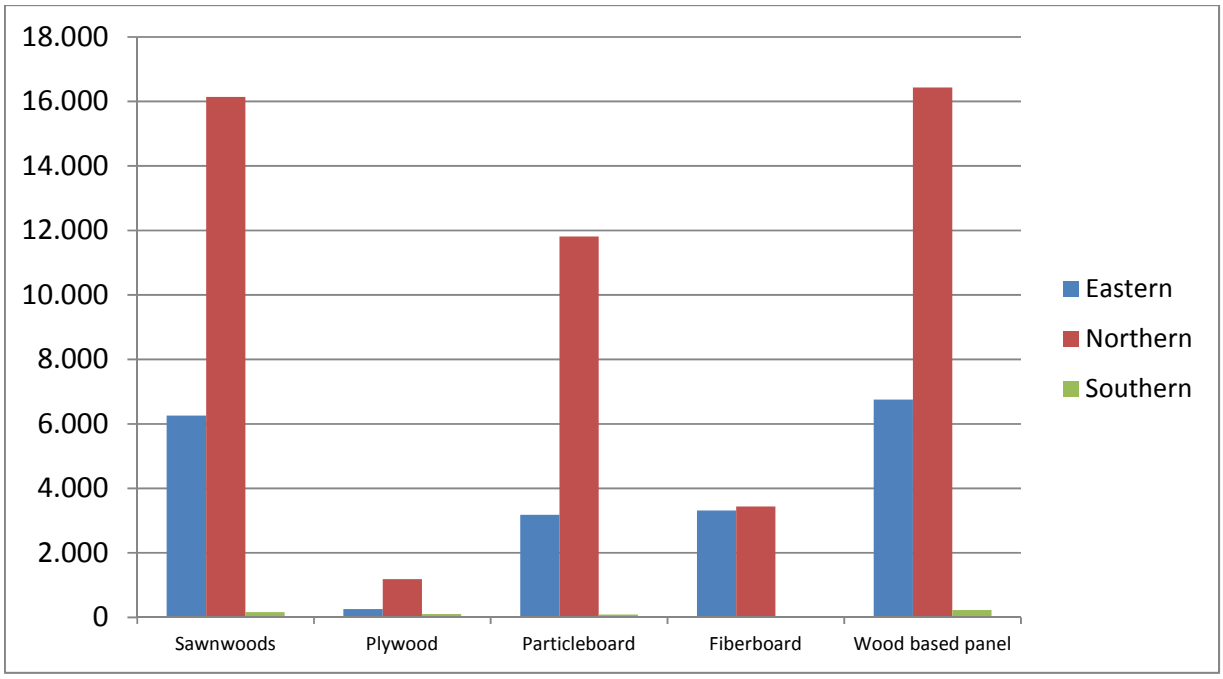

Figure 12: Sawnwood, Plywood, Particleboard, Fiberboard and wood based panel in Mediterranean Sub regions (Source: SOMF, 2013).

4.1.4 Tourism Sector and Mediterranean Forests

Rural development can be achievable through the multi-functionality of forest as they provide arrays of goods and services, even though some of them do not always have a direct market value. One of those many services is forest based tourism which undeniably represents an ecological and economical asset for the Mediterranean Region (Christodoulou, 2010). Forest based tourism lies under ecotourism and has been developed successfully within national parks, nature reserves and marine protected areas all over the Mediterranean countries. Nature-based, rural and ecotourism are products designed to be sustainable, responsible and community-based activities (EC, 2014). The value of tourism is highest in the northern Mediterranean countries, namely Italy and France ranging from 170 million to 420 million Euros, however in the EMCs the highest tourism value is from turkey (16 million euro), followed by Israel and Lebanon (Merlo, 2005).

BOX 3 Case of Ecotourism in Lebanon's Shouf Biosphere Reserve

The Shouf Biosphere Reserve was declared a UNESCO Biosphere Reserve in 2005. It covers 165 km² and includes Al-Shouf Cedar Nature Reserve, Ammiq Wetland Protected Area, and 24 villages from the eastern and western sides of the Barouk and Niha mountains. It accounts for a quarter of the remaining cedar forests in Lebanon. The reserve has become a popular destination for ecotourism activities such as hiking, snowshoeing, and bird watching. About 60,000-70,000 Visitors per year are benefiting Shouf Reserve from improved services and facilities most of which was made possible through donations and grants (about $2.2 million in 10 years (EDILE, 2015)). The Total Value of Tourism is $712,500/ Year which is divided as follow:

Table 4: Monetary value of Shouf Biosphere reserve in Lebanon (Source: EDILE, 2015)

Description	Value in US$
Entrance fee	$186,000
Lodging fee	$79,000
Conventional Restaurant	$247,500
(TawletAmmor Eco-restaurant)	$200,000

4.1.5 Transportation Sector and Mediterranean Forests

Bio-fuel is a sustainable biomass energy used for transportation. It is derived from agricultural crops, including conventional food plants or from special energy crops. They can also be derived from forestry, agricultural or fishery products or municipal wastes, as well as from agro-industry, food industry and food service by-products and wastes (UNEP, 2013). Bio-fuels significantly reduce CO_2 emissions compared to fossil fuels. The starch ethanol reduces emissions by an Average of 37-40%; sugarcane ethanol reduces emissions about 90% (Think Bioenergy). As prices of crude oil is touching sky high, the crops grown for biofuels can reduce dependence on fossil fuels, resulting in economic benefit overall (Viesturs, 2013). The most known and used Bio fuels are Bio ethanol and Biodiesel, their description is as follow:

- **Bioethanol** (ethyl alcohol, grain alcohol, CH3–CH2–OH or ETOH) is a liquid bio fuel which can be produced from several different biomass feedstock and conversion technologies. The fermentation process is similar to that used to make wine or beer, and pure ethanol is obtained by distillation (Balat, 2008).
- **Biodiesel** is produced by combining vegetable oil or animal fat with an alcohol. It can be blended with traditional diesel fuel or burned in its pure form; however the energy content of biodiesel remain less than that of diesel (88 to 95%). This Biofuel can be derived from a wide range of oils, mainly oils from rapeseed, soybean, palm, coconut or jatropha therefore it has more physical properties than bioethanol (IEA, 2007).

Box4 Bio-ethanol from Carob tress

Bio ethanol is an attractive alternative fuel because it is a renewable bio-based resource and it is oxygenated thereby provides the potential to reduce particulate emissions in compression–ignition engine (Turhan, 2010). The carob tree (*Ceratonia siliqua*) is an evergreen shrub or tree located in the arid region of Mediterranean region. Wild olive and carob woodlands and maquis were once widely spread along the fertile soil of the dry coastal and inland plains (WWF website). It is mainly cultivated in southern Mediterranean sub-region because of the climate. The Table 4 shows the hectares of carob cultivation in the sub region. Carob is cultivated mainly because of its edible seed pods with an average production of 2000–3500 kg/ha. Carob tees are drought resistance and requires little maintenance and produces a range of products from the seed and the pod (Merlo, 2005).

