Energy Islands: The case of Greece

A holistic approach

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Piraeus, March 2022

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Abbreviations:

EZZ: Exclusive Economic Zone

EURATOM: European Atomic Energy Community

TFEU: Treaty of the Functioning of European Union

GHG: Green House Gases

EU: European Union

NM: Nautical Miles

APERC: Asia Pacific Energy Research Centre

R&D: research and development

WW2: Second World War

UNCLOS III: United Nations Convention on the Law of the Sea III

IEA: International Energy Agency

OECD: Organization for Economic Co-operation and Development

E-mobility: Electric mobility

RES: Renewable Energy Sources

StE: Hellenic Council of State

IUCN: International Union for Conservation of Nature and Natural resources

GSCI: Global Sustainable competitiveness index

UN: United Nations

ESI: Environmental Sustainability index

IMF: International Monetary Fund

EPI: Environmental Performance index

BOT: Built-operate-and-Transfer

PPPs: Production Sharing Agreements

JOA: Joint Operation Agreement

IL: International Law

UNIDROIT: International Institute for the Unification of Private Law

ELR rule: Exhaustion of Local Remedies rule

IIAs: International Investment Agreements

BITs: Bilateral Investment Treaties

ICJ: International Court of Justice

LCIA: London Court of International Arbitration

UNCITRAL: United Nations Commission On International Trade Law

L.: Law

PPC: Public Power Corporation

B.E.P.C.: Board of Energy Planning and Control

DEPA: Public Natural Gas Company

RAE: Regulatory Authority of Energy

Art.: Article

HTSO: Hellenic Transmission System Operator

CHP: Combined Heat and Power

CRES: Centre of Renewable Energy Sources

HPP: Hybrid Power Plant

PPAs: Power Purchase Agreements

MWh: Megawatt per hour

UNFCCC: United Nations Framework Convention on Climate Change

ETS: Emissions Trading System

NDCs: National Determined Contributions

COP26: Conference of the Parties 26

WEO: World Energy Outlook

WWF: World Wide Fund for Nature

NECP: National Energy and Climate Plan

NAS: National Adaptation Strategy

CCISC: Climate Change Impacts Study Committee

CoM: Covenant of Mayors

SECAP: Sustainable Energy and Climate Action Plan

RAAPs: Regional Adaptation Plans

M.D.: Ministerial Decision

S&P Global BIM: Standard & Poor's Global Broad Market Index

S&P Greece BIM: Standard & Poor's Greece Broad Market Index

SDC: Sustainable Development Goals

TPES: Total Primary Energy Supply

WPs: Work Packages

TEIP: Technological Education Institute of Piraeus

GWh: Gigawatt hours

PV: Photovoltaic

DSM: Demand Side Management

IENE: Institute of Energy for South-East Europe

SMEs: Medium-Sized Enterprises

SMILE: Smart Islands Energy Systems

SIDS: Small Island Developing State

GDP: Gross Domestic Product

kWp: kilowatts peak

Abstract:

Over the years, islands have become overly dependent and vulnerable to traditional energy lines. Great importance has to be laid down to their energy resources to help them achieve sustainability and energy independence, constituting them self-sufficient. Thus, islands become part of the European energy transition and the zero-emissions EU initiative until 2050. As a consequence of the environmentally friendly directives of the EU, the traditional centralized energy production facilities are gradually being replaced with distributed, heterogeneous, multidirectional, and smart energy systems. Often serve as ‘‘test subjects’’ for new technologies and their performance. As a key figure, the European Commission, encourages research and innovation in the energy field. States and industrial actors have identified islands as key energy transition sites because their distinctive isolation characterizes them compared to main-lands. Therefore, energy routes are to be made to facilitate their needs. Also, these islands can easily, with the available technology, abstain from the traditional production of energy from fossil fuel to emission-free renewable energy sources that could include hybrid models of energy production. The energy transitions should actively work to anchor initiatives solving additionally local concerns and localized issues. Many Islands of the EU, despite having access to renewable sources of energy, still depend on expensive fossil fuel imports for their energy supply. The European Commission has launched the ‘‘Clean Energy for EU Islands Initiative’’ as part of the ‘‘Clean Energy for all Europeans’’ package. One of the primary instruments of this initiative is the European Islands Facility (NESOI), which aims to create through innovation and subsidies clean energy projects across the EU islands. Plentiful projects are already underway in the EU and Greece, including the Astypalea project of Volkswagen, the Tilos project, the ESBØ project in Norway and Sweden, and older projects such as the Samsø project in the Netherlands and the El Hierro in Spain, which are some of the many innovative projects that led the way in R&D for establishing independent islands. Nevertheless, are these projects sustainable and energy-wise secure? Do they hold geopolitical importance for Greece? What legal aspects could an energy contract of this magnitude entail? There are many questions around the subject of energy islands that are to be answered in a theoretical

way to depict the importance of governance, the legal dimension of energy security, while assessing the factor of energy sustainability and evaluating the legal environment of these pioneering projects via the use of various indexes. Most importantly, are the EU projects equivalent to other initiatives worldwide, such as Hawaii and Maldives, or does the Union need to reconsider and recalibrate them, especially due to the Covid-19 pandemic and its' economic stagnation? Where should the weight be shifted, and how energy exploitation contracts can be sustainable and durable under almost any circumstances?

Keywords: Energy Islands, Greece, International Energy Contracts, International Investment Law, Arbitration, Energy Transition, Sustainability, Energy Security, Clean Energy for all Europeans, The Clean Energy Initiative for EU islands, Tilos Island, Astypalea Island, Comparative Analysis, ESBØ project, Samsø Project, El Hierro Project, Hawaii and Maldives Energy Independence.

Introduction:

The Paris agreement of 2015 set for the first time the global legally binding aim of keeping global warming below the 2 °C margin with the parallel pursuit of limiting it to 1,5°C. The European Commission started by laying the zero-emissions target for 2050, also known as the ‘‘Green Deal’’, which set the whole attempt in motion. To make these targets from fiction into reality, the European Commission needed to set timetables, middle goals and provide the necessary subsidies and expertise. Additionally, the fruits of that effort had to be equally distributed among all Europeans, raising expectations relatively high. The ‘‘Clean energy for all Europeans legislative package’’ provided the policy framework to the Member States to facilitate a clean and fair energy transition. Then, ‘‘The Clean Energy for EU Islands Initiative’’ specified that actions for islands and endeavored to make that target from fiction to reality. Moreover, the role of National Energy and Climate Plans provided the footing for fast and efficient de-carbonization. Essentially, the general notion of protecting the environment and the gradual depletion of non-renewing traditional energy reserves (e.g. crude oil, coal, natural gas) led to a turn towards renewable energy sources and alternative solutions (e.g. biofuels, hydrogen, wind, and solar energy). The ‘‘Valletta Declaration’’ of May 2017 was ground zero, an informal attempt to

smooth coordination, cooperation, and promotion of the islands' transition between the relevant Member States. The mainspring was the ''Memorandum of Split'' in which all the relevant sides expressed their intention to cooperate and facilitate the transition of EU islands[1]. It is in the best interest of many European countries to collaborate since the EU has more than 2200 inhabited islands in the EU, which have renewable energy sources but continue to depend on fossil fuels for their energy supply. Among those is Greece, due to its overwhelming number of islands and islets, around 6,000 from which only 107 are inhabited and only 53 have a population of over 1,000, which vary based on the year and the methodology of research. Nevertheless, its apparent energy has a crucial role to embody to make these islands self-sufficient and energy secure.

The Normative Pillars:

Based on the founding treaties of the European Union, energy started being part of the active portfolio of the Union, since the very start in 1951 with the Treaty that established the European Coal and Steel Community and in 1957 with the establishing of EURATOM[2]. Both of these treaties united Europe under the common denominator of energy and eased the tensions of WW2. Following, the Maastricht Treaty strengthened the Community's commitment to environmental protection[3] and included for the first time energy in the Community's fields of action as part of industrial policy[4]. Even then, there was a need for a clear legal basis for energy-related issues, which was issued with the ''Treaty of Lisbon'' in 2008[5]. Article 194 of the TFEU was formed constituting the legal basis for energy policy in the European Union until today[6]. The newfound energy policy revolved around: A) the creation of the internal energy market, a competitive market in which the user could choose freely its provider, B)

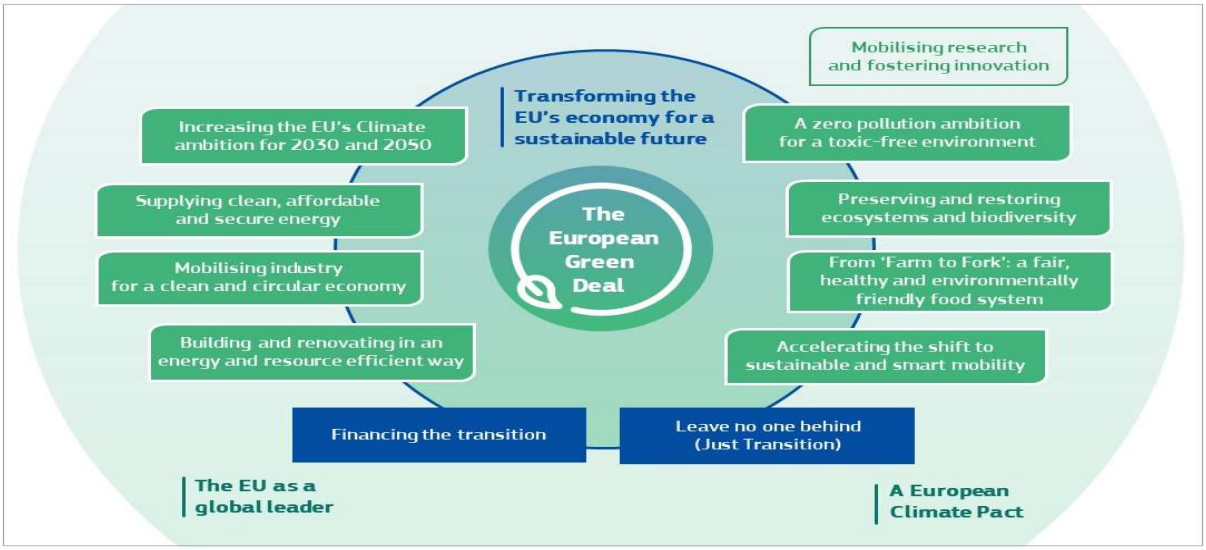
[1] ''The Memorandum of Split'', June 2020.
[2] G.E.F. Kalavros, Th.G. Georgopoulos, "European Union Law: Institutional Law", 2nd edition, pp.10-12 July 2013.
[3] Maśloch, Piotr & Wojtaszek, Henryk & Miciuła, Ireneusz, "European Union Climate and Energy Policy based on an Analysis of Issued Legal Acts ", December 2020.
[4] Wilkinson, David. "Maastricht And The Environment: The Implications for the EC's Environment Policy of The Treaty on European Union.", Journal of Environmental Law, vol. 4, no. 2, p. 221-239,1992. http://www.jstor.org/stable/44247929.
[5] Jan Frederik Braun, "EU Energy Policy under the Treaty of Lisbon Rules Between a New Policy and Business as Usual", European Policy Institutes Network working paper no.31, February 2011.
[6] Matteo Ciucci, Albane Keravec, "Energy Policy: General Principles", Fact Sheets on the European Union, May 2021.

the interconnection of the networks of the Union, C) the implementation of a clean energy system that would be able to cope with sudden increases in demand (e.g. summer months demand in Greece or generally peak hour demand), D) proactive energy diplomacy, and E) the security of supply under the umbrella of solidarity between European Union Member States.

The Road to Zero-emissions:

On December 08' the first crystal clear energy targets were set with the 20-20-20 objective. Its timetable used 2020, 2030, and 2050 as the primary years of reference and included milestones that the Union had to achieve in the

Figure 1: The European Green Deal



following years: A) greenhouse emissions cuts in comparison with 1990 levels B) an increase of the renewables energy consumption share in the total energy mix, C) increase energy efficiency (e.g. national energy efficiency action plans that boost industrial competitiveness, smart buildings with the ability to retain heat in the winter and sustain a stable temperature in the summer), and D) the interconnection of the electric networks with the re-configuration of the European electricity grid into a new generation smart grid. Mainly, it contained a detailed plan for 2020 and a more vague action plan for the aforementioned years. Specifically for 2020, the target was to reach 20% in all action fields except the interconnection goal, which was scheduled to reach around 10%[7].

[7] European Commission. "Energy 2020: A Strategy for Competitive, Sustainable and Energy Security ", COM(2010) 639 Final, November 2010.

As for 2030 targets, they specify: A) a 40% cut of greenhouse emissions related to 1990's concentration levels of CO2 in the atmosphere, B) a 32% augmentation of renewable energy consumption, and C) a 32,5% increase in energy efficiency[8]. Following the same direction, the ''Clean Energy Package'' of November 2016 focused on defining to what extent the European Union will deliver on 2030's climate objectives and concluded that focus should be given: A) to energy efficiency, B) achieving global leadership in renewable energy sources, and C) providing a fair deal price-wise for consumers[9]. These targets were set to pave the way and implement the zero-emissions target of 2050, also known as the Green Deal, which is meant to create a climate-neutral European Union[10]. It was already foretold that plan would affect all aspects of the European economy, which made it apparent to set some main strategic areas that would provide the necessary advancing ratio. One of the most important strategic parameters of that plan based on the Union's portfolio is energy efficiency, with the parallel implementation of renewable energy sources aiming towards using energy sources with a friendlier environmental imprint. Additionally, the gradual connectivity of the energy networks will speed up this process for areas that are unable to deploy renewables with the present circumstances due to their high starting investment cost. In that direction, the Union provides subsidies for companies and individuals interested in investing in remote locations, such as islands. For these purposes, initiatives such as the ''GREENCAP'' and the ''Clean Energy for EU Islands Initiative'' were launched by the European Commission, creating mechanisms and institutions to organize and provide the know-how to the European States. The Union is expanding its strategic focus into areas that would provide the necessary environment for these projects to bloom. Focus is given to creating a competitive and united European market that would boost the industry to grow within a circular economy. As for the highly debated issues around the cost of infrastructure and the interconnection of networks, it has been deemed crucial for the growth of the energy sector that some investments need to aim to update the current infrastructure or replace it. These are highly

[8] European Commission, "Third Report on the State of the Energy Union", COM(2017) 688 Final (p.1-2), November 2017.
[9] European Commission, "Clean Energy for all Europeans ", COM (2016) 860 Final, November 2016.
[10] European Commission, "The European Green Deal ", COM (2019) 640 final, December 2019.

dependent on the financial aid provided by the Union, and without it the initiative would be colossal for single governments and states to financially bare. Also, other strategic areas that hold their significance are the growth of bio-economy, natural carbon sinks (e.g. forests, oceans), and carbon capture methods, which are capable of capturing and storing the remaining carbon dioxide that's already in our ecosystems and which under normal circumstances most of the basic remedy policies are inefficient against. Therefore, due to the complexity of the issues surrounding the environment, a detailed plan was needed to reach as close as possible to the goal of reducing GHG emissions up to 95% until 2050[11]. The European Commission is pursuing climate action in a challenging international setting with growing geopolitical tensions between the states that abate its policies and those that choose to emit GHG (e.g. Russia) and at a period that the Covid-19 pandemic has already caused economic stagnation in the global market and is expected to slow down further the economic growth[12].