Table 4: Wild olive and Carob resources (000ha) in southern Mediterranean (Source: Merlo, 2005).

Country	Wild Olive , Carob (000ha)
Morocco	500
Algeria	100
Tunisia	70
Libya	50
Total	720

4.1.6 Agriculture and Forest Sector

4.1.6.1 Pastoralism and grazing:

Extensive livestock production in the rangelands and forest among rural communities is one of the most sustainable food systems on the planet. Grazing or Pastoralism plays a major role in safeguarding natural capital, maintaining soil fertility, water regulation, pest and disease regulation, biodiversity conservation and fire management (UNEP, 2014). The also play a prominent role in climate change mitigation as worldwide five billion hectares of graze lands sequesters between 200-500 kg of carbon per hectare per year (UNEP, 2014).

Although grazing has been declined in many Northern and Western European countries but in the eastern and southern European Countries it is still a common source of livelihood. In many Mediterranean countries grazing is a free public right of forest communities, notably in Tunisia where grazing accounts for 71 percent of the total forest value (Perevolotsky and No'am, 1998). In Morocco, the grazing value is estimated by assuming that value of 1 FU is equivalent to 1 kg of barley, if a market price of €0.17 /kg of barley, the total value of forest grazing in Morocco is estimated to be €255 million (Merlo, 2005). Based on the estimation made by the state planning organization (2001), there are 5.6 million cattle, 10.7 million sheep and 1.6 million horses grazing in forest areas in Turkey. These animals graze freely in Turkish forests, and it had been estimated that forest fodder can be valued at around US$225 million annually. In Italy, there are 2 Mha of grazed forest, with a minimum forage consumption of around 200 Fu/ha and the total grazing value reach to €69 million (Merlo, 2005). Overall the importance of grazing is high in southern and eastern Countries and Turkey, with a total value of around 24-55% of TEV, and low in most northern countries where grazing accounts for less than 10% of the TEV as shown in Figure 13.

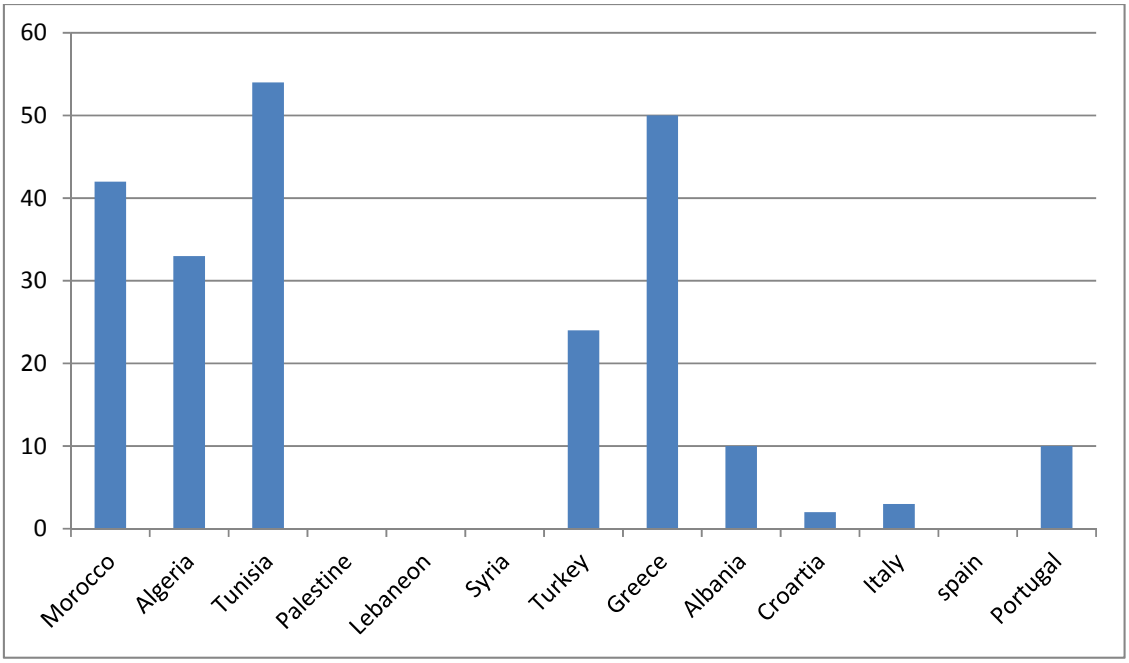

Figure 13: Total Economic valuation of Fodder in Mediterranean Countries (Source: Merlo, 2005)

4.1.6.2: Timber and Firewood

"*Forest sector in green economy can contribute through the supply of marketed and un-marketed forest goods and services. They have the potential to create revenue for livelihoods, meanwhile can conserve forest biodiversity, and maintain and develop forest ecosystem services on a sustainable basis. A green economy opens up additional opportunities for growth and employment in the forest sector even in the changing climate"(UNECE, 2012).* Timber and other WFPs such as firewood have always been important to the region, mostly rural areas of the southern and Eastern Mediterranean region. Firewood extracted from Mediterranean forests contributes to the energy sector of green economy (detail in section 4.1.1). Apart from that, the timber produce from the Mediterranean forest contribute toward the Build sector of Green economy, by producing products such as plywood, fiber wood, sawn wood and wood based panel (see detailed explanation in section 4.1.3).

4.1.6.3: Non-wood Forest Products

Forests provide a large variety of products and services, among which non-wood forest products (NWFP) have showed a rising interest in Italy (GIZ, 2013). Globally, the majority of the NWFP are harvested and used locally for the household needs, while only a small part is sold for commercial proposes (FAO, 2010). Non-wood forest products and services contribute towards the poverty reduction goal of Green economy by providing sustainable food for the local inhabitants (Honey, Mushrooms). The Mediterranean Forest provides employment to many local communities, making it contribution to another goal of green economy i.e "Create green Jobs". Some of the dominant Non-wood forest products and services are given in the next sections.