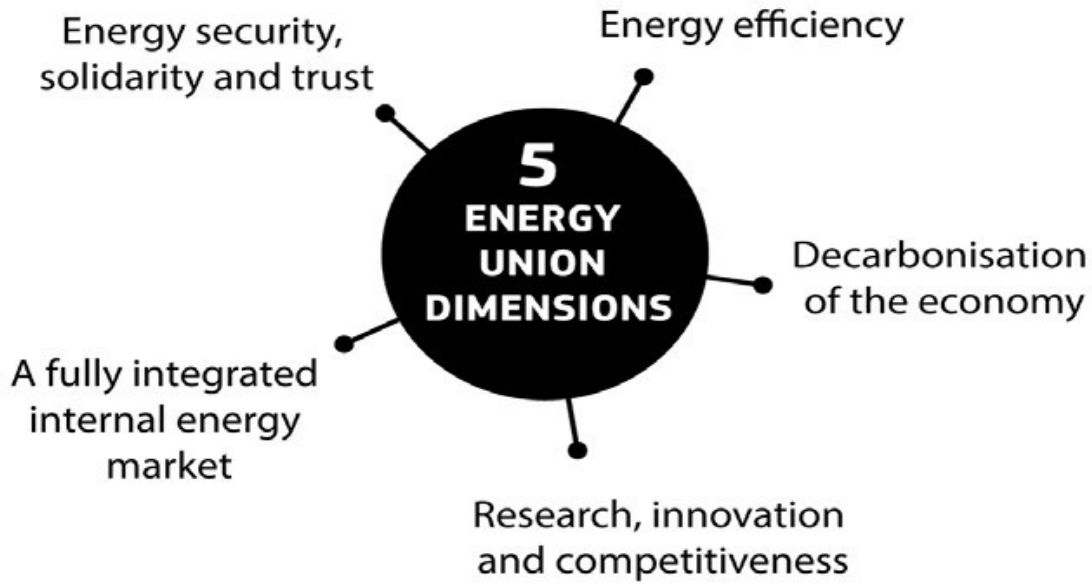


Figure 2: The Five Energy Union Dimensions

[11] Siddi Marco, "The European Green Deal: Assessing Its Current State and Future Implementation", Finnish Institute of International Affairs, pp.4-13, May 2020.

[12] European Commission, "Roadmap 2050: A Practical Guide to a Prosperous Low-carbon Europe, Technical Analysis, Executive Summary ", Volume I, pp.3-18, April 2010.

A Geopolitical Overview of Greece:

As Herodotus theorized geography is an important factor in the prosperity of a nation, while as Thucydides pioneered that the control of the sea implies a level of control over trade and thus over the riches. Therefore, even in our present age, the islands of the Aegean hold a privileged position between the two states; Greece and Turkey. Especially, their geographical position in the Aegean Sea is considered of paramount importance, due to their natural resources and their capability for EEZs based on the law of the Sea (UNCLOS III). Moreover, their proximity to Turkey has caused numerous disputes from the signing of the Treaty of Sevres after the end of the Second World War. Thus, securing a certain level of independence, energy-wise, is very crucial to secure a standard of living for their residents (e.g. fewer

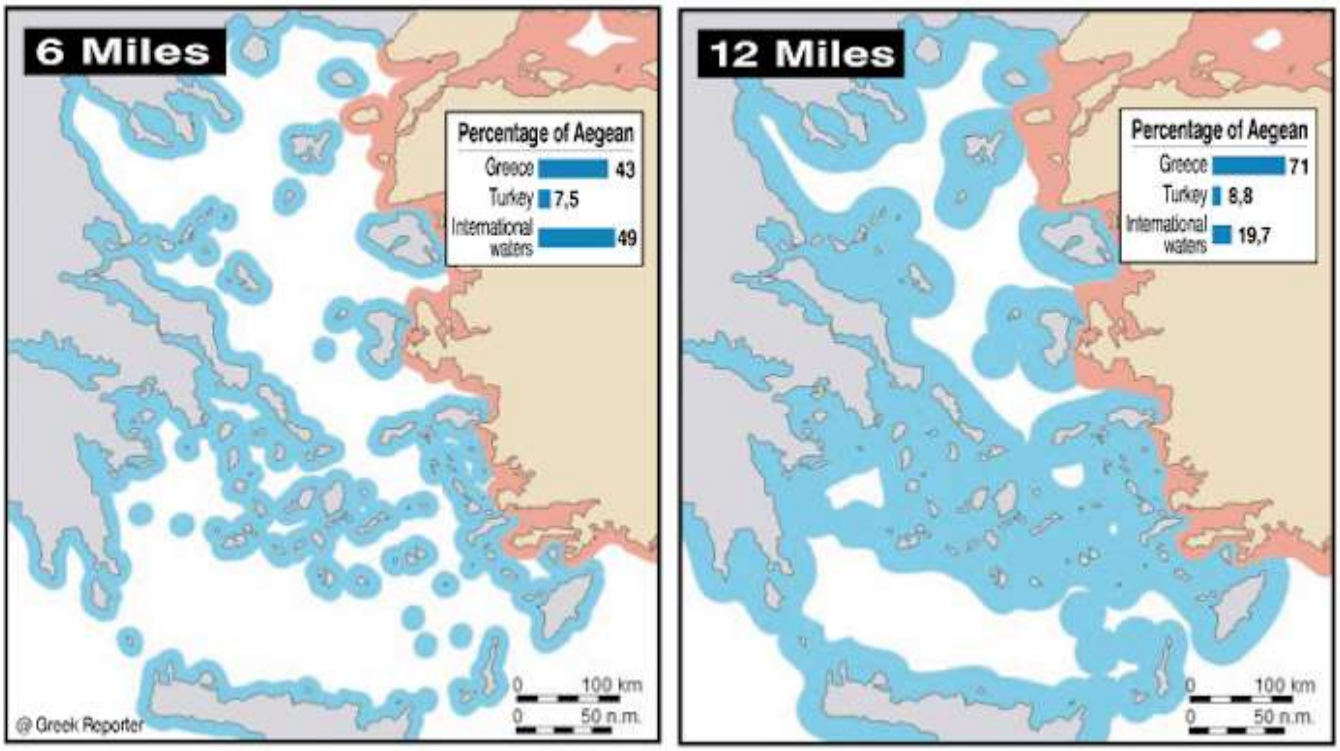


Figure 3: International Waters of the Aegean

blackouts), to be capable and to maintain as many permanent residents as possible and avoid having them migrate to the main land out of necessity. Providing equal treatment to the islands with the mainland can prove to be a strong geopolitical ace in the hole. Additionally, it could be said that the ‘‘buffet region’’ that is affected most out of the rivalry between Greece and Turkey is the Islands

of the Aegean and especially those with closer proximity to the shores of Turkey. Consequently, energy security and self-sufficiency are highly important for the isolated islands of the Aegean. Thusly, the East Med Pipeline and the interconnection of Cyclades is a strategic move that provides self-sufficiency to the region. Furthermore, when viewing the big picture of the Eastern Mediterranean small islands, such as the island of Megisti (Kastelorizo), if their EEZ is accepted, can easily reform the geostrategic terrain between Greece, Turkey, Cyprus, Libya, and Egypt. Based on the theoretical approach of Morgenthau in 1948[13] and Klare in 2008[14] energy can be and is regarded as a geopolitical tool that is capable to reform a state's geostrategic relationships with its neighboring states. The ability of Greece as a nation to access the necessary energy resources to maintain or even broaden its national power without compromising its foreign policy and national objectives depends on its level of energy security. Thusly, the making self-sufficient remote islands in the Greek Archipelago, such as Astipalea, Tilos, and Kastelorizo is of paramount importance.

In the salient case of Kastelorizo, which is not primarily an energy-related matter, since it is highly affected by the overlapping claims in the area and simultaneously by the Law of the Sea. Briefly, the overlapping claims start from west of Cyprus and reach roughly under Crete having the little island of Kastelorizo right in the middle of the dispute (Figure 4). The unilateral delimitation of the EEZ for Turkey and the ''fail state'' known as the Turkish Republic of Northern Cyprus with arbitrariness caused the dispute over the Greek-Cypriot EEZ[15]. Of course, legal-wise it would be logical for Kastelorizo to have its own EEZ, as it is considered part of the region, and the closest island is that of Rhodes. Additionally, it would be more proportionate, due to the magnitude of the dispute, to accept that Kastelorizo needs an EEZ that connects it with Rhodes since it is at the far-out borders of Greece and is to be isolated if EEZ of Turkey would be accepted. Thusly, that would be the most adequate and realistic way to draw

[13] Morgenthau Hans J., "Politics among Nations: The Struggle for Peace and Power ", A. A. Knopf, New York, pp. 82-86, 1948.
[14] Klare Michael T., "Rising Powers, Shrinking Planet: The New Geopolitics of Energy ". New York: Metropolitan Books, pp. 14-21 and 101-104, 2008.
[15] Athanassios G. Platias, "Geopolitical Challenges in the East Mediterranean", in Book "The Geostrategic Changes in the East Mediterranean and their Implications", Papazisi publications, Athens, pp. 76-77, 2019.

the line from the perspective of Greece. In the case of further escalation of the disputes, the principle of median lines could be employed to smoothen and resolve the dispute as soon as possible. As Kastelorizo has its geostrategic value for Greece, the Aegean islands, if their EEZs were extended close to 12 nm, their influence would hinder the commercial sea routes of the pelage. The in-between routes would be covered with the extension of 6 nm EEZs, minimizing international waters in the Aegean from approximately 49% to 19,7% of the pelage (Figure 3).

As Figure 4 indicates the importance of EEZs is a matter that affects all the Greek islands, directly and indirectly, depending on the case and the proximity to the neighboring states. Additionally, it affects the naval routes, thus sea trade which affects the economic interrelations between states. As article 74§1 of UNCLOS III states for the delimitation of exclusive economic zones between States with opposite or adjacent coasts, similar to the case of Greece and Turkey, there is needed an equitable solution based on the special circumstances of the dispute and always under the prism of equitable principles[16]. As in the judgment of Qatar v. Bahrain, which was issued on the 16th of March 2001, the court acknowledged the importance of the principle of equidistance in the forming of its decision[17]. If Turkey were to cosign the UNCLOS III the principle of equidistance would provide the legal ground for the delimination of the EEZs in the Aegean. Except if, Greece unilaterally declared its EEZ to 12nm or less depending on the strategy of the government, to force the hand of the Turkish government to either sign the UN Law of the Sea Treaty or to engage in further more essential consultations to reach a final agreement.

Energy independence and security of the Greek islands can provide the necessary stepping stone for a proactive diplomatic route or a policy that would end the deadlock that the Aegean and the Greek government is experiencing since the first violation of Turkey in November 1973[18]. Therefore, energy is a

[16] Farantouris, N.E. (ed.), "Energy Law, Policy & Economics ", Jean Monnet Chair in Law & Policies, NB, Athens, pp. 331-333, 2012.
[17] I.C.J. 40, "Maritime Delimitation and Territorial Questions Between Qatar and Bahrain " (Qatar v. Bahr.), 2001 (Mar. 16), http://www.worldcourts.com/icj/eng/decisions/2001.03.16_boundary.htm
[18] https://www.mfa.gr/en/issues-of-greek-turkish-relations/relevant-documents/delimitation-of-the-continental-shelf.html

geopolitical factor that has to be taken into account not just from an economic, technological, and business standpoint but also from a diplomatic. Thusly, an Aegean with sustainable and independent islands is easing the Greek government's duty to provide them with a continuous supply of energy and securing the Greek naval and energy routes in the same move.

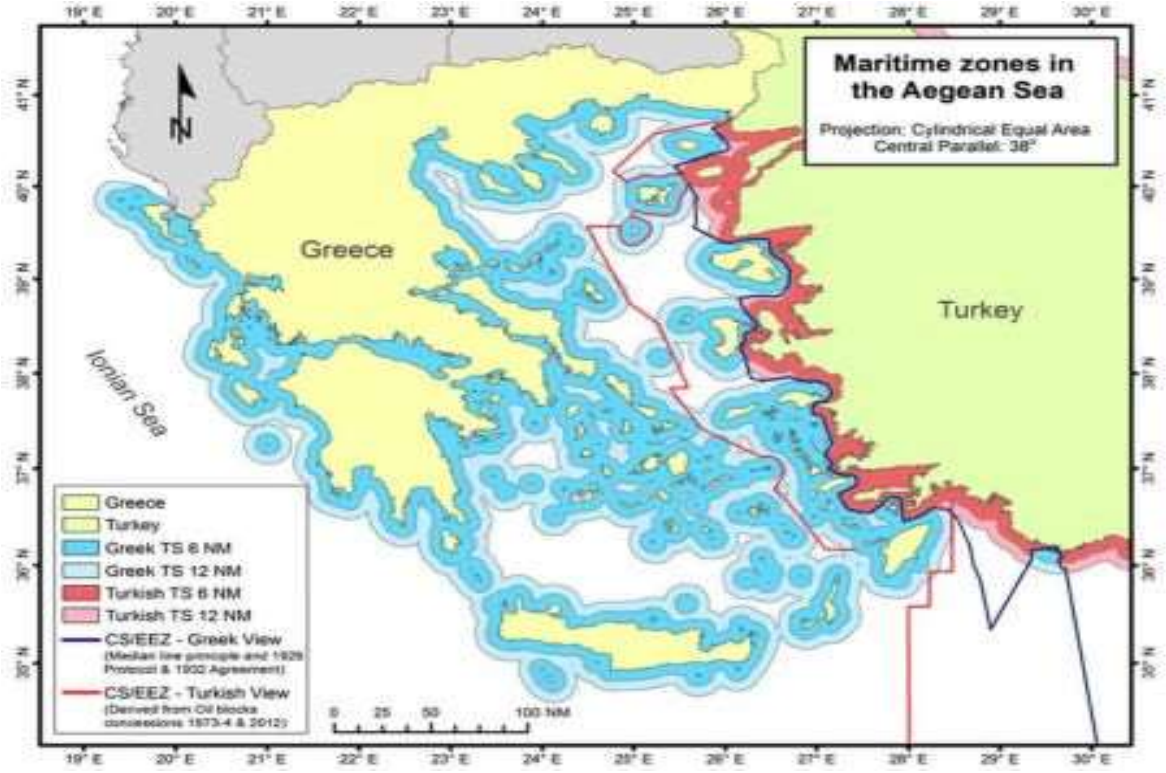


Figure 4: EZZ Zones of the Aegean with Greek and Turkish claims

The Clean Energy Initiative for EU islands:

The European Union, under the umbrella of the zero-emissions objective that aims to reduce greenhouse gas (GHG) emissions in the atmosphere to the levels of 1990, created a specialized initiative to provide assistance to remote islands, whom interconnection to the main electricity network would be economically inefficient or impossible to render these islands autonomous. That ambition of the Union led to the creation of ''The Clean Energy for EU Islands Initiative'' and the European Islands Facility (NESOI), which is in charge of providing the know-how and the necessary subsidies for these projects to flourish. In essence, ''The Clean Energy for EU Islands Initiative'' is meant to promote and establish renewable energy in the islands, while creating in the process jobs and economic growth and, of course, reducing greenhouse gas emissions. Particularly, it will promote autonomous and self-reliant islands and lead

the way to the transition from high-cost fossil fuels imports to RES with the appropriate tailored energy mix for each island, based on its natural resources and geography. In a way, it is an initiative to support and help the growth of these vulnerable communities. In Europe, that entrepreneurship is needed from more than 2400 islands, which host around 15 million Europeans[19]. All that effort derived from the general effort of the European Union and the Commission to provide clean energy to all Europeans, while modernizing the economy, setting proactive plans innovative plans for the future such as carbon capture, hydrogen utilization, network interconnection that strengthen energy security and energy efficiency and bring people and countries closer to move towards a cleaner planet for all[20].

The Importance of Energy Sustainability and Security:

In the creation of the so-called ‘‘Independent Energy communities’’, a factor of immense importance and value is their sustainability in the long-term horizon and not just in the short-term. Therefore, their planning should aim for not just protecting the environment and securing a stable energy flow, but also for the longevity of the applicable solution. Especially, in energy islands, that repairs parts and specialized technicians may not be able to easily access the island in the winter. Therefore, the project has to account for the energy sustainability factor and not just generally its energy security, which is of equal importance, but in the case of remotely-located islands the survivability of the project and its general sustainability are factors that need to be accounted beforehand even the planning of the project.

In the following analysis, great emphasis is to be given to the energy security aspect of an energy contract, which can be quite helpful in determining the sustainability factor of any given investment even in the specific case of an energy island project.

[19] Fact Sheet: "Clean Energy for Islands Initiative ", November 2018. ec.europa.eu/energy/topics/markets-and-consumers/clean-energy-eu-islands_en

[20] Ristori Doninique, Director General for Energy (European Commission) , "Clean Energy for all Europeans ", European Union Publications, July 2019.

The Importance of Energy Contracts:

Energy has a fundamental function in our everyday lives and is a factor that helps us maintain our standard of living while sustaining the weight of the modern world, which is highly dependent on it. Thus, energy contracts have to be sustainable for their projects to be delivered in time and provide the necessary services to the end-users without causing delays and technical problems. As part of the governance factor of energy security contacts have to honor some basic clauses that balance the rights of the parties, in a way that does not affect the end goal of the project. Especially, in areas that experience technical problems, such as blackouts or high fluctuations of the energy load during peak hours, these projects could hold great significance for the end-user. In energy islands cases, the clauses and timetables set into the contract are even more crucial, for the residents to advance to friendlier energy generation methods, while avoiding fragile networks that are cause for alarm, especially in the winter months that ship timetables are more flaccid. Thusly, in cases of remote islands whose interconnection to the mainland network is far too costly, at the present state of affairs, it is rather preferable for the installation of hybrid power generation stations that can be connected with renewable energy sources (e.g. wind, solar and geothermal). The first step is the transition of the old generating facilities from lignite and oil to natural gas, which decreases their CO2 imprint on the environment. The second step is the active and sustainable interconnection with renewable energy sources. The third step is the active involvement of the locals with green properties' programs such as ''I Save - I Autonomate'' which aim for the creation of energy efficient households. Additionally, in Greece there are plenty of programs, as is the ''I move Electrically'' program, that promotes and subsidize the purchases of electric private and professional cars, bikes, and scooters, while building more public charging stations for in-city use and gradually providing even more incentives for their use as the EU green policy is implemented.

Discussion:

When examining an energy-related issue we should not only test generally the economic factors of the project and the innovation parameter but also its legal basis, its contracts, with special care to the rights of the parties involved, and

their contractual security. A holistic approach is necessary especially for the energy sector, in which the projects hold the public interest on their shoulders and just the private benefit of the investor and generally of the contractual parties. Thus, the examining of the project should ideally start from assessing its energy security and then focus on the sustainability factor and the governance aspect surrounding it. Then depending on the theoretical approach chosen the remaining aspects of the 5s and the 4As of energy security should be examined having as an umbrella clause the protection of the environment and the securing of unhindered energy supply for the civilians of each state.

In the case of Greece, as a state, it is fortunate enough to be a member of the EU in today's energy transition benefiting from the financial, legislative, and innovative initiative of the EU. Thusly, securing its place in the developing world of cost-efficient and freely supplied green energy, while protecting the environment and ensuring the standard of living of its residents. Additionally, the EU has provided major assistance financially with providing the know-how to the known project for the interconnection of Cyclades via underwater electricity cables[21] to the main-land network is an important project securing the unhindered supply of energy mainly for Syros, Paros, Tinos, Mykonos, and Naxos. As an EU funded project, the initiative has provided in its first phase electricity not only for Syros, Paros, Naxos, but also for the close-by islands of Antiparos, Koufonissi, Schinoussa, Iraklia, Ios, Sikinos, and Folegandros, which are all nowadays covered by the mainland electricity transmission system. During its B phase, Paros and Naxos will be connected to the mainland and Naxos with Mykonos through underwater cables. Finally, in phase C, a second interconnection will be made between the main-land at Lavrion leading again back to Syros[22] constituting those islands energy secure. Unfortunately due to the immense cost of interconnecting the further apart islands of the Aegean ''the Clean Energy Initiative for EU islands'' took effect to create independent and self-sufficient islands. There are still a lot of non-interconnected islands (Figure 5) in the Aegean some of which are considered too remote to be connected to

[21] https://www.rae.gr/non-interconnected-islands/?lang=en

[22] https://ec.europa.eu/regional_policy/en/projects/greece/connecting-greeces-cyclades-islands-to-the-mainlands-power-grid

the main power grid due to the high cost of the investment in comparison with the far less cost of creating autonomous energy units either on each of them either on their neighboring islands, which are sure to provide the necessary self-sufficiency while keeping the cost at logical levels. As for figure 5, in addition to the interconnected islands shown, nowadays in 2021, Paros, Mykonos, and Naxos have completed their connection to the electricity network.

Figure 5: The interconnected and non-interconnected islands in Greece[23]

Literature Review:

In this part of the research, we are going to present some basic notions and theoretical approaches about energy security and sustainability that will be of great help in analyzing the impact of the legal status of energy investments in an energy island based on the available indexes.

Energy security is a complex term with different views depending on the theoretical approach. In the literature, it is usually fragmented into dimensions, components, and metrics. Specifically, of great importance in the following research

[23] https://www.admie.gr/en/grid/description/lines-map (In 2021 Naxos, Mykonos and Paros are connected).

is going to be the availability parameter of the four A's definition, the sustainability, and sufficiency of the five S's, and the dimensions that Sovacool and Saunders conceptualized in 2014, which included environmental, economic, and social sustainability as vital parameters of projects and the constant of governance, which incorporates generally of the regulating and legal background that affects the equation.

Energy Security:

Conceptualizing:

From the early days of the 20th century, energy security has been related to oil supplies for the army[24]. The terminology has traditionally been concerned with fossil fuels and securing their unhindered supply[25]. Opinions and theoretical approaches for energy security are abundant, which has caused confusion among authors[26]. The term is not clearly defined. Some researchers strongly believe that "*there is no common interpretation*" (Checchi, Behrens, and Egenhofer 2009)[27], while others that the concept is "*elusive*" (Kruyt et al. 2009[28]; Mitchell 2002)[29], even "*slippery*" or even "*difficult*" (Chester2010)[30]. Thus, one iron-clad definition does not exist. Each group of authors, if one may buddle them into categories, adds or excludes certain criteria, while others correlate the term with the continuity of energy commodity supplies, others with prices and quantities, and others with severity filters. In many cases, the concept is blurry the least causing confusion and overlapping in policymaking with energy sustainability and economic efficiency. A starting point for conceptualizing energy security is the way of Baldwin, who defined security as ''a low

[24] Yergin Daniel, "The Prize: The Epic Quest for Oil, Money and Power ", Simon & Schuster, New York, 1991.
[25] Barrett M. & Bradshaw Michael & Froggatt A. & Mitchell C. & Parag Yael & Stirling Andy & Watson, Jim & Winzer Christian, "Energy Security in a Multipolar World ", report of the ESRC Research Cluster on Energy Security in a Multipolar World, pp.5, 2010.
[26] Winzer, C., "Conceptualizing Energy Security," Cambridge Working Papers in Economics 1151, Faculty of Economics, University of Cambridge,2011.<https://ideas.repec.org/p/cam/camdae/1151.html>
[27] Checchi Arianna, Arno Behrens, Christian Egenhofer, "Long-Term Energy Security Risks for Europe: A Sector-Specific Approach", CEPS Working Document, no.309, January 2009.
[28]Bert Kruyt, D.P. van Vuuren, H.J.M. de Vries, H. Groenenberg, "Indicators for energy security ", Energy Policy, Volume 37, Issue 6, Pages 2166-2181, 2009, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2009.02.006, (https://www.sciencedirect.com/science/article/pii/S0301421509000883).
[29]Mitchell John V., "Renewing Energy Security", Royal Institute of International Affairs, July 2002.
[30]Chester, Lynne. "Conceptualising Energy Security and Making Explicit Its Polysemic Nature ", Energy Policy 38, no. 2, 2010, pp. 887–95. doi:10.1016/J.ENPOL.2009.10.039.

probability of damage to acquire values''[31], considering that the starting point for energy security should be based on the general notion of security and then specialized. Then, the general definition of security could be reformed and adjusted per the different answers that researchers provide to three distinct and simple questions: A) Security for whom? B) Security for which values? C) From what threats? Baldwin suggested some additional questions to the above mentioned, which had to do with the quantification of security, its cost, its means, and the necessary timetable, which would be needed for the implementation of the measure[32]. Hippel asked similar questions[33], all of which are not explicitly used in the research for the basic notion of energy security[34], but are quite helpful in delineating some aspects of its notion.

The Classical Notion:

Basically, energy security took its classical form from the theorist Yergin in 1988, who considered it as a way to ensure ''adequate, reliable supplies of energy at reasonable prices''[35]. His definition is similar with the one of International Energy Agency (IEA) in 2001 "Energy security is defined in terms of the physical availability of supplies to satisfy demand at a given price" [36]. As Luft and Korin realized energy security is not just a term that has different meanings, but also that these interpretations highly depend on the country of study, its geographical location, its natural resources endowment and its economy[37]. Additionally, even its status as a producer or consumer or as a transit may influence their energy security as Johansson mentioned in his study in 2013[38]. Various researchers deduced that energy security can be affected by factors, such as

[31] Baldwin, D. A. "The Concept of Security", Review of International Studies 23, p. 5-26, 1997.
[32] The four additional questions of Baldwin: ''How much security?'', ''At what cost?'', ''By what means?'', ''In what time period?''
[33] Hippel's questions: What to protect? From which risks? By which means?
[34] Hippel, David & Suzuki, Tatsujiro & Williams, James & Savage, Timothy & Hayes, Peter, "Energy Security and Sustainability in Northeast Asia", Energy Policy 39, 2011.
[35] Yergin Daniel. "Energy Security in the 1990s ", Foreign Affairs, vol. 67, no. 1, pp. 110–132, 1988. JSTOR, www.jstor.org/stable/20043677
[36] IEA, "Towards a Sustainable Energy Future ", OECD Publishing, Paris, 2001. https://doi.org/10.1787/9789264193581-en.
[37] Luft G., Korin A., "Energy Security: In the Eyes of the Beholder ". In "Energy Security Challenges for the 21st Century: A reference handbook " of Luft, G.,and Korin, A.(eds), Santa Barbara, CA: Praeger Security International, 2009.
[38] Johansson Bengt, "A broadened typology on energy and security", Energy, Volume 53, pp. 199-205, 2013. ISSN 0360-5442,https://doi.org/10.1016/j.energy.2013.03.012. (https://www.sciencedirect.com/science/article/pii/S0360544213001886)

vulnerability of the supply routes, political systems and the status of international relations, which made them realize that energy security is a dynamic concept and simultaneously fluid. In the present day, when the ever evolving environmental energy policy challenges are the cause of reforms in the energy sector, energy security has to readapt its content and change in order to keep up with today's fast pacing world of innovation. That's the bedrock of energy security and its provenance. One of the most recent definitions of ''Energy security'' considers the term as having "*access to clean, reliable and affordable energy services for cooking, heating, lighting, communications and other productive uses*"[39]

The 4A's Definition:

A basic way to approach energy security can be sought through the 4A's: "availability", "affordability", "accessibility" and "acceptability". "Availability" includes elements related to geological existence of resources, while "accessibility" is involved with geopolitical elements. "Affordability" has mainly economical content. "Acceptability" includes the environmental and social factors of energy security[40]. That definition as logical and simplistic as it seems, it wasn't created out of the blue but consists of the piled-up knowledge and the research up until that point in time. Based on the classic energy security literature of Deese and Yerning, which the ''Asia Pacific Energy Research Centre'' in 2007 gatherer, reorganized and bundled together with the preexistent notions of availability and affordability with acceptability and accessibility. These last two dimensions already existed, but were not connected with energy security until the 2007 initiative of the APERC. Then various researchers provided their own little peddle of progress to the literature of energy security through the necessary theoretic analysis that established the 4As definition in the scientific society.

Another interesting way to view energy security is through the 5S's: surety, survivability, supply, sufficiency, and sustainability, based on which Sovacool and

[39] Hiroshan Hettiarachchi, Chandrashekar Kshourad, "Promoting Waste-to-Energy: Nexus Thinking, Policy Instruments, and Implications for the Environment in Current Developments" in book: "Biotechnology and Bioengineering Waste Treatment Processes for Energy Generation", Sunil Kumar, Rakesh Kumar and Ashok Pandey, Chapter 9, pp. 163-184, 2019,Elsevier.