Mushrooms: It is well known that without fungi forests cannot survive, as they have three main roles in forest ecology: rotting wood; parasitizing weak or diseased trees; and forming symbiotic relationships with trees. A mushroom is the reproductive structure produced by some fungi and is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground on soil or on its food source (Maheshwari, 2012). In Mediterranean, mushrooms are known as an important NWFPs and have been used for medicinal, ritual, and alimentary purposes since prehistoric times. The European basin mushroom diversity in Mediterranean region is very high due to high diversified site conditions (Pettenella and Kloehn, 2007). Mushrooms benefits are concentrated mostly in the northern countries (as shown in Figure 14). A decade of mushroom data collection in the pine forests of Catalonia shows a wide-ranging yield (2–124 kg per ha per year), with an estimated average autumn yield of 41 kg per ha (Martínez de Aragon et al., 2011). Wild mushrooms commonly found in Mediterranean basin are *Boletus spp., Cantharellus cibarius and C. lutescens, Amanita caesarea* or *Morchella esculenta*. Nevertheless, mushrooms account for less than 4% of the total economic value of Mediterranean forests, with an average production value ranging from €2—10/ha /year (Pettenella and Kloehn, 2007). In Mediterranean region mushrooms are considered public property and is usually regulated by local authorities through permits. The permits and tickets to the local authorities and owners help in regulating the collection of mushrooms by non-local hobby pickers (*fungo di Borgotaro*). In Eastern and Southern Mediterranean Countries no precise estimate for mushrooms production is available,

not due to unavailability of mushrooms but mainly because they are collected for free and sold in thin market (Merlo, 2005). `

Cork: Mostly found in the western and southern Mediterranean region Cork is the soft tissue found in the inner bark of the ever greencork oak (*Quercus suber – family Fagaceae*) (Ciesla, 2002) As a unique and important NWFP cork is known commonly as wine and champagne stoppers, however it can provide other uses as well like insulation, floats for fishing nets and bulletin boards (Fortes, 2009). The plank of Corkwood is also used for manufacturing many products like stoppers, bungs, washers, buoys, floor coverings, facings for walls and ceilings, inner soles of shoes, records, polishing blocks, protector plates and handicraft products and one of the earliest uses of cork was in footwear (Ciesla, 2002). In the Mediterranean Region Cork oak covers more than 2 Mha and provide livelihood for thousands of people (*Q. suber*) (Varela, 1999). Cork oak forests are widely distributed in the entire western Mediterranean along the coast from low and medium elevations on siliceous substrates (WWF). Approximately 300 000 tons of cork are harvested annually in the western Mediterranean Basin, 70% of which is transformed into bottle stoppers Portugal as the world leading cork producer, obtain €550/ha of cork oak area, accounting for 35% of the TEV (Merlo, 2005).

Honey: Honey is the natural sweet substance, produced by honeybees from the nectar of plants or from secretions of living parts of plants, or excretions of plant-sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in honeycombs to ripen and mature (White, 1980). Locally in the Mediterranean wild honey from temporal broad-leaved trees are the most important NWFP. Some of the Mediterranean tree species producing the wild honey includes *Eucalyptus spp*., *Castanea sativa*, *Robinia pseudoacacia*, and *Tilia spp* (Slyvamed, 2012). The highest value per hectare, about €90/ha is found in Lebanon, almost the same as Egypt (world leading honey producer). Honey is an important value in Cyprus, Lebanon and Greece; however in other countries it is only represents 3% of total TEV (Merlo, 2005).

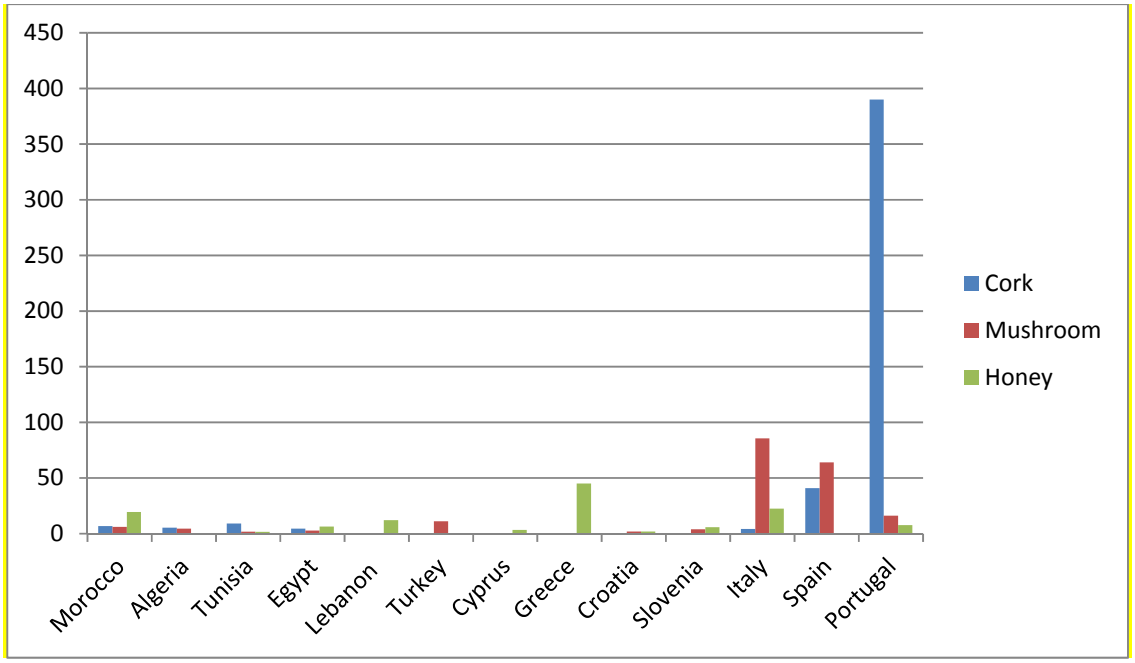

Figure 14: Value of Cork, Mushrooms and Honey of Mediterranean Countries in Million Euros (Source: Merlo, 2005)

4.1.6.4: Ecosystem Services

Carbon sequestration in Mediterranean Forests:

The carbon stored in forest ecosystems is distributed in three compartments:

- Biomass of living plants (including stem, branches, foliage and roots),
- Detritus of plant (includes cones, branches, forest litter, tree stumps, toppings and logs)
- Soil (organic mineral humus, surface and deep mineral soil) (Rio et al., 2008).

Forests are a known as a main component of carbon cycling because of its richness of Biomass. In forest biomass carbon stores as an essential attribute of stable forest ecosystems providing a key link in the global carbon cycle (Malhi et al., 2002). Carbon dioxide by photosynthesis is first converted into organic matter, and then later for a period of time it is utilized by the trees in variety of forms and returned ultimately back to the atmosphere through respiration and decomposition or even disturbance (EPA, 2015).