[40] Bert Kruyt, D.P. van Vuuren, H.J.M. de Vries, H. Groenenberg, "Indicators for Energy Security", Energy Policy, Volume 37, Issue 6, pp. 2166-2181, 2009. Doi: 10.1016/j.enpol.2009.02.006.

Saunders conceptualized the following five dimensions that are quite similar to the 4As: A) the availability of energy, B) its affordability, C) its safety and technological resilience, D) the environmental, social and economic sustainability and E) governance (i.e. quality transparency, accountability, relevant legislation ,and contractual rights)[41]. As mentioned at the beginning of this chapter, the factor of governance has to be accepted as crucial in the overall project, since without the ensuring and safeguarding of both contractual parties rights, the project could undeniably dissipate and never come into fruition.

Alternative Approaches:

Beyond the 4A's there are alternative approaches of energy security defining it as the low vulnerability of vital energy systems[42]. The resilience of the system is mainly attributed to factors, such as risk of investment, sectorial risk and geographic. Vital energy systems are energy resources including infrastructure and uses linked together by energy flows that support critical social functions. Usually, their boundaries are either sectoral or geographic. Vulnerabilities are considered as combinations of exposure to various risks and resilience capacities[43].

[41]Sovacool Benjamin K. and Saunders Harry, "Competing policy packages and the complexity of energy security", Energy, 67, issue C, p. 641-651, 2014. https://EconPapers.repec.org/RePEc:eee:energy:v:67:y:2014:i:c:p:641-651. DOI:10.1016/j.energy.2014.01.039.

[42] Jessica Jewell, Aleh Cherp, Keywan Riahi, "Energy security under de-carbonization scenarios: An assessment framework and evaluation under different technology and policy choices ", Energy Policy, 65, (C), pp.743-760, 2014.

[43] Cherp Aleh & Jewell Jessica, "Energy security assessment framework and three case studies", 2013. DOI:10.4337/9781781007907.00018; Jewell Jessica, "The IEA Model of Short-Term Energy Security (MOSES): Primary Energy Sources and Secondary Fuels ". IEA Energy Papers, 2011.

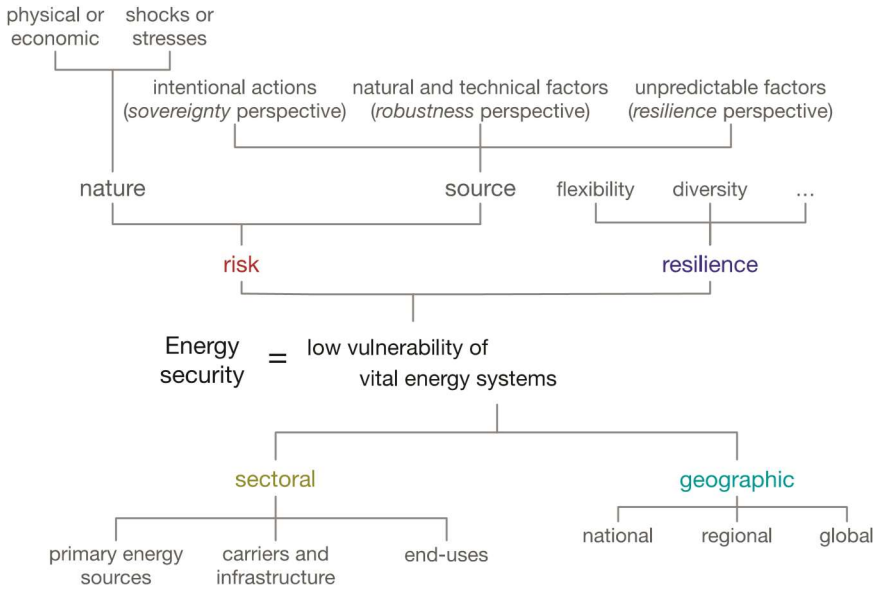


Figure 6: Parameters of 'low vulnerability of vital energy systems'[44].

As Figure 6 indicates energy security is affected directly and/or indirectly by: A) various risks, which are classified and countered based on their nature and source (e.g. systematic or specific risk, technical or technological), B) the general resilience of the project, which is an abstract term that can include the general norm of flexibility of the project and its ability to diversify depending on the issues and problems it encounters, C) sectoral issues that derive from the type of the energy source, the available carriers and infrastructure and of course the end-users its provided for, D) its geographical location or locations and countries it passes by. Vital energy systems can be affected by these factors individually or their conglomeration. Each of the above mentioned parameters can affect the others and change them causing salient convergences in the wholesale project.

Associating with the Present Analysis:

Theoretically, after conceptualizing energy security and defining our factors of interest, the last step is choosing adequate dimensions for our index and then measuring them through their components measured either from qualitative or quantitative criteria. Some can be measured through data research and by gathering statistical samples or by using already existing ones. One relatively easy way to establish an index is for the values of the metrics to be piled up

[44] Cherp Aleh & Jewell Jessica, "The concept of energy security: Beyond the four As". Energy Policy, 75, 2014. Doi: 10.1016/j.enpol.2014.09.005.

and formulated into z-scores that can in turn be aggregated into an index[45]. For the sake of simplicity the following analysis is going to be based on the specific indexes that are going to provide the necessary data and inquiry to assess and compare at a certain degree the projects of Greece with some EU projects and world projects. For the sake of that analysis in the present chapter as a reference to energy security and its influence over an energy project the ‘‘International Energy security risk index’’ and the ‘‘Energy Trilemma Index’’ are going to be employed. Enabling the further assessing of theoretical the influence of energy security and in later chapters the components of the sustainability and legislation as governance to the future of the Greek island projects such as Astypalea and Tilos.

That approach can provide a clearer delineation of the components of energy security and not just a theoretical comparative analysis as the one that is going to be demonstrated in the last part of this research. The more tangible data the more thorough the analysis. Thus, the index is going to assist into applying theory into the most possibly accurate data. The merging of discrepancies depends in that case of the data, which deprive the index, meaning the theoretic approach, the conceptualizing, the components chosen and the statistical sample used.

Energy Trilemma Index:

The ‘‘Energy Trilemma Index’’ is a tool that adequately ranks countries on their ability to provide sustainable energy through three main dimensions: Energy security, Energy equity which includes accessibility and affordability, and Environmental sustainability[46]. Thus, as an index it combines sustainability, with energy security and energy equity providing an all-around approach. This Index can further to assess the sustainability of national energy policies, which can provide even more insights in a country’s path.

Specifically, Greece is at the 39th place of the global index with diverse performance across its three dimensions. The separate scores in each of the three

[45] Paravantis John, "Dimensions, Components and Metrics of Energy Security: Review and Synthesis ", SPOUDAI - Journal of Economics and Business, 69(4), pp.38-52, 2019. https://spoudai.unipi.gr/index.php/spoudai/article/view/2755

[46] https://trilemma.worldenergy.org/#!/energy-index

dimensions of the index in the case of Greece are for ‘‘Energy Security’’ 54.7 out of 100, for ‘‘Environmental Sustainability’’ 72.9 out of 100 and for ‘‘Energy Equity’’ 81.1 out of 100 and their subsequent balance rate is C, B, A in the above mentioned order.

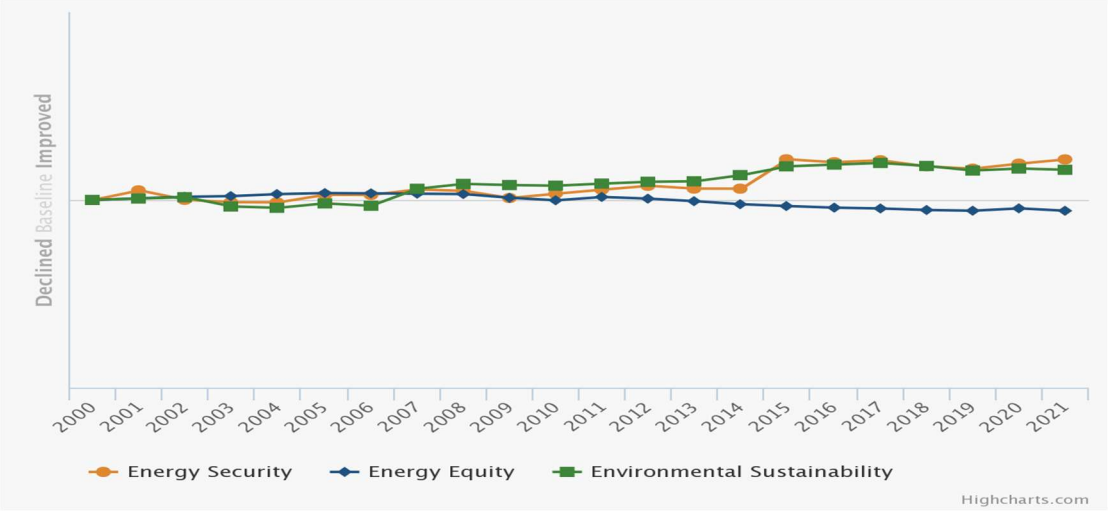


Figure 8: Historical Trilemma index Scores of Greece[47]

The increase in low carbon electricity generation in Greece with far less lignite being used, which reaches less than 15% of the overall energy mix in 2021, while RES and natural gas share has gone up, with a far lower energy intensity, which justifies the ‘‘Environmental Sustainability’’ rate that is going to rise to A. Unfortunately there’s a decreasing score, which is witnessed in ‘‘Energy Equity’’ that can be attributed to a rise of electricity costs from 2021, along with the decreasing incomes caused by the halting of the market due to the Covid-19 pandemic. As for RES Greece’s effort surpassed the renewable energy mix target of 2020 and stays in track for the 2030 CO2 emissions reduction target, while being paired with an increase in Import independence and microeconomic and political stability Greece is highly enabled to achieve in the future a balanced and improved score in the ‘‘Energy Trilemma Index’’. Additionally, based on figure 8 there a significant from 2014 in energy security, while environmental sustainability seems to follow a rising path in the same years but halts in 2019 at the start of Covid-19 pandemic, indicating that the energy security is the factor most attention and care should be provided to staidly improve Greece’s C rating.

[47] https://trilemma.worldenergy.org/#!/country-profile?country=Greece&year=2021

Energy Sustainability:

The Notion:

The concept of sustainability encircles the notion of balancing current resource consumption with the resource requirements possibly needed for future generations. In theory there are two main forms of sustainability: ‘weak’ and ‘strong’. ‘Weak’ sustainability, as a notion, suggests that manufactured and natural capital are nearly interchangeable, allowing environmental impact to be quantified in financial terms. Finding the optimum approach to deploy such resources is thus crucial to an effective strategy for achieving sustainability[48]. On the other hand, the concept of 'strong' sustainability acknowledges that environmental issues extend beyond simple allocation issues to include issues of distribution and scale. Resources must be distributed fairly, and their distribution and consumption must result in a situation in which economic activity does not jeopardize global ecological carrying capacity. The goal of strong sustainability is to incorporate size, equity, and efficiency into the weak model[49].

Theorists understand sustainability as a notion that bundles together economic, social and environmental sustainability. As mentioned in the previous chapter energy sustainability can be viewed as dimension of energy security, based on the 5Ss, which contains environmental, social and economic sustainability. Environmental sustainability, in its most basic form, is the obligation of the human race to conserve natural resources and protect global ecosystems that support their health and wellbeing, not only now but also in the future for future generations. Economic sustainability is a subset of sustainability that refers to the methods we must employ in order to protect and sustain our human and natural resources, as well as to produce long-term sustainable values through optimal use while taking into account natural resource recovery. In practice, we must protect finite natural resources now so that future generations can meet their

[48] K. Rennings, "Economic and ecological concepts of sustainable development: external costs and sustainability indicators", in the book: "Social Costs and Sustainability: Valuation and Implementation in the Energy and Transport Sector", O. Hohmeyer, R. L. Ottinger and K. Rennings, New York, Springer, pp. 47–60, 1997.

[49] Marilyn A. Brown & Benjamin K. Sovacool, "Developing an 'energy sustainability index' to evaluate energy policy ", Interdisciplinary Science Reviews, 32:4, pp.335-349, 2007. DOI: 10.1179/030801807X211793

own requirements. When formal and informal processes, institutions, structures, and connections actively enhance the capacity of current and future generations to produce healthy and livable communities, this is referred to as 'social' sustainability. Communities that are socially sustainable are equal, varied, connected, and democratic, and they give a high quality of life. As a result, its scope is vast and difficult to define in practice. Between the three types there is some overlapping as its natural in the field of practice[50].

All three of these types are important for an energy project, since its probabilities of coming into fruition are highly dependent, per the current legal status quo, on the acceptance of its environmental assessment and the possible ramifications it could cause to the local ecosystems.

In Practice:

As it is apparent the environmental sustainability affects economic sustainability and is dependent even upon social sustainability and thus local acceptance. One of the most recent examples in Greece being the halting of building of wind turbines in Andros, due to the decision of the ''Hellenic Council of State'', which is the ''Supreme Administrative Court of Greece'' (StE 2419/2019) on the endangering of the ''Bonelli's eagle'' nests and harming their natural habitat, which put a stop in the construction of wind turbines during the reproductive period of the eagles. Specifically, the ''Bonelli's Eagle'' with its current scientific name as ''Aquila Fasciata'' (older classification Hieraaetus fasciatus) is considered to be one of the largest eagles in Greece, second only to the almighty ''Golden eagle''. Despite its continued classification as a species of least concern by the ''International Union for Conservation of Nature and Natural Resources'' (IUCN), the ''Bonelli's eagle'' population has declined perilously, including almost all of its European distribution, and may face potential local extinction[51]. The species decline is a consequence of the widespread habitat destruction, the electrocution from electricity pylons and its persistent persecution from hunters. In Greece, it is protected by the Joint Ministerial Decision 414985/85

[50] Goodland, R. and Daly, H., ''Environmental Sustainability: Universal and Non-Negotiable''. Ecological Applications, 6(4), pp.1002-1017, 1996. https://doi.org/10.2307/2269583

[51] López-López P, Sarà M, Di Vittorio M, ''Living on the Edge: Assessing the Extinction Risk of Critically Endangered Bonelli's Eagle in Italy'', PLOS ONE 7(8), 2012. https://doi.org/10.1371/annotation/dd99f4a8-9ec1-4177-9b2b-e145a348ca2a

and is classified as ‘‘Vulnerable’’ in the Greek Red Data Book. In 1997 its total number were around 85 to 105[52] in approximately 50 breeding pairs[53]. More than 50% of its population is found on the Aegean Islands and Crete making it a matter of importance especially in the case energy projects in the Aegean that involve wind turbines. In that specific case the inhabitants of the island are putting up a fight to stop the installation of industrial wind turbines on the island, making the project suffer from lack of not just environmental sustainability but also social due to the shortage of social acceptance. Thus, the sustainability factor is not just meant to be present in the beginning of the project or just the licensing period, which includes the environmental impact assessment, but also from the contraction phase to its completion and the future maintenance that’s going to be needed.