It is estimated that Mediterranean forests sequester less carbon than other types of forest, mainly because of the inaccuracy of data that is not acceptable at UNFCCC (SMOF, 2013). An evaluation made in 2005 projects that in the Mediterranean forests the economic value of carbon storage ranges between US$37 billion and US$63 billion, which means around 13 percent of the TEV (Ding et al., 2011). However this economic value is smaller than that of forests from central–northern Europe (US$117 billion to US$190 billion), but higher than that of forests in northern Europe (US$11 billion to US$23 billion) and Scandinavian Europe (US$32 billion to US$35 billion) (SMOF, 2013). Mediterranean Forest sequestrate around 0.01-1.08 tc/ha of forest annually, with the lowest value from Albania due to large timber cut. The highest value of carbon sequestration is from Croatia and Slovenia with 2.7 million tC and 1.2 million tC respectively (Merlo, 2005). In Eastern Mediterranean Countries the highest value is from turkey due to large forest cover. In a climate change context, the Mediterranean forest type is considered to be vulnerable to loss of biodiversity and carbon sequestration services (Fischlin et al., 2007). However in the southern countries of Mediterranean countries and Lebanon have net reduction in a value as a result of carbon emission as shown in Figure 15.

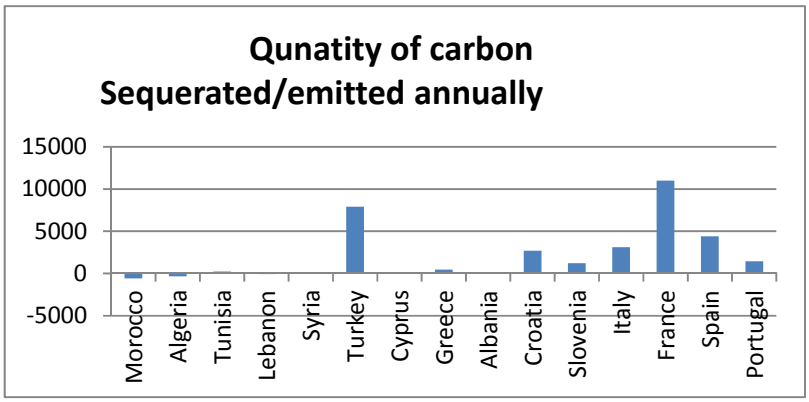

Figure 15: Net quantity of Carbon Sequestrated and emitted annually (Source: Merlo, 2005)

Biodiversity in Mediterranean Forests:

In Mediterranean region around 25% of the about 200 terrestrial animals found in the region are 350 species of bird are epidemic to the region, and is therefore known as the hotspot of biodiversity conservation (IUCN, 2008). Mediterranean region, compared with central and northern Europe have around twice as many woody species, in general Mediterranean forests host a larger number of tree species (1000 versus 30) and a higher animal diversity (11.3 versus 30) than European forests. (Scarascia-Mugnozza et al., 2000)In order to value the option, bequest and existence value of biodiversity revealed preference method are widely in use (Australian Government, 2005). Therefore CVM surveys were conducted in only few northern countries (Spain, Italy, France and Croatia) to estimate the value for reserve and parks by calculating the annual willingness to pay for existence values of parks. The total value of forest biodiversity (option, bequest and Existence) is highest in Tunisia (4.8) followed by Greece (2.8), however in other countries the overall percentage of the value is negligible (Merlo, 2005).

Hunting in Mediterranean:

In Europe, hunting has a long history and has developed to include heterogeneity of cultures and traditions. It is value derived from wild living natural resources with arrays of social and economic benefits for European forest communities; the most prominent one is providing

incentives for people to conserve them (IUCN, 2000). Hunting is regulated in all Mediterranean countries, and state sell shooting and hunting permits and specify area where hunting is permitted (Merlo, 2005). In 1992 the economic flux in France associated with hunting was estimated to be close to around €1.95 billion providing around 23,000 jobs (Pinet, 1993). In Italy, the annual total costs incurred by 850,000 official hunters is estimated at €3.26 billion and hunting and shooting further create a little less than 43,000 jobs in total (Pinet, 1993). From the Mediterranean region the value from the hunting is highest in Northern sub-region due to value from the hunting is highest (up to 5.8 in Croatia) percent and lowest negative southern sub-region (Morocco -5.7). In Eastern Mediterranean Countries the highest value is found in Lebanon because of large number of hunters (around 600,000) but overall the highest percentage of the TEV from the sub region is from Turkey (Merlo, 2005).

4.2: Action plans for the Mediterranean forests in Green Economy

4.2.1: Lebanon

Title: National Report to the United Nation conference on Sustainable development RIO+20 (Ministry of Environment Lebanon, 2012)

Lebanon's forest landscape continues to undergo significant transformations and losses primarily due to habitat fragmentation, unplanned urban expansion leading to soil erosion. In order to combat deforestation Lebanon has initiated and is implementing number of programs to restore forests including the National Action Plan to Combat Desertification (MOA/GIZ/UNDP, 2003-2010), the National Reforestation Plan (MOE, 2002), Safeguarding and Restoring Lebanon's Woodland Resources (MOE/GEF/UNDP, 2008-2013), and the Lebanon Reforestation Initiative (USFS, 2010). Forest fires are consuming Lebanese forests at a rate that is faster than all reforestation initiatives combined. There were 280 recorded forest fires in 2009 affecting 2,642 ha, up from 129 fires in 2004 affecting 586 ha. A number of fire prevention and fire-fighting initiatives were launched since 2005 including the preparation of a Fire Risk Map to predict forest fire-prone areas. Following the devastating fires of 2007 and 2008, several ministries Environment, Agriculture, Interior and Municipalities, Civil Defense and the Lebanese Army have come forward with fire presentation and rescue initiatives. Fire prevention programme have also generated green jobs linked to fire protection, forests guards, protected areas and forest management. Forests in Lebanon have great potential for sustainable tourism, as protected areas and therefore despite significant urban pressure, ecotourism is a burgeoning subsector in Lebanon. In particular, the Al Shouf Cedars Nature Reserve and Biosphere Reserve has established itself as a premier ecotourism destination in Lebanon, generating jobs and expanding rural income in buffer areas. Around 15,000 jobs in the forestry sector are expected by 2020 if the GOL's National Reforestation Plan is fully implemented.

4.2.2: Morocco:

Title: The Green Economy in Morocco (UNECA, 2015)

Moroccan logging industry represents around 2% of agricultural GDP; 0.4% national GDP and generates 50000 permanent Jobs. It provides income for 50% of the rural population,5-7 billion Dirhams/year 4% of the world's cork supplies (150,000 quintals/year) and represents 30% of

timber and industrial wood needs (600,000 m3/ year). However Timber harvesting in the country exceeds triple the potential of the forest, leading to deforestation. The Deforestation is estimated at 31,000ha/year, reduces the ecosystem's ability to absorb CO_2. In recent years, improved reforestation rate has been noted (40 000 ha/ year on average against 25 000 ha / year in 2005) because of the restoration plan. The Reforestation Master Plan was launched in 1994, for the achievement of a 1.5 million ha reforestation in 2030. Mitigation potentials of the plan varies between 1,500,000 and 2,210,376 TeqCO2/year according to the baseline scenario and can reach 3,700,000 TeqCO2/year in case of a REDD+ implementation strategy.