Greece’s Sustainability Initiative:

The ‘‘Sustainable Greece 2020’’ initiative, in its core, aims to contribute with the creation of the necessary conditions for a new development model in the country, which will ensure a Sustainable Economy and Society[54]. It is based on the ‘‘Greek Sustainability Code’’, which provides a structured system with regards to the transparency and commitment of businesses towards Sustainable Development and Responsible Entrepreneurship. As the Greek code is based upon the ‘‘German Sustainability Code’’ it upholds all a recognized European standards for sustainable development. It is a joint effort with the cooperation any organizations active in Greece that wants to take part in the effort, no matter their size or legal status, including Companies, public entities, local administration civil society organizations, and even academic foundations and institutions. Every Company can participate in the Code and be integrated in the best possible way depending on the maturity of its internal procedures. Additionally, the ‘‘Greek Sustainability Code’’ offers the Companies the possibility to improve themselves, while gradually adapting to its levels. The primal strategic goal of the Initiative is the development of a systematic dialogue at national level that

[52] Bourdakis, S. ‘‘Status and conservation of Bonelli´s Eagle in Greece’’, Hellenic Ornithological Society, Unpublished report, pp.5, Athens, 1997.
[53] Tucker, G.M. & Heath, F.A., ‘‘Birds in Europe: Their conservation status’’, Birdlife International Conservation Series, No.3, Cambridge, 1994.
[54] https://www.sustainablegreece2020.com/

will provide the founding basis of creating methodologies and tools that will support Sustainable Development in Greece. Thus, as an initiative it isn't directly involved with the energy sector, but it can provide the structural development that a company needs to survive in today's competitive market. Nevertheless, there are already quite a lot companies of the energy sector participating in the initiative as ''sustainability ambassadors'' (e.g. Hellenic Petroleum S.A., Mytilineos S.A) The whole initiative is supervised by the ''Sustainability Observatory'' of Greece[55], which constitutes a national monitoring mechanism that gathers all the best practices and Initiatives piling their collective knowledge together and then developing under the framework of sustainable development, responsible business and social responsibility an economic, environmental and social plan for businesses and individuals .

Global Sustainable Competitiveness Index:

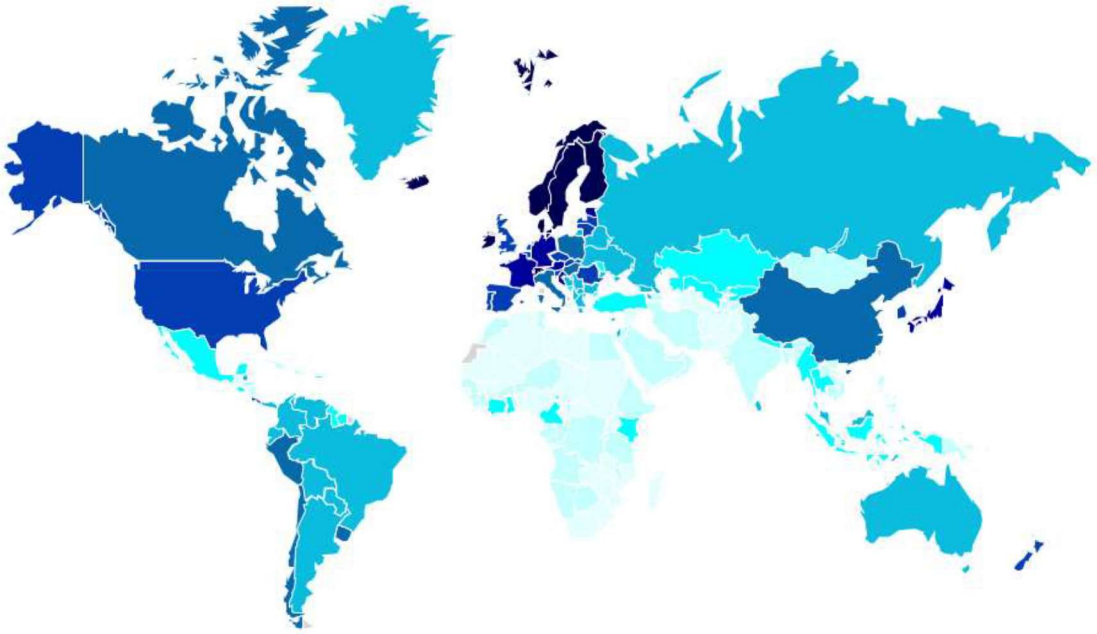
As it is known, sustainability comes into tree forms: economic, social and environmental. The Global Sustainable Competitiveness Index (GSCI) is considered to be one of the most comprehensive ranking of countries currently available and it is basically a complex index that measures sustainability in its full form and uses that data to assess the competiveness of each country[56]. Specifically, the GSCI measures the competitiveness of countries based on 131 quantitative indicators derived from the World Bank, the IMF, and a variety of UN agencies. The 131 indicators are grouped into 5 sub-indexes: ''Natural Capital'', ''Resource Efficiency & Intensity'', ''Intellectual Capital'', ''Governance Efficiency'', and ''Social Cohesion''. In its current form it resembles more an economic sustainability index that a complex one, but its inquiry is valuable especially in the case of investments in the energy sector and in the Greek islands that usually derive from EU companies, and EU initiates, which will keep track of the sustainability factor closely.

Based on the index Greece is one of the least competitive countries in the EU, which shows that our economy does not have yet a valuable comparative advantage and it is still on the verge of developing it. The rest of the EU countries have each specialized on a few submarkets conquering a great portion of the

[55] https://observatory.sustainablegreece2020.com/home/
[56] https://solability.com/the-global-sustainable-competitiveness-index/the-index

EU market (e.g. car industries mainly in Germany, France and Italy). Thus, being capable to use their surplus on other markets and into further developing their infrastructure. Greece has to first invest in the basic infrastructure that will provide the necessary boost for the energy sector, which is still in its beginning stages and hasn't yield results yet. The effort is quite apparent, but a certain amount of patience and close monitoring of the Greek market in the next years will further illuminate the present difficulties and concerns that are shown from the Greek market's level of competitiveness. Even though, Greece's overall rank of sustainable competitiveness is 42 out of 180 countries and per the data the country's competitiveness is at a very high level with a score of 49.6[57].

Figure 9: The Sustainable Competitiveness World Map 2021[58]



The Dark areas indicate high competitiveness, while light areas low competitiveness

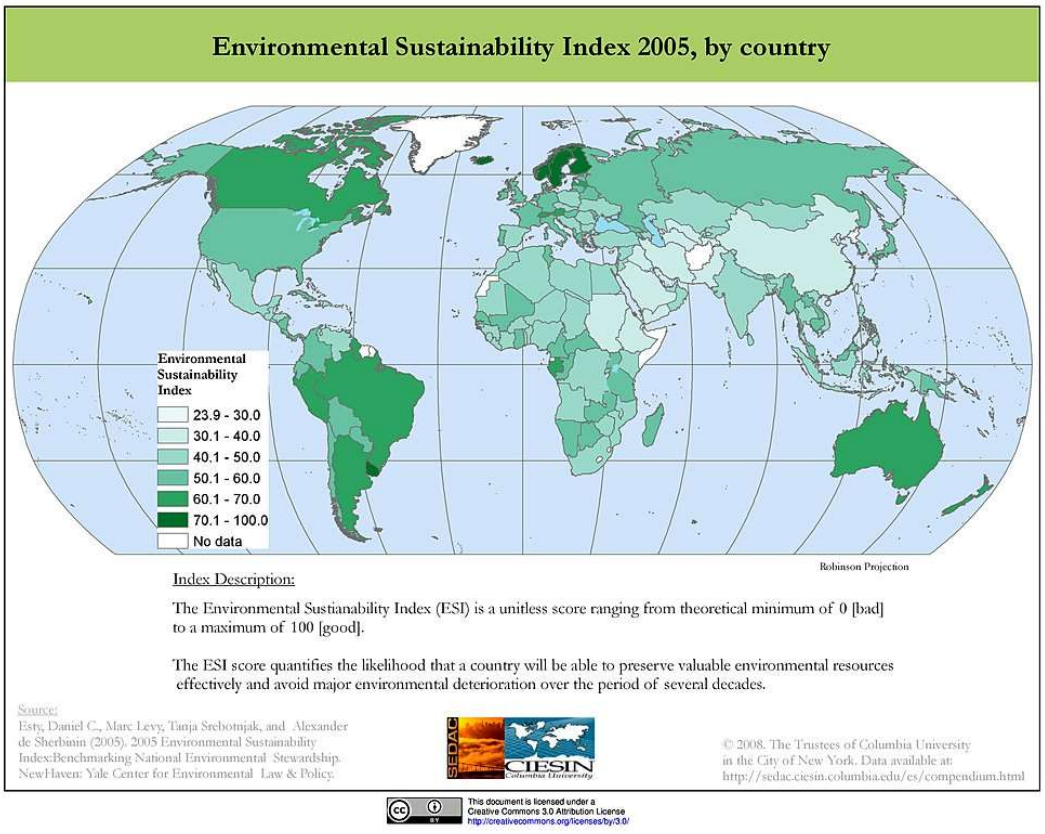
Environmental Sustainability Index (ESI):

The ''Environmental Sustainability Index'', also known as ESI, measures the overall progress towards environmental sustainability[59], thus of one out of three types of sustainability. As it is shown in figure 10, Greece has a score of 50.1

[57] The Global Sustainable Competitiveness Index, State of the World Report, 10th edition,pp.19, October 2021.
[58] Ibid., 8.
[59] https://sedac.ciesin.columbia.edu/data/collection/esi

to 60 in the ESI, meaning there are still a lot to be done for the protection of the environment in our country. The developed countries of the EU seem to be over the average score, indicating that the EU upholds a degree of environmental sustainability policies, but some countries such as Spain seem to be a bit left behind in score. Figure 10 shows the basic categorization of countries made by ESI in 2005. The state of environmental sustainability of the EU and the world has changed already, but can be a useful historical reference for the ground covered the past two decades by the various initiatives and the environmental policies. The zero-emissions target and the energy transitions targets of the EU member states have definitely contributed to the improvement of the environmental sustainability of each EU member state. For more concreate data on the present environmental sustainability of each state the ‘‘Environmental performance index’’ (EPI) can be of great use, which is included in the subsection of the ‘‘Environmental aspect’’ of energy projects as a critique to the legislative direction of Greece in the last decade.

Figure 10: Environmental Sustainability Index (ESI) 2005



Global Sustainability Index:

The Global Sustainability Index is a helpful tool, which examines the policies and actions regarding the environment of every nation on earth. Greece is bound by the EU climate mitigation target of a 40% reduction in GHG emissions by 2030 based on the 1990 levels. The country has surpassed successfully its 2020 target and is on track for the next target of net-zero emissions target of 2050. The key points of its national energy strategy are to eliminate lignite coal reliance from its energy mix while increasing its renewable energy share. Specifically, Greece is ranked 33rd on the global ranking [60] of the ‘‘Global sustainability index’’. Thusly, Greece’s position holds great significance in reference with all its policies for the environment showing a high degree of environmental responsibility.

The Legal Parameter:

Durable Contracts:

In the energy sector, it is a must that investments should be aligned with a long-term vision and strategy as defined by the host-government, which determines how the extractive sector can contribute to broader sustainable development objectives. More specifically an energy contract can be a significant tool for governments and investors alike, which should be durable against the special changing circumstances (e.g. market conditions, counterparties obligations, government changes and changes in the legal regime). A durable contract, which should also be a sustainable one, consists of a long-term relationship and operational partnership between the host-government, investors, and local communities, which can fulfill national energy objectives based on shared and realistic expectations. The balance of interests among the host-government, investors, and communities depends upon the recognition of their specific individual rights under applicable international and national law. Additionally, long-term contracts should seek to maximize their overall value, including economic, social, and environmental outcomes. To the extent not covered by the applicable law, contracts should be prepared for and provide the identification and management of the potential adverse environment including health, safety, and societal impacts of any energy project, while establishing unambiguous roles

[60] https://earth.org/global_sustain/greece-ranked-33rd-in-the-global-sustainability-index/

and responsibilities for the host-government and the investor to forestall and mitigate the impact of those factors onto the project, in consultation with the affected local communities. These contracts are negotiated and based upon the continuing sharing of key financial and technical data in order to build a common understanding of the performance and the main risks and opportunities of the project. Moreover, in order to operate in a sound investment and business climate, energy contracts should be characterized by a fair, transparent, and clear legal and regulatory framework. Should always be consistent with applicable laws, and anticipate that the host-government may introduce laws, regulations, or policies that: A) are not arbitrary, B) do not reflect internationally recognized standards and good-practices generally accepted from time to time in the industry and could remove the consequences and substantive adverse impacts of the project for the host-government depositing the risk "on the shoulders" of the investor. Additionally, energy contracts should be underpinned by a fiscal system that provides fair sharing of economic rent between the investor and the host-government, while taking into consideration the risks and potential rewards of any given project. A contractual regime with automatic adjustments can be quite useful in these cases as it enables the government to take upon the prevailing market conditions, which vary with commodity price, production volume, resource quality. This regime could reduce the incentive for either party to seek re-negotiations[61].

International Energy Security Risk Index:

Before getting to know the some specific projects of Greece and their fellow EU and world projects it would be advantageous to witness the position of the country in some indexes that are specialized for the energy sector and energy security and sustainability. In turn then, the comparison between the projects would be more plausible even though the legal and natural and economic conditions of each project differs quite a lot.

[61] Doak Bishop, Eldy Quintanilla Roché and Sara McBrearty, ‘‘The Breadth and Complexity of the International Energy Industry’’, in Doak Bishop and Gordon Kaiser’s, The Guide to Energy Arbitrations, 2nd Edition, Law Business Research Ltd, pp. 1-13,2017.

Figure 7: International Energy Security Index Summary[62]

Energy Security Risk Summary: Greece	
Risk Scores:	
2018 Energy Security Risk Score	1,076
Score in Previous Year	1,115
Score in 1980	973
Best Energy Security Risk Score 795 (1995).	
Worst Energy Security Risk Score 1,149 (2011).	
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2018	14%
Best Relative Score	-3% (1980)
Worst Relative Score	33% (2001)

The International Energy Security Risk Index, is an energy risk indicator, which uses quantifiable data, historical trend information and government projections in order to identify the policies and other factors that contribute positively or negatively, depending the case scenario, to international energy security. Specifically, Greece has a score of 1076 with a yellow indication. In this index there are four indicating colors of risk starting from low risk with blue and then advancing towards higher risk with yellow, then orange and finally red indicating the highest risk. Greece is ranked in the second lowest category of risk, which on its own it shows that the country can attract investments and provide them a high degree of energy security. Compared with the EU member states Greece's score is at the average, which shows its level of competitiveness in the EU energy market. More importantly, as shown in figure 7 the worst ever score was a few years after the economic crisis of 2008, thus validating that economic stagnation was at least one of the factors influencing the indicator and our county. Secondly, when compared with the OECD counties Greece has an average annual difference between the years 1980 to 2018 amounts to 14% more risk than the average member of OECD, which may be attributed to the relatively smaller and in debt economy of Greece. The average of OECD countries is close to a 1200 score, which indicates that Greece is slightly below. Therefore, Greece should focus on its competitiveness and attract via energy investments financial resources, updating and creating additional infrastructure

[62] https://www.globalenergyinstitute.org/international-energy-security-risk-index (by right clicking onto Greece)

even for the most remote locations of the country, its islands mainly, while seizing a comparative advantage in the energy sector. Generally, as it will be mentioned in the ‘‘Sustainable Competitiveness Index’’ sub-chapter, the country does not have a sector with the necessary know-how and infrastructure to be called its comparative advantage in the EU or even the world market. It is said that tourism is the main product of Greece, but in essence a lot of investments are needed for a sustainable investment that provide infrastructure in which future investments could take into account and use to flourish and further modernize. Thus, the testing of the most cutting edge technologies in our energy islands (e.g. the hybrid energy system of Tilos or Astypalea's e-mobility initiative) are going to be the perfect starting point for new innovative solutions in the energy sector that Greece can export into the world.

Contractual Types:

Before an investment can come into existence, the state and its contracting parties negotiate and establish the basic terms of the contract in the pre-contractual phase. There are some main contractual types from which the state can choose depending on the nature of the investment. The most frequently encountered investment contracts can assume the form of: A) natural resource concessions, B) public service concessions, C) ‘‘Built-operate-and-Transfer’’ contracts also known as BOT contracts (a type of concession agreement) and D) private-private partnerships also known as PPPs[63]. The exploration and exploitation contracts traditionally consist of ‘‘modern concessions or licenses’’, ‘‘authorizations’’, ‘‘production-sharing agreements’’ (PSAs), ‘‘cooperation agreements’’, ‘‘joint ventures’’ (Joint operation agreements or JOA) and ‘‘service contracts’’ depending on the agreement and the interest of the contractual parties[64].

Different contractual types can be used even within the same state for different type of projects depending on the volume of risk the state wants to undertake and the technology that is available to it. Especially ‘‘concession contracts’’ (e.g.

[63] C. L. Lim, Jean Ho, Martins Paparinskis, "International Investment Law and Arbitration: Commentary, Awards and other Materials", 2nd Edition, Cambridge University Press, pp.52-55, March 2021.
[64] Carmen Otero García-Castrillón, "Reflections on the law applicable to international oil contracts", The Journal of World Energy Law & Business, Volume 6, Issue 2, pp. 129–162, June 2013. https://doi.org/10.1093/jwelb/jwt004

BP v. Libya[65]) or ‘‘licenses’’ have evolved to modern participation agreements, which are based on partnership with equal rights among the partners[66]. Usually, the investor has as an incentive the exploitation rights of the resources found for a fixed amount of time contained in the initial contract and when this time period ends the state can claim ownership of the resources. ‘‘Authorizations’’ are self-explanatory; it is an agreement whereby one of the parties authorizes the other to undertake the obligation to perform an act in the name of the contract. As for ‘‘PSA’s’’, they do not grand the company ownership of the resources for a set amount of time, as concession contracts do, but instead focus on the recouping of the sunk cost and then the gathering of profit. Thus, they are ideal for private investments in volatile investment cases, mainly new areas of interest. Additionally, the risk of extracting less resources than anticipated is shouldered by the companies as a balancing factor of the financial incentive given to invest (privileged investment)[67]. When resources are discovered in one location the state allows the companies that helped in the general search to recoup their sunk cost and make the pre-agreed upon profit. ‘‘Joint ventures’’ as the term prescribes may involve the creation of a jointly controlled project company that is controlled from both parties. Thus, it is a shared decision making model different from the previously mentioned contract types. Lastly, ‘‘service contacts’’ are used when the state wants to have great control over the resources and their exploration. Practically, the state delegates a specific job to a private enterprise. There are three types of service contacts: risk service contacts, pure service contacts and technical service contacts. The first type is not used often since it entails the private company to bear the risk of exploitation. The second type mainly contains the need of service that the state delegates to a company that has the ‘‘know-how’’ knowledge upon a simple fee of commission. Finally, the third is narrowed down to the technological expertise of a company that is provided for a fixed compensation. Service contracts or

[65] BP Exploration Company (Libya) Limited v. Government of the Libyan Arab Republic, Award (Merits) 10 October 1973.

[66] Jenik Radon, "The ABCs of Petroleum Contracts: License-Concession Agreements, Joint Ventures, and Production-sharing Agreements", in "Covering oil: a reporter's guide to energy and development", Open Society Institute, chapter 5, pp.63-65, 2005.

[67] Likosky Michael, "Contracting and regulatory issues in the oil and gas and metallic mineral industries", Transnational Corporations, Volume 18, Issue 1, pp. 7 - 14, Dec 2010. https://doi.org/10.18356/a528fffd-en

agreements are quite similar to the aforementioned participation agreements and, if classified, the degree of control held by the state is in between that of concessions and cooperation agreements.

Evidently, the terms of an agreement can affect a lot the public interest of the state, thus when choosing the type of the contact and agreeing upon clauses, the state needs to take into account the best possible way to maximize its profit and eventually its power from the possible economic and even political benefits that can arise. Additionally, the terms determine not just the profits that a nation earns from its natural resources but also whether a government will have the regulatory authority to enforce its environmental policy and other standards to the contractors. One of the biggest challenges a state faces is that it needs to regulate itself when participating in contracts like a normal business, especially in the case of a resource-rich state that has the economic advantage. This is without mentioning the regulatory changes that a state can make in order to maximize its profits against all competitors in the same market place. Thus, the possibility of corruption of the state looms behind any energy contract, especially one for the excavation of a new reserves upon which a lot of people's jobs are dependent. There are a lot of possibilities for the state to abuse its dominant position and for the private enterprises to try ''to buy their way in a project''.

Applicable Contractual Law:

Usually, the ''private international law'' approach cannot ignore the ''public international law'' implications in energy contracts. ''Public international law'' similarly to most national legal systems, recognizes the public ownership of natural resources. There are limits to the conflict of laws dimensions, which depend on the conflict of laws and their interpretation by the authority (judicial or arbitral) called to resolve the disputes arising during the contract's lifespan the very first element to determine the disputes applicable law.

The choice of contract law can be from A) international law and B) a national legal system or even C) a combination of both. There is a tendency towards resorting to IL and ''lex petrolea'', because it is the international legal system that has a great number of international instruments, particularly in the case of arbitration, or in similar cases where the parties may not have made the choice

of law. Generally, the normal principles of private international law, in the plausible case of applicable conflict of laws rules, are followed in contracts between private companies and also applied to contracts involving state parties[68].

Basically, the arbitral tribunal is not bound to apply the conflict of laws rules either of the state where the seat of the arbitration is located or of the state involved directly or indirectly in the arbitration agreement. Secondly, applying conflict of laws rules to such contracts will not necessarily lead to the application of a national legal system, but it may lead to other substantive legal systems. For contracts involving state parties, as in the case of those involving private parties, arbitral tribunals generally seem to accept the priority of party autonomy as principle. Therefore, when the parties have inserted in their contract a choice-of-law clause specifying the application of a particular substantive law system, their choice is to be respected by the tribunal. However, the variety of choice-of-law clauses is much wider. The application of a national legal system remains the most common solution for contracts involving state parties. Within the aforementioned category, this can lead to the application of the national law of the state party involved in the contract, although this not usually the case when intergovernmental arbitration institutes are chosen to settle the dispute. Frequently, the choice of the national law of the state entity counterparty can be combined with a stabilization clause to ensure that the state does not alter or manipulate the applicable law after the conclusion of the contract to the disadvantage of the other party to the contract. Mandatory rules of the national legal system of the state party involved or international public law can come into play much more in arbitrations involving state parties than in those between private enterprises. State parties or their contractual behavior may be subjected to specific restrictions in the name of public interest. An option in that case is the application of general principles of law, which can balance the and maintain the equilibrium of contractual rights. Contracts involving state parties can also be subjected to public international law, where treaties lay down the applicable rules or mandatory restrictions for the dispute resolution procedure. Sometimes there is even reference to public international law in the choice-of-law clause in

[68] Berthold Goldman, ‘‘The Applicable Law: General Principles of Law - the Lex Mercatoria’’, in Julian Lew’s, Contemporary Problems in International Arbitration, Springer, pp. 113-125,1987.

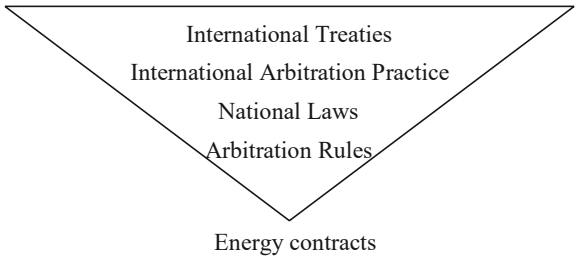
a contract between a state party and a foreign private enterprise. Specific considerations apply to contracts that are called ‘‘public international law contracts’’. When state parties enter into international commercial contracts, unless an agreed choice-of law clause provides otherwise, they have to accept the functioning rules of the game. Thus, implying the applicability of relevant trade usages, which are used by most modern institutional arbitration rule-sets and oblige their arbitrators to take them into consideration. It may also imply the applicability of ‘‘Lex Mercatoria’’ if it is accepted in principle and in concrete rulings. A further option for contracts involving state parties is the application of the ‘‘UNIDROIT Principles’’. Generally speaking, it is possible to anticipate that, be it an arbitral or a national jurisdictional court, the ordinary response will be to apply host State law and, at the least, take into consideration commercial uses and ‘‘IL principles’’. However, arbitral practice proves that, beyond any combination of these regulatory systems, any of them could also be applied in isolation. There is a search for a generally accepted contractual legal regime for relationships between States and foreign companies in the hydrocarbons exploration and exploitation sector. In pursuing a neutral regulation, parties, through contract clauses, and arbitrators through the application and interpretation of contract clauses, have given a considerable role to the ‘‘internationalization’’ of the underlying legal relationship and, therefore, to the definitive ‘‘privatization’’ of States’ contracts. As a consequence, it is possible to witness the appearance of a specific international State’s contract legal regime that, based on ‘‘IL principles’’ (general principles of law) and ‘‘Customary (general) IL’’ at times with imperative (ius cogens) character, brings in the international commercial principles and practices of the oil sector. These principles and practices constitute the specific ‘‘Lex Mercatoria’’ (stricto sensu). Overall, the resulting ‘regime’ could be said to entail a specific ‘‘Lex Mercatoria’’: the ‘‘Lex Petrolea’’. Moreover, it is important to note that the role of oil and gas practices in the regulation of these contracts has been expressly acknowledged, not only in the contracts themselves, but also in certain national legislations. As an example, a great number of contracts include the sentence: ‘shall apply the generally accepted customs and usages of the international petroleum industry’, pre which contracts refer to the application of these practices. The International Court of Justice has declared the ‘‘ELR rule’’ and more specifically that local

remedies must be exhausted before international proceedings may be instituted as a well-established and functional rule of customary international law"[69]. The imperative norms of the host State will be applicable to exploration and exploitation contracts, without disregarding the application of the Lex Contractus imperative rules. The ‘‘Lex Contractus’’ tends to be the same (host State), although combined with the principles of IL and the sector specific ‘‘Lex Mercatoria’’. The host State's imperative rules are mandatory for its national courts and, eventually for a third-country court or an arbitration tribunal, as an imperative rule of a law closely related to the contract. In this case, if it was not directly applied, it would be, at the least, taken into consideration. The legal regime applicable to oil and gas international contracts is usually determined by a number of normative instruments that, in the vast majority of cases, operate in a simultaneous and coordinated way. From a ‘‘Private IL’’ perspective, beyond parties making use of their autonomous will to establish their respective substantive compromises resorting to, and to a large extent establishing, the commercial customs and uses of the sector (Lex Petrolea stricto sensu), the contracts often contain conflict of laws clauses. Conflict of law clauses tend to opt for a combination of legal rules that, in the majority of the cases, include host-State law and ‘‘IL principles’’ and ‘‘rules’’. Even when these last ones are not expressly mentioned, they invariably appear generally to be associated with the host State legal system. When contracts do not include choice of law clauses, conflict of laws norms will lead to a similar solution. In any case, ‘‘IL principles’’ constitute the basis on which the sector-specific ‘‘Lex Mercatoria’’ sits and, therefore, they could be claimed to have become part of it. Even without being mentioned in the determination of the applicable law, the ‘‘Lex Petrolea’’ is used anyway, particularly within arbitration, as a means for interpreting and completing contract terms. In addition to the unavoidable application of the ‘‘Lex Contractus imperative norms’’, the application of IL is compulsory when it comes to issues like expropriation. Moreover, despite the difficulties, economic coercion measures adopted in multilateral forums have been suggested to have an imperative character. However, as to this kind of measure, the only certainty is

[69]Newcombe, A. P. & Paradell, L. ‘‘Law and Practice of Investment Treaties: Standards of treatment’’, Kluwer Law International, pp. 6, 2009.

that its application will be imposed, whatever the ‘‘Lex Contractus’’ is, on companies personally or commercially related to the sanctioning States. Procedural law can be contained in the contract or set by the tribunal. Substantive law can be selected by the parties as governing law in their agreement, but modern practice generally prefers an approach that denationalizes the applicable substantive law and applies general principles of law. Thus, the applicable law of an energy contract is not a fixed issue, especially in the case of arbitration in which the parties can choose their preferable law though a consensual arbitration clause. Then the Lex Arbitri, which governs the arbitral proceedings, is the law of the place of arbitration or more commonly where the seat of arbitration is located. Therefore, an energy contract is dynamic and its applicable law can derive from a great variety of rule-sets as figure 11 indicates.