4.2.3: Portugal:

Title: Green Growth Commitment (Governo de Portugal, 2015)

Portugal's goals for the forestry sector are based on the attraction of capital in order to increase the country's production capacity and ensure the sustainable management of resources and multiple uses of forested areas. Forested areas, which include not only forest stands but also scrub land and spontaneous pasture, cover around six million hectares. Most Portuguese forest is privately owned (around 92%) and the state only owns around 2% of forested land, with the remaining 6% belonging to local authorities and Communities. Environmental activities and services of Portuguese forests are estimated to contribute around 1.3 billion euros to the Portuguese economy each year. The sector's added value has accounted for an average of 2.1% of the country's GDP since 2000. Also since 2000, the forestry sector has accounted for an average of 10% of Portuguese exports and an average positive trade balance of more than 1 billion Euros. Finally, the sector is also responsible for around 100,000 jobs. Therefore the action plan will be implemented to promote the use of forestry products with low carbon footprints (e.g. through green public procurement) and has planned to increase 50% increase volume of wood and other certified forestry products traded on the market between 2010 and 2020.

Wildfires and growing infestations by pests and disease are some of the main obstacles to growth and sustainability in the forestry sector in Portugal. An average of 74,614 hectares of forest were destroyed by fire between 2003 and 2012 (2.5%) of the total area. Therefore the National Plan for Forest Protection against Fires (PNDFCI) is expected to set up forest fire protection networks in rural areas. Important aspects of the plan are the management of fuels in corridors or mosaics

and preventative forestry management initiatives and awareness campaigns for specific target audiences. The government has also expected revenue from green taxation in 2015 (165 million euro), out of which 17.5 million euro will be allocated to benefits and incentives for sustainable mobility, forest management and nature conservation. The remaining amount of 148 million euro will, in practice, fund an income tax reduction, under the family quotient.

4.2.3: Turkey

Title: Turkey Green Economy Policy Paper (World Bank, 2013)

As the paper indicates, Turkey ranks low on deforestation and forest degradation and has a relatively lower forest cover (about 15% of land area). Forests in Turkey provide a range of extractable commodities, from timber to wood fuel to various non-timber products, and a range of ecosystem services, from regulation of soil, water, and climate to sequestration of carbon and provision of habitats, supporting important economic activities. While greening the rural economy requires focusing on broader natural resource management issues including biodiversity conservation, forestry, and water resources, the focus of the this policy paper was mainly on agriculture, not only because of its socio-economic importance, but also because of its environmental footprint in terms of water use, agro-chemicals, and soil degradation. The Study doesn't in specific discuss the present or planned state's initiative for reforestation and scaling up the production of forest products and services. However it does highlights the importance and need of such action plans and initiatives.

4.3 Overview of Mediterranean Forest Potential for their Contribution in Sectors of Green Economy

In Mediterranean Countries a range of forest goods and services play an important role for the socio-economic development in the region. The amount of timber and Firewood resources that can contribute to the Energy, Build and Transportation sectors of Green Economy differs across the three sub-regions of Mediterranean. As shown in Figure 16 timber removal is highest in Northern Countries (91 million), second highest in Eastern Countries (22.78 million, mainly because of Turkey 21.04 million) and the lowest in Southern Countries with 19.08 million. The Firewood removal is highest again in the Northern countries (38.13million) but the lowest in the Eastern Mediterranean Countries because of more fuel wood capacity of Maghreb countries of

Southern Mediterranean. The sectors of green economy dependent on the timber and firewood resources of Mediterranean, can gain limited contribution from SEMCs. However in the SEMCs there are several underestimated No-wood forest products and services that can be useful to secure existential job and income opportunities for the population. There is considerable potential in the Mediterranean region for NWFP harvesting to produce significant income and to generate rural employment and promote sustainable forest management. In the context of Green Economy, forests have considerable market and development potentials. In Maghreb Countries where potential for WFPs are limited, NWFPs such as grazing, cork, fruits, and plants, are the most important forest benefit and can contribute 40 percent of household income (GIZ, 2013). Watershed protection is very significant, particularly in Syria (US$100/ha/year) and the Maghreb countries (US$31/ha/year) in general. Specific ecosystems can reach particularly high values: net annual benefits from cork oak are estimated at US$214/ha in Tunisia and can reach up to US$440/ha in Morocco's Maamora forest (GIZ, 2013). As shown in Table 4, like Lebanon, forest-based ecotourism can be another avenue of opportunity for some countries in the region and any recreational values captured through user fees or other fees can be reinvested in forest management and other activities benefiting local people.

As discussed in the first chapter and Figure 4, MENA region suffers from water stress, and soils susceptible to erosion. In such a fragile environment, the forests can play a vital role in protecting water supplies, regulating water flows, and conserving soil is particularly. For example, watershed protection is the single most valuable benefit in Syria accounting for more than 50 percent of the TEV of forests and in Maghreb countries, it is second in value only to grazing, varying within US$26-32/ha per year (GIZ, 2013). As a whole, total economic forest values are also higher in the North (around 176 €/ha/year, with a highest recorded value of 344 €/ha/year for Portugal) than in the South and East (around 67 and 48 €/ha/year, respectively, with a lowest value of 6 €/ha/year for Egypt) (Merlo, 2005).

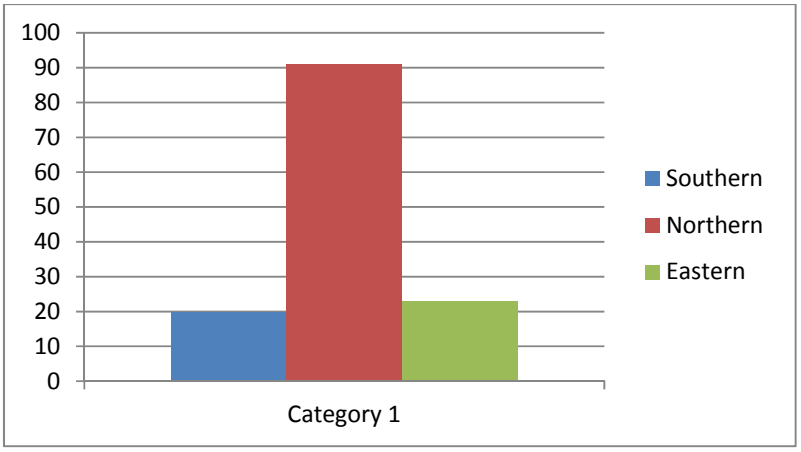

Figure 16: Timber removal (Million m3 u.b) in Southern, Northern and Eastern Countries of Mediterranean (Source: Global Forest assessment, 2015)