Figure 11: Rules governing energy agreements



Clauses:

Contractual clauses are equally important in defining the type of the partnership and provide additional security for both signatories in the case of a fall out, depending on their agreement. Any clause integrated into a contract has to be bilaterally approved and then ratified by all parties participating in the contact. Unilaterally forced clauses, if proven to be so, are to be considered null. Even then, the contact continues to affect the parties on the content that’s bilaterally signed. They may include a great variety of terms for the economic percentage that each participant holds, adjusting their responsibilities, referring to the recouping of sunk cost, including a set of different provisions for the discovery and production phase and even give preference to employing the locals with privileged working terms[70].

[70] Likosky Michael, supra note 67 at 15-18.

Clauses are highly crucial in long-term energy contracts. There are two general types of useful clauses in energy contracts stabilization and adaptation or renegotiation that can ensure the honoring of the contract and its re-adaptation. The theoretical basis of the principle of ‘‘pacta sunt servanta’’ meaning the rule of sanctity dictates that contracts must be honored and provides the legal footing for stabilization clauses. In some cases after the passing of some years, based on the rule of thumb, one of the parties could due to unexpected changes of the contractual circumstances not have any more interest to proceed with the application of the contract. In that case the rule of ‘‘rebus sic stantibus’’ provides the footing for adaptation and renegotiation clauses that can persevere the contract and make it more durable. Specifically, ‘‘pacta sunt ervanda’’ freezes the parties rights and obligations in the name of the sanctity of contracts (e.g. stabilization clauses), whereas the ‘‘rebus sic stantibus’’ rule provides adaptations and renegotiation of the contractual conditions that may often become necessary in the presence of a drastic change of circumstances[71].

Stabilization clauses are ‘‘*a special variant of choice-of-law clauses*’’[72]. Any future changes to the host state’s applicable law, which will function to the investor disadvantage, disturbing the contractual balance, with such a clause are to not be applied to it. Stabilization clauses practically, are useful in maintaining a particular legal regime for a considerable period of time irrespective of any changes that can possibly occur in the political, social, and economic environments of the concerned state[73]. They are a contractual risk management tool that aims to maintain legal and economic equilibrium of the investment project by preventing unilateral actions of the host country in exercising its sovereign rights. Mainly, they are one of the means by which a host country can provide assurances to its investors of the stability of their contracts and investments[74].

[71] Bernardini Piero, "Stabilization and adaptation in oil and gas investments", The Journal of World Energy Law & Business, volume 1, issue 1, pp.98-112, 2008. DOI:10.1093/jwelb/jwn001.
[72] Dolzer R., Schreuer C., "Principles of International Investment Law" , second edition, pp.75-76, November 2012, Oxford.
[73] Nigel Blackaby , Constantine Partasides , et al., Redfern and Hunter on International Arbitration, 6th edition, Kluwer Law International, Oxford University Press, Chapter 3, pp. 155 - 228, para. 120-127, 2015.
[74] Joseph E. Neuhaus, "The Enforceability of Legislative Stabilization Clauses", in Book "Practising Virtue: Inside International Arbitration", part 3, chapter 19, Oxford University Press, 2015. DOI:10.1093/acprof:oso/9780198739807.003.0020

There are six basic types of stabilization clauses. First of all, ‘‘freezing clauses’’ or ‘‘stabilization clauses stricto sensu’’ guarantees that the tax regime, benefits, privileges and exemptions provided in the contract will be maintained as where signed and shall not be changed through the duration of the contract. Secondly, ‘’Intangibility clauses’’ guarantee that no national law changes will affect unilaterally the content of the contract against the private entrepreneur (private company). Thirdly, an ‘‘economic equilibrium stabilization clauses’’ can protect the rights of the contractor when after its date of taking effect, existing laws and regulations are amended or annulled or new laws and regulations are introduced that affect the economic rights or benefits. Mainly, that contractual clause delegates the parties to meet with each other and make the necessary changes to the contract, in order to maintain the contractor's rights, benefits and interests and to ensure that any revenues or incomes or profits derived or to be derived under the contract shall not in any way be diminished as a result of such changes[75]. Then there are the basic contractual clauses, the allocation of burden clauses and the legislative clauses. All of the aforementioned clauses are drafted in respect of the sanctity of the contracts and are a factor that encourages investors to undertake reliable long-term commitments for challenging projects. The above mentioned clauses are usually used by developing countries because they seek economic development through foreign investments. Thus, clauses that protect foreign investments are the most appropriate tool for attracting investments and maintaining them.

In order to tally with the changing circumstances in energy contracts adaptation or renegotiation clauses are employed as an alternative or in combination with stabilization clauses. An alternative concept that aims to preserve the sanctity and stability of the contact, but in practice its’ application is quite difficult depending on the agreed upon circumstances of triggering the renegotiation right[76]. There are renegotiation clauses triggered by changes caused by new legislations and adaptation clauses of general application leading to the renegotiation of the agreement upon the initiative of either the state or the investor.

[75] Faruque Abdullah "Validity and Efficacy of Stabilisation Clauses: Legal Protection versus Functional Value", Journal of International Arbitration, 23, pp. 317-336, 2006.
[76] Dolzer R., supra note 72, pp.77-78, 2012.

Specifically, there are automatic adaptation clauses that function automatically when the event of the change occurs and recalibrate the contract in a prescribed way that both parties have already agreed upon. Practically, these clauses are often used in connection with payment obligations. Instead of preagreeing upon a fixed price, the payment can be calculated with an index or according to a formula, which reflects the current economic circumstances. Then, renegotiation clauses are categorized into: A) the limited renegotiation clauses that could increase the benefits of one of the parties if a certain event occurs (e.g. changes in the terms of concession as in the case of Aminoil v. Kuwait 1982[77]), B) the hardship renegotiation clauses that have a much broader spectrum and their triggering event is not specified specifically and neither are the provision that need to be changed as in the case of Nippon Steel v. Quintette of 1991[78] and C) the wide range renegotiation clauses, which are broader that hardship clauses since their triggering event isn't described at all. Such clauses are in practice quite rare, since both parties have to agree in order for them to come into effect. The gap-filling clauses can be proven to be useful in supplementing contracts which the parties deliberately left incomplete. However, in most case scenarios, when no agreement can be reached and parties want the contract to be terminated and not extend it most gab-filling clauses won't be able to keep the contract active[79].

Basically, adaptation or renegotiation clauses can be employed as alternative to or in combination with a stabilization clause. The adaptation or negotiation clauses can offer both parties protection against the hardships or changes in the circumstances that the agreement was signed in and affect either both parties either one of them. The undertakings can renegotiate in good faith the agreement.

[77] American Independent Oil Co. Inc. (Aminoil) v Government of the State of Kuwait, 21 ILM 976, 1982.
[78] Quintette Coal Ltd. v. Nippon Steel Corporation, CanLII 5708 (BC CA), 1991.
[79] S. M. Kröll, "The Renegotiation and Adaptation of Investment Contracts", In Norbert Horn and Stefan Michael Kroll, "Arbitrating Foreign Investment Disputes: Procedural and Substantive Legal Aspects", Studies in Transnational Economic Law, volume 19, pp. 425 – 470, 2004.

Of course, much less, the extent of which the agreement may be changed depends on the specific wording of the clauses of the contract, which can be generic or referring to an objective standard or even only the private party. The parties' obligations should be precisely defined to avoid future disputes and generally problems in the implementation of the contract. The clauses can leave open the objective of restoring the original equilibrium by implying full compensation or the reaching of an equitable solution. One of the most common features of any process of renegotiation is that it should be conducted in good faith.

Permanent Sovereignty:

It is in the interest of natural resource rich countries to use their resources in order to obtain funds for their social and economic development. Thus, the need to enter into contracts with foreign companies arises. The State needs to negotiate the right to reap as much benefits as it can from the exploitation of its natural resources. Nowadays, that can be also implied for any country that's trying to invest in RES and in a sense create the infrastructure needed in order to decrease its dependence on foreign energy inflows. Thusly, in the technological race of energy all countries participating aim for securing their energy self-sufficiency or at least reducing their energy dependence. In order to achieve that and secure the preferable outcome, in the most beneficial way for them, is to balance properly their contractual rights and obligations against their counterparty. In essence, that's referred to as the balancing of the contract it requires for the state, which based on the principle ''permanent sovereignty over natural resources'', can never be alienated from its natural resources to provide certain rights over its resources, depending on the type of contract, in order for the counterparty to be sheltered that their contractual rights will be honored.

''Sovereignty'' as a notion is related to the idea of superiority and derives from the Latin word ''supra''. In the relations between states it signifies their independence. Specifically, the notion of "permanent sovereignty over natural resources", which was established in 1952 (UN Resolution 626 (VII) of the 21st

of December)[80] and fully formulated in 1962 with the resolution 1803 (XVII) of the UN General Assembly[81], signifies the straggle of states to control their natural resources[82]. Nowadays, the concept of permanent sovereignty has been incorporated as a principle of international law protecting states and their territorial rights on their natural resources. Basically and most importantly from the state's perspective, it can never be totally alienated from its natural resources no matter how long-term the contract is. It is a safety measure that enables a state to retain its rights over its resources, because they are considered part of its land and territory. Therefore, natural resources are part of a state's ''national sovereignty''.

Over the years, it has evolved mainly from the resolutions of the UN sometimes restricting and others expanding its legal content. Mainly, as mentioned, the concept of permanent sovereignty expresses the idea that natural resources should be controlled by the State in which they are located. The notion shouldn't be indiscriminately applied to all case of natural resources, but mostly to upstream activities meaning exploration and exploitation of natural resources. If permanent sovereignty was applied to all activities it could lead to a clash of states. Downstream activities, mainly transporting and distributing energy products among consumers could be included in the scope of permanent sovereignty, but not in all cases. It depends weather the state acts as imperium with ''jure imperi'' (public acts) or as a private individual with ''jure gestionis'' (private acts). When the state acts as an individual and the further away its practices are from upstream activities courts both European and American are less likely to accept a plea of sovereignty immunity. Courts usually assume a restrictive approach over the notion of sovereignty. Basically, the state can never be totally

[80] D.R. Bishop, "International Arbitration of Petroleum Disputes: The Development of a Lex Petrolea" in book by Albert Jan van den Berg "Year Book Commercial Arbitration - volume XXIII", pp. 1131-1207, 1998.

[81] A. Fatouros Arghyrios, "An International Legal Framework for Energy (Volume 332)". In Collected Courses of The Hague Academy of International Law, 2021. doi:http://dx.doi.org/10.1163/1875-8096_pplrdc_A9789004171985_02.

[82] Esa Paasivirta, Ph. D. (Cantab.), Internationalization and Stabilization of Contracts versus State Sovereignty, British Yearbook of International Law, Volume 60, Issue 1, pp. 315–350, (pp.313-312) 1989. https://doi.org/10.1093/bybil/60.1.315

alienated from its natural resources, because it retains its rights over its resources since ass already mentioned they are considered part of its ‘‘national sovereignty’’.

Internationalization of Foreign Investment Contracts:

The internationalization of contracts, functioning as a the failsafe, has been perceived as a way to deny the effect a state could have to a contract by making unilateral changes without the other parties consent[83] (e.g. expropriation or nationalization of energy resources). Mainly, it protects the third parties that enter contacts with states counterparties. As a notion internationalization is considered to be highly controversial since it erases the distinction between obligations governed by international law and contractual obligations which are governed by domestic law[84]. As for their legal justification it is the unrestricted application of the principle of ‘‘pacta sunt seruanda’’. Thus, the notion of ’’permanent sovereignty over natural resources’’ interacts with the internationalization of contracts. The first protects the state and the second the company that the state gets in business with. Practically, the internationalization of contracts balances the power of states on the concept of ‘‘pacta sunt servanda’’. That way, foreign investors are protected and capable to get as much as their domestic adversaries, being protected by a legislative veil that minimizes the possibility of nationalization or expropriation and even in that case it provides adequate remuneration. A full proof tool, of our days for the internationalization of energy contracts is arbitration, which provides a variety of regulating options depending on the agreement of the parties (e.g. the agreement could be subjected to ‘‘European Charter Treaty’’ rules).

Arbitration:

As a private form of binding dispute resolution, arbitration is conducted before an impartial tribunal and while it emanates from the agreement of the parties it is regulated and enforced by the State[85]. Arbitration is fundamentally used as a method for resolving investment disputes. Disputants can agree to submit their dispute or disputes to an individual, the arbitrator or arbitrators, whose judgment

[83] Ibid., 316-317.
[84] C. L. Lim., supra note 63 at 37-38.
[85] Margaret L. Moses, "The Principles and Practice of International Commercial Arbitration", Third Edition, Cambridge University Press, pp.1, 2017. https://doi.org/10.1017/9781316585245

they are prepared to trust. The arbitrator's purpose is to listen to the parties, consider the facts and the arguments, and make a binding decision. That decision is final and binding because the parties have agreed that it should be and because generally it cannot be appealed to a higher level court. Usually, the only reason a party can challenge an award is only if there is some defect in the process. Mainly, Arbitration is an effective method of obtaining a final and binding decision on a dispute, or series of disputes, while dodging in the process traditional litigation and the fear of the counterparty's ''home court advantage''[86]. Although, in some cases because of national laws and international treaties such as the New York Convention, that decision will be enforceable by a court of law even if the losing party fails to implement it voluntarily. In other cases there may arise dispute about the applicable law if not being specified in the relevant clause in which case the opinion of the court will be asked if the arbitrators can't solve that issue and start the arbitral tribunal.

Non the less, investment arbitration is the most prominent tool for resolving investment disputes[87].Usually, arbitration is included into the contract as a specifically designed clause, but in the case of investment disputes there's an absence of it in most cases. Due to the stipulation of International Investment agreements (IIAs), bilateral investment treaties (BITs) or even national investment laws by modern states, which provide their consent to an investment claim, in a binding legal form, ''arbitration without privity'' emerged, allowing for the investor to start the arbitral proceedings after his consent with no prior contract with that specific state[88].

Pros and Cons:

Arbitration as a form of dispute resolution is known for its binding effect, which is dependent completely on the choice of the parties, else the validity of the agreement is deficient. Additionally, arbitration offers a more, theoretically, neutral forum in comparison with litigation and gives the parties substantial autonomy and control over the process. Each party fears the other party's "home court advantage" and avoids it using arbitration especially when one of the

[86] Ibid.
[87] C. L. Lim, supra note 63 at 88.
[88] Ibid., 89-94.

counterparties is a state. Mainly, the advantages of arbitration, if summarized, would be its binding effect, the neutrality of the procedure, the veil of confidentiality, the generally shorter process than in a full-scale litigation or a national court proceedings and even the belief that in some cases it is less expensive than litigation or normal national court proceedings which depends on the specific case scenario and the arbitrators that are in charge of the proceedings. If one wanted to separate the two most important advantages those would be the likelihood of obtaining enforcement, by virtue of the New York Convention, a treaty with 156 countries-signatories and the neutrality of the forum[89]. Another advantage could be the continuity of arbitration, meaning an arbitral tribunal is appointed to deal with one particular case, and its task is to follow that case from beginning to end[90].