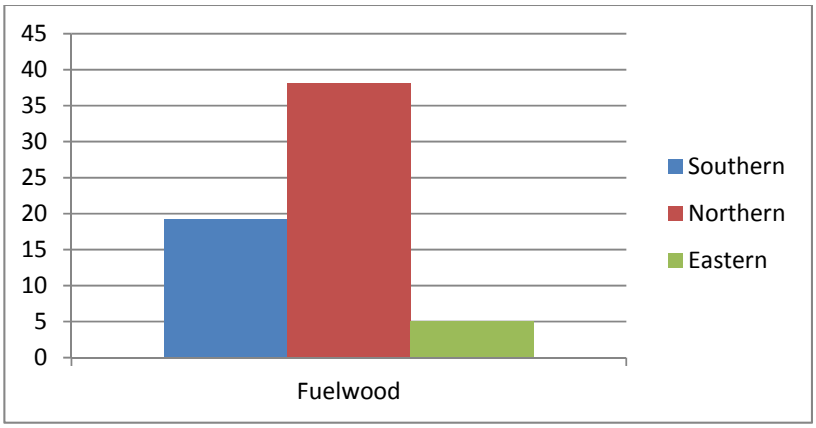

Figure 17: Firewood removal in Million m^3 u.b in Southern, Northern and Eastern Countries of Mediterranean (Source: Global Forest assessment, 2015)

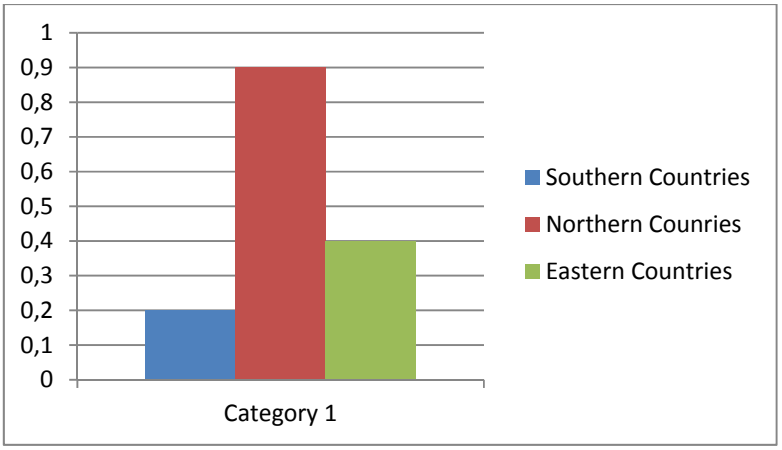

Figure 18: NWFPs Removal (tones) in Southern, Northern and Eastern Countries of Mediterranean, 2005 (Source: State of Mediterranean Forests, 2013)

Employment in Mediterranean Forests:

In Mediterranean Employment in forestry and forest related activities represents a portion in the total national economy. Few examples of such jobs include silviculture, forest management, forestation, forest tracks, fire prevention and combating, and psychopathological treatments. The employment in Moroccan Forests represents 5.2% of the total national employment, which includes around 26,000 jobs by fuel wood collection, 40,000 jobs by grazing activities and another 4544 jobs by the public sector. The Algerian Cork sector in employs 60,000 - employs 3000 personnel for harvesting and around 1000 for processing of Cork (Merlo, 2005). Provided by the government of Lebanon by 2020, there can 15,000 new green jobs in forestry, if the national reforestation plan is fully implemented, and focuses on developing the ecotourism and sustainable tourism sector (ESCWA, 2015). The Forest employment timber base industries in Italy accounts for 4.7% of the total national employment and 13.2% of the industrial employment, i.e around 500,000-700,000 job (Merlo ,2005). In Portugal a total 227,800 persons employed are employed in Forest sector, which is 5.1% of the total workforce. It comprises of 33600 persons (0.8%) in silviculture, logging and hunting; 188,900 persons (4.2%) in forest industries and connected activities; and 5300 persons (0.1%) in non-marketed supporting services (Governo de Portugal, 2015). As shown is Figure 19, forest employment in NMCs is highest in Italy. Forest employment is also very high in Turkey (62,000 FTE) and some other SMCs (GFRA, 2015) (FTE is the hours worked by one employee on a full-time basis).

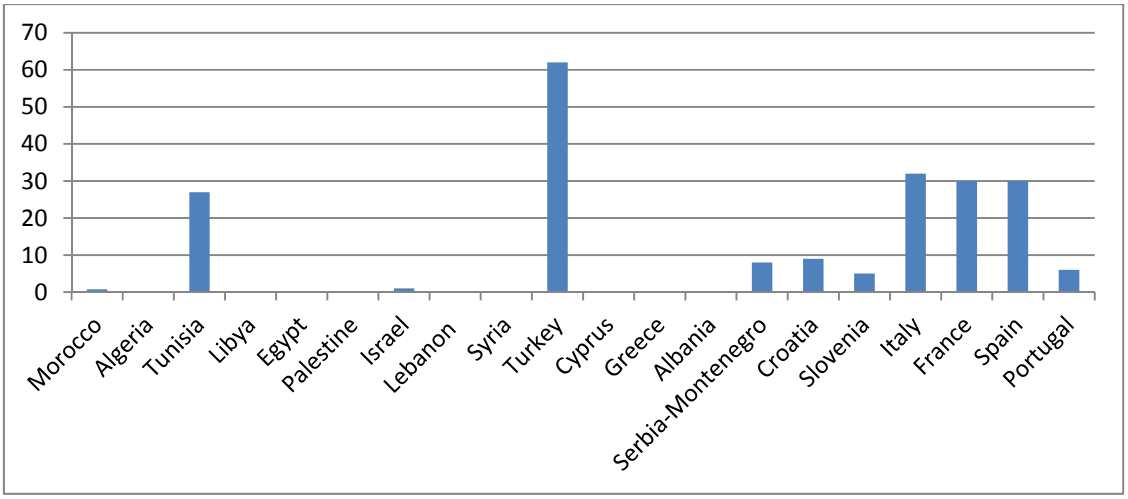

Figure 19: Forest employment (000) FTE, in Mediterranean (2010) (Source: Global Forest assessment, 2015)

4.4: Mediterranean Forest in the context of Rovaniemi Action plan

The Rovaniemi Action Plan for the Forest Sector in a Green Economy, adopted on 13 December 2013 in Finland, describes how the forest sector in the UNECE region could lead the way towards the emerging green economy at the global level. The Action Plan consists of 5 pillars with their respective goals as shown in Figure 20.

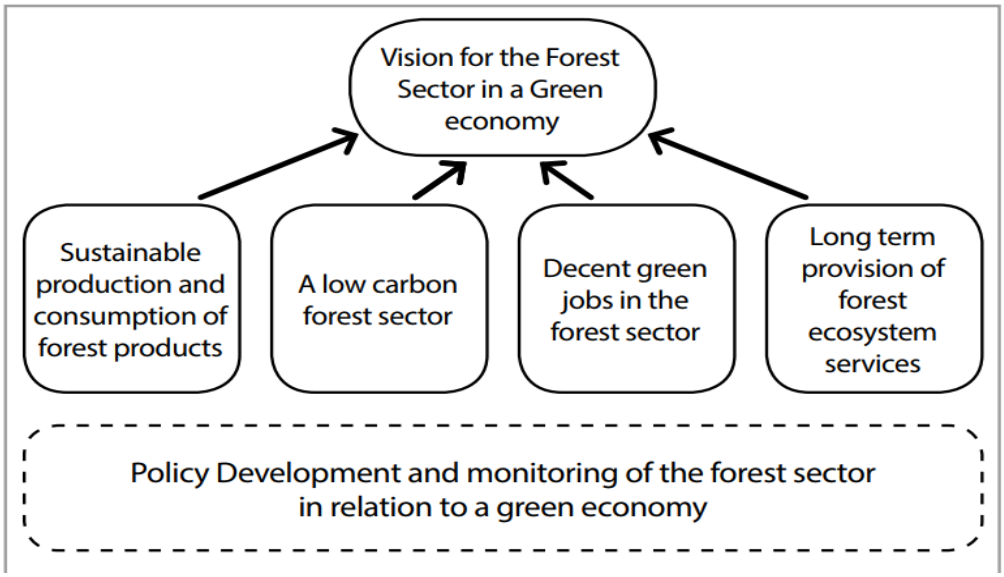

Figure 20: The Five pillars for the Vision of Rovaniemi Action Plan vision of forest Sector in Green economy (Source: Rovaniemi Action Plan, 2014).

The Rovaniemi action Plan was formulated for UNECE partner countries, where forest area and production of timber is relatively higher than many countries in Mediterranean, particularly southern-Eastern countries. The first and the far most concern of the action plan is that it is for forest sector and doesn't cover Rangelands. Many countries in the SEMs have low forest cover, but significant area of rangelands. However, their contributions to national economies and livelihoods have not been properly assessed or recognized yet. Rangelands in Greece constitute a very important natural resource as they occupy 40% of the total surface. Not only is their forage production essential for the development of extensive livestock farming, but also they play a key role in outdoor recreational activities, protection from erosion, provision of water supplies and biodiversity conservation (Parissi, 2013).

In reality, the five pillars of vision of green economy, if to be considered for Mediterranean region have limited implication. The vision of low carbon sector that demands forest contribution to mitigation (sequestration, storage and substitution) of, and adaptation to, climate change, will remain invisible in the countries where forest area is too low. In many countries the total economic value of carbon sequestration is too low that it is almost negligible e.g, (Libya, Egypt and Syria). However as shown in Figures (19) and (18) there is a potential for generating decent green jobs in the forest sector and benefits from ecosystem services respectively, in almost all the Mediterranean countries. The policy development and sustainable production and consumption of forest product (particularly NWPs) are the remaining two pillars of the action plan that needs to be address in the Mediterranean Region.

4.5: Opportunities for forestry and rangelands to contribute to the green economy in the Mediterranean Countries

In the Mediterranean region, forests and rangelands provide numerous benefits that meet the social, economic and cultural needs of millions of people. In addition, the ecosystem services provided by forests and rangelands help to minimize the consequences of climate change and support the protection of soil and water, leading to improved food security. It has been discussed above that value of forests for green economy differs in three Mediterranean sub-regions, it is vital to highlight the different opportunities for the forest sector and rangeland from these sub-regions to contribute to the green economy.

Increasing natural capital: Although many of the countries in the Arab region have low forest cover, the area of rangelands in many countries is still significant. Economic growth in the region is likely to result in greater interest in the development of green economies and the most obvious and visible way that forests and rangelands can contribute to this is by increasing forest cover and managing the forests and rangelands sustainably. Demand for green products may also increase as countries develop. For example, there is a lot of interest to replace energy intensive materials with wood in many Northern countries and Turkey. At the meantime, most countries in the Near East Region are net importers of wood, so it is unlikely that such initiatives will grow in this region (FAO, 2013). However, considering the significant area of rangeland, increased availability of biomass for fodder and fuel could have a significant impact on some of the poorest rural people living in many of these countries in Arab Mediterranean Countries e.g, Morocco, Algeria, Egypt, and Lebanon.

Green job creation and Eco-tourism: Efforts to increase natural capital (such as afforestation and rangelands restoration) can create many green jobs that may also have positive benefits in terms of poverty alleviation. In the Arab region, sustainable/eco-tourism has the potential to support a green economy, as it can contribute towards generating direct revenues, enhancing sustainable production and increasing the sale of local products. Ecotourism could provide considerable opportunities for poverty alleviation in rural areas in several countries, particularly Lebanon, Egypt and the Syrian Arab Republic. Promoting sustainable/ecotourism at the national level requires an integrated plan/strategy and cooperation between concerned stakeholders including governments, ministries, financial bodies, NGOs, private and public sectors and individuals (ESCWA, 2013). Forest-based ecotourism may also provide another avenue of opportunity for some countries in the region and any recreational values captured through user fees or other fees can be reinvested in forest management and other activities benefiting local people.

Integrate the value of forest benefits and Green value chains: With a greater understanding of forest's potential to contribute to a green economy, it becomes critical for governments to capture and develop the full range of forest benefits, including their contribution to livelihoods of the poor and marginalized. Incorporating the value of fodder, water services and biodiversity in national accounting, investing in green infrastructure to increase resilience to climate change and increase budget allocations to the forestry sector are some important initiatives government can take to increase the role of Mediterranean forests in Green economy. Keeping in view the strong potential of NWFPs production in Mediterranean countries, the development of value chains and ethical bio-trade can be helpful to increase these forest benefits. In the Southern Mediterranean Countries, these initiatives are required to support decentralized financing streams (microfinance, local investment banking) for developing legislations to guarantee the equitable sharing of the benefits and to promote the use of certification schemes (fair-trade, etc) (GIZ, 2013).

Green accounting and PES: Even though the forests and rangelands in the SEMCs provides livelihoods and ecosystem services to millions of people, the contribution of the formal forest sector to the GDP is low in most countries, mainly because the full range of market and non-market benefits provided by forests and rangelands (including contributions to the livelihoods of marginalised people) are not included in national income accounts (FAO, 2013). Payments for Environmental Services (PES) are a popular incentive mechanism to conserve indirect benefits provided by ecosystems, such as water services. In a PES mechanism, the beneficiaries of environmental services downstream in a watershed (e.g. water users) compensate the producers of such services (e.g. farmers or forest managers) for the difference in net profit resulting from adopting the practices preferred by water users rather than the most profitable alternative. Most documented examples are found in Europe, and focus on biodiversity conservation and watershed management e.g: Vittel (Nestlé Waters) in France and Biodiversity Conservation in Girona Spain (Perrot-Maître, 2006; Gorriz and Prokofieva, 2011).

Conclusion:

Forests and rangelands of the Mediterranean region provide numerous benefits that meet the social, economic and cultural needs of millions of people. The ecosystem services provided by forests and rangelands in the region help to minimize the consequences related to climate change (dust storms, severe droughts, etc.) and support the protection of soil and water, leading to improved food security and Conserving non-renewable water resources. Mediterranean Forests has a strong potential to contribute to a greener economy and a more sustainable society, in particular by securing employment, and providing renewable climate-friendly products (e.g. timber for buildings, wood for energy) and a variety of other services. Sustainably managed forests play an essential role in the carbon cycle, releasing oxygen while locking up carbon dioxide in the trees and soil. The wood and forestry sectors can make a significant contribution towards meeting green economy objectives, linked to climate change policies, mainly through the abatement of greenhouse gas emissions and expansion of renewable energy objectives. However in many Mediterranean countries, in particularly South-Eastern countries timber and firewood productivity are too low for having the ability to contribute in different sectors of Green economy (includes Build, Transportation and Energy sector). By supporting the development of value chains and ethical bio-trade of NWFPs, the productivity of the products can be increased and can benefit livelihood of many. The incentive mechanism to conserve indirect benefits provided by ecosystems, such as Payments for Environmental Services (PES) for water or biodiversity in also much needed to extract contribution to other sectors of Green Economy (including; Agro forestry, Tourism, Water). This study work concludes that the contribution of the forest sector in Green Economy is not negligible; therefore considering various initiatives to increase the forest benefits in the National Action Plan of Mediterranean countries like other sectors (Energy, Agriculture, and transportation) is of immense importance. Lastly in Mediterranean region a smart approach is required, where the contribution of both Forests and rangelands in Green economy are equally acknowledged to grasp the maximum benefits.

Annex:

Annex 1: Sustainable Development goals Relevant to Green Economy

Sustainable Development Goals (SDGs)	Description
Goal 1	*End poverty in all its form everywhere* An inclusive green economy encourages sustaining growth, creates green jobs and empowers communities for better livelihoods; public revenues for social investments (health, education, social protection. In its multiple dimensions Green Growth allow poverty to be reduced and eradicated over time through the complex and interactive features of growth, redistribution, as well as direct target (UNEP, 2015).
Goal 2	*End Hunger and Food security* In one coherent policy framework a transition to green economy provides an opportunity to merge economic needs with environmental concerns while promoting food and nutrition security for poor and vulnerable people. SDG Goal 2 targets to profound change of the global food and agriculture system in order to nourish today's 795 million hungry and the additional 2 billion people expected by 2050 (IFPRI, 2012).
Goal 6	*Ensure the availability and sustainable management for water and sanitation for all* The sustainable provision of critical water services is essential to provide transition towards a green economy and to recover the lost balance between natural and

	human made. It is important to formulate a growth strategy that focuses too heavily on water Watersheds and Aquifers. Therefore SDG Goal 7 targets to not only solve issues relating drinking water, sanitation and hygiene, but also the quality and sustainability of water resources worldwide (UNESCO, 2017).
Goal 7	*Ensure access to affordable, reliable, sustainable and modern energy for all* The energy crisis is due to the dependence of energy demand on natural resources that are used to power industries and cities. These natural resources are in limited supply and take hundreds of thousands of years to replenish the stores (CEPF, 2010). The targets set by Goal 7 provide a pathway towards clean technology. Switching to clean technologies will fulfill two of the three criteria required for a green economy, i.e. a low carbon footprint and the efficient use of natural resources. In its role, clean energy is the enabler of economic growth and development and also serves as catalyst for the third aspect of green economy: employment and social inclusion (Goldman Sachs, 2015).
Goal 8	*Promote, sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all* The design principles for an "Inclusive Green

	Economy" speak to these elements of a socio-ecological and economy-wide transition in financing. It aim to create strong institutions specifically geared to safeguard social and ecological floors (APRSCP, 2014). SDG 8 target to promote cross-sectoral economic transformation by addressing all pillars of sustainability, hence promoting sustained, inclusive and sustainable economic growth. It focuses on the highest productivity through fair employment and decent work for all.
Goal 13	*Take urgent action to combat climate Change and its impacts* Greenhouse gases from human activities are the most significant driver of observed climate change as the concentrations of these gases in the atmosphere has increased in past century due to human activities. World-wide Governments are putting in place strategies and bringing policy reforms to develop green industries like renewable energy in order to reinforce regulations to reduce carbon emissions. The green growth as a core concept of green economy focus on creating green jobs, technologies and infrastructures, in order to support Climate change adaptation and mitigation (Nhamo, 2016) The well focused strategy for green growth will be a powerful instrument to achieve SDG goal 8 to combat Climate change and its impacts.
Goal 15	*Protect, restore and promote sustainable use of terrestrial*

	ecosystems, sustainably managed forest, combat desertification, and halt and reverse land degradation and halt biodiversity loss. The Green Economy is well suited mechanism to grab benefits and opportunities provided by Sustainable Land Management (SLM) and Sustainable Forest Management (SFM). Both of them are meant to prevent land and forest degradation and also to restore that is already degraded. This can be achieved through planning Schemes that support payment for ecosystem services or that creates market mechanisms for land-derived ecosystem services. It would help to offset the short-term economic costs to land users practicing conservation and ecological agriculture. SLM and SFM have a potential to generate sustainable income and benefit at regional and local level in long run. Land-use in agriculture, energy and forestry will fulfill the criteria of green economy through sustainable development, food security and poverty eradication (UNCCD, 2011).

Annex 2: Percentage of primarily designated area for soil and water protection in Mediterranean Countries

Country	Total Forest area (1000 ha)	% primarilry designated for soil and water protection
Albania	776	17
Algeria	1492	53
Bulgaria	3927	12
Croatia	1920	4
Cyprus	173	0
Egypt	70	49
France	15954	2
Greece	3903	0
Israel	154	15
Italy	9149	20
Jordan	98	98
Lebonean	137	25
Libya	217	100
Montenegro	543	10
Morocco	5131	0
Palestine	9	
Portugal	3456	7
Slovenia	1253	6
Spain	18173	20
Syrian	491	0
Tunisia	1006	41
Turkey	11334	17

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