When the positive aspects of arbitration are viewed from a different perspective they can be considered disadvantages. The flexibility of arbitration could be considered both an advantage and a disadvantage depending on the specific case. Usually, when the choice of arbitrators is tailored to meet the specific requirements of the dispute that is practically an advantage but that still depends on the parties interests of the outcome of the arbitral tribunal. Additionally, an arbitral tribunal may possess greater powers than those of a judge e.g. in case the national law provides less remuneration that the international arbitration rules for that specific dispute provide. In some cases, confidentiality is not possible or is easily breached when the parties are multinational companies of great interest.

Some of the main disadvantages are the lack of any significant right of appeal and the fact that arbitrators have no coercive powers, meaning they do not have the power to penalize a party that fails to comply with a tribunal's request. Additionally, in multiparty disputes, an arbitral tribunal frequently does not have the power to join all relevant parties, even though there are indirectly or directly involved in some aspect of the same dispute, the tribunal is limited to the parties

[89] United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards, opened for signature June 10, 1958, 21 U.S.T. 2517, 330 U.N.T.S. 38 ("New York Convention") www.uncitral.org.
[90] Moses, supra note 84 at 3-6.

that signed the arbitration agreement. The tribunal's power derives from the consent of the parties, thus when a party has not agreed to arbitrate the dispute, usually the tribunal cannot obligate it to join the arbitration. However, the flexibility of the procedure, the ability of the parties to choose specialized experts and procedural rules that fit their specific dispute constitutes arbitration on of the fastest and more reliable mechanisms for multinational dispute settlements.

Typology:

There are two basic types of arbitration: A) Institutional and B) Ad hoc arbitration, each of which has its own function and distinct characteristics. Institutional arbitration differs from ad hoc arbitration mainly because an institution such as the ICJ or the LCIA could be chosen to be in charge of the proceedings under a certain fee. Usually, institutional arbitration is preferable since a professional body provides the arbitration guidelines (e.g. 79% of arbitrations are Institutional). The Institution that is in charge could pick the UNIDROIT rules as administered by the ICJ, but the procedure is considered slower than ad hoc arbitration. Of course that depends on the type of dispute that has arisen. Generally, ad hoc arbitration has no administering institution[91], is considered cheaper and allows parties to design the framework of their dispute and mainly the set of rules that are to be used. That mainly means that the parties can establish their own rules of procedure. Thus, ad hoc arbitration can be shaped to meet the wishes of the parties and the particular dispute. In order for that be as efficient as possible the parties must cooperate. In practice, ad hoc arbitrations are usually conducted on the basis of the UNCITRAL arbitration rules, which the parties agree to accept for their particular dispute. The main disadvantage of ad hoc arbitration is that it depends for its full effectiveness on cooperation between the parties. In the case of institutional arbitration the rules laid down by the established arbitral institutions are usually proven to work well in practice. Additionally, these institutions provide specialist staff to administer the arbitration and assistance for the arbitrators. In comparison to ad hoc arbitration the parties pay a fixed fee in advance to cover the costs of the arbitration. Moreover, there may be some delay in the proceedings because of the basic steps these institutions take in order for the procedure to commence. Especially, the

[91] Moses, supra note 85 at 10-11.

time limits laid down from institutional rules usually fail to take account of the time that a state or state entity needs to obtain approval of important decisions, but in certain cases time extensions are given. Evidently, most arbitrations are Institutional due to the stability that is provided for the rules of the institution and its reputation but in some cases ad hoc arbitration can be proven valuable and quite fast when a seasoned arbitrator or arbitrators is in charge of the proceedings[92].

The Importance of Arbitration:

As it is already known arbitration is nowadays a fundamental mechanism, which protects the parties in a case of a fallout or generally a despite. Its protection starts from the parties initiative and written usually consent, while in the case of Sates their consent can be implied (arbitration without privity). Whatever the case may be, as an alternative dispute resolution mechanism, arbitration is a valuable part of energy contracts securing the parties interests and ambitions. With the parallel application of stabilization and adaptation clauses the contract can be even more durable and long-term, securing the safest possible gains from the investor. Thus, as a policy Greece could form a set of special draft contracts that would further simplify the signing process and intervene in a not invasive way to help the parties, in case they are fellow companies, to further their protection and contract durability.

Overview of National Energy-related Legislations:

The main objective of energy and specifically RES legislations are to organize the market, set some functioning rules of procedure and follow through the liberalized model of the EU market, while securing the completion of the project for the service of the general interest. Understanding the gradual way of evolution of the legislations is an important step for comprehending today's series of investments in the energy sector and especially in our distant and isolated islands.

Viewing the national legislative endeavors of Greece delineates a clear path towards a competitive investment-friendly Greece. Were RES have their own special role in the Greece's energy transition. Starting from the beginning of

[92] Nigel Blackaby, supra note 73 at 1-70, chapter 1, para. 140-152.

RES legislation in Greece with L. 1475/1984 on “Utilization of geothermal potential’’[93], which endorsed provisions relating to issues of research, lease and exploitation of geothermal sources, thus initiating gradually the exploitation of RES within Greece and then causing an organized endeavor to promote the use of renewables, which took place with the enactment of L. 1559/1985 on “Regulation of alternative energy issues and special issues of electricity generation from conventional fuels and other provisions’’[94]. Basically, signifying for the first time the initiation of electricity production from renewables, by incorporating provisions according to which both individual producers and local government organizations were given the right to produce electricity as independent self-consumers, however, only under the precondition that renewables would be used during the production process, consuming partially the output of energy produced, while selling the excess of energy to Public Power Corporation of Greece known with the acronym PPC. Its contribution wasn’t as high as expected towards the development of RES due to the fact that PPC, while purchasing electricity at a very low price, installed the majority of projects. Most of which were mainly small wind farms and photovoltaics of low output, whereas local governmental organizations contributed far less than anticipated. This indicated that more effort, legislative wise were to be made, in order for the maturing and broad establishing of RES in the Greek market. Up until this point legislations were focused mainly in in promoting RES investments for commercial purposes, which impeded to a large extent the involvement of the private sector into the energy sector.

The necessary background needed one whole decade to formulate the first draft and then enactment of L. 2244/1994 on “Regulation of issues pertinent to the generation of electricity by renewable energy sources, fossil fuels and other provisions”, which is considered of prime importance as a piece of legislation for the road to establishing of RES in Greece with the sole purpose of to increasing RES participation into the Greek energy mix[95]. Individuals were finally permitted to produce electricity from renewables[96], under the precondition that

[93] Official Government Gazette of the Hellenic Republic, Issue A’ 131/11.9.1984.
[94] Official Government Gazette of the Hellenic Republic, Issue B’ 135/25.7.1985.
[95] Official Government Gazette of the Hellenic Republic, Issue A’ 168/7.10.1994.
[96] Art. 2 L.2244/1994.

they would later on sell it either to the system or the grid[97]. In addition, it determined the RES licensing framework, by introducing production and installation licenses as a fundamental prerequisite for the establishment and operating of RES units[98]. It further introduced the fixed feed-in-tariffs scheme for the purchasing of RES produced energy, which were beneficial for both the interconnected energy system and the non-interconnected system providing the ground breaking possibility of signing long-term contracts with PPC and guaranteeing the financial viability of RES projects, while being the forerunner of today's energy contracts. Additionally, with the established of strong financial incentives, in the form of grants or subsidies a favorable investment environment was created leading in general to the augmentation of energy related investments and specifically those relating to the installation of wind farms, which the first of which became operational in 98'. Even though the positive impact on the development of RES there were still issues with the limits of private investments in the sector mainly caused by the complicated licensing procedure that use to exist.

The first attempt to integrate RES technologies into the Greek households was endorsed by L. 2364/1995 on the "Establishment of the Energy Control and Planning Body, import, transport, marketing and distribution of natural gas and other provisions"[99]. The "Board for Energy Planning and Control" (B.E.P.C.) was created with the main purpose of drafting up plans for energy programs[100]. Mainly, that law focus on the basic terminology for the natural gas sector, while organizing its basic form at that time and setting the ''Public Natural Gas Company'' (DEPA) as the network operator both for the transmission and distribution of natural gas[101].

An important turning point in the progress of Greece's energy sector liberalization is the law that signaled the transition from the monopoly status quo towards a fully competitive market structure starting from the electricity market with L.

[97] Ekaterini N. Iliadou, ''Electricity sector reform in Greece'', Utilities Policy, Volume 17, Issue 1, 2009, pp. 76-87, ISSN 0957-1787, https://doi.org/10.1016/j.jup.2008.03.002.
[98] Art. 3 L.2244/1994.
[99] Official Government Gazette of the Hellenic Republic, Issue A' 252/6.12.1995.
[100] Art.1 L. 2364/1995.
[101] Art.3 L.2364/1995.

2773/1999 on “Liberalization of the Electricity Market and on regulation of Issues Related to Energy Policy”[102]. Including the majority of the provisions entailed in L.2244/1994, such as the feed-in-tariffs system for the electricity production by renewables and the obligation of RES electricity producers to acquire two separate licenses one for production and another one for installation purposes[103]. At that point, the market conditions and legal framework for RES applications was established upon the prioritization of RES access into the electrical grid. Once again a licensing system was needed but this time specifically for RES. The Regulatory Authority of Energy, known as RAE, was introduced into the Greek energy market as a key entity providing assistance on RES licensing. Specifically, RAE had the authority, based on L. 2244/1994 to provide its official opinion per case, as a prerequisite for the legal operation of RES stations, while in essence was obliged to either make a positive or a negative recommendation to the Ministry of Development, which in turn would issue the production license. All RES electricity producers were obliged to follow the aforementioned procedure with the exception of those stations mentioned in Art. 3 § 3 of L. 2244/1994, who were exempted at that point[104]. Additionally, RAE started acting as a dispute settlement authority for complaints against the transmission or distribution system operators.

Apart from the introduction of RAE into the Greek energy system, another new key entity was introduced, the Hellenic Transmission System Operator (HTSO)[105]. Once the production license was issued, RES electricity producers had the obligation to sign a 10 year contract with the capability of a renewal either with the HTSO or with the operator of network, which at that point was still PPC. Under that agreement they were required to sell the generated by RES electricity exclusively to one of the two above mentioned entities, receiving a fixed feed-in-tariff[106], thus retaining the RES stable pricing regime, which was introduced by L. 2273/1999. In this context, a “Special Account for RES and Combined heat and power (CHP)” was being introduced, from which either

[102] Official Government Gazette of the Hellenic Republic, Issue A’ 286/22.12.1999.
[103] Art. 4 L.2773/1999.
[104] Art. 10 L.2773/1999.
[105] Art. 14 L.2773/1999.
[106] Art. 37 L.2773/1999.

HTSO or PPC were recovering the money already paid to the RES electricity producers[107]. However, this effort turned out to have a huge deficit, which is responsible for the delayed payments made to RES producers, causing a chain of cause and effect throughout the energy sector that was further amplified in later years with the economic crisis of 2008.

Aiming to facilitate the establishment of RES projects L. 2941/2001 was enacted on "Simplification of procedures for the establishment of licensing companies for renewable energy sources, regulation of issues of the Greek Shipyards S.A. and other provisions.''[108] Particularly, efforts were made to simplify as much as possible the time consuming and difficult licensing procedure by the issuing that a building permit was no longer a prerequisite for the installation of solar stations and wind generators but instead, only an approval granted from the competent urban planning service, was sufficient. Even for the rest of RES projects, which were still subjected to the issuance of a building permit, it was no longer required of them to have the approval of the ''Committee of Urban Planning and Architectural Control, except for some specific cases such as those involving traditional housing developments or sensitive environmentally protected areas[109].

The RES licensing, as an endeavor, was made to implement the known as "one-stop procedure", which would prevent the involvement of various public entities in different stages of such licensing, therefore eliminating as much as possible the existing bureaucratic delays and hurdles. The issuance of both installation and operation licenses, were at that point a responsibility of the ''Department of Design and Development, of their local administrative districts[110]. Moreover, L. 2941/2001 established the terminology that characterized RES projects as projects of ''Public Interest'', regardless of the type of legal entity (private or public entity) executing the project[111]. That characterization had an effect on potential investors motivating them to further engage themselves in the energy sector. Furthermore, it was provided that expropriation would be

[107] Art. 40 L.2773/1999.
[108] Official Government Gazette of the Hellenic Republic, Issue A' 201/12.9.2001.
[109] Art. 2 § 7 L.2941/2001.
[110] Art. 2 L.2941/2001.
[111] Art. 2 §9 L.2773/1999.

used as a means to establish future RES stations and at that time the first RES projects emerged in forests and scrublands in Greece, of course, after the approval of the Minister of Agriculture[112]. Moreover, the "Specific framework of spatial planning and sustainable development for RES''[113] was created by amending basic provisions of L. 998/1979[114]. Following that legal reform L. 3175/2003 introduced valuable amendments aiming the enhancing of competition in the Greek energy market, mostly electricity market, while implementing the provisions of Directive 2003/54/EC related with the promotion of biofuels in the market and it set the framework for geothermal energy matters and hybrid RES installations[115]. That considered to be the first important mention of biofuels in the Greek legal system and an effort to further enhance the exploitation of both biofuels and geothermal energy.

There was a need to create firm and stable requirements for the rational use of Greece's geothermal potential and by "rational use" it referred to research, exploitation and use of geothermal energy in the energy mix of the country[116]. It incorporated provisions regulating the right of research and the way of use of geothermal energy from the state[117] or even of a third party with the approval of the state[118]. With the amended article 2 of L. 2773/1999, which included the highly important mention that RES electricity production could also be accomplished through hybrid installations with the use of mainly RES and secondarily conventional fuels[119], thus removing the existing vagueness as for whether or not those stations could produce electricity with the use of RES.

With L. 3299/2004 on "Private Investment Incentives for Economic Development and Regional Convergence", RES stations were subject to aid schemes such as grants, leasing subsidies and tax allowances, so that incentives could

[112] Art. 2 § 1 & 3 & 6 L.2773/1999.
[113] Art. 2 § 10 of Law 2773/1999.
[114] Official Government Gazette of the Hellenic Republic, Issue A' 289/29.12.1979.
[115] Official Government Gazette of the Hellenic Republic, Issue A' 207/29.8.2003.
[116] Art. 1 L.3175/2003.
[117] Art. 4 L.3175/2003.
[118] Art. 5 L.3175/2003.
[119] Art. 23 § 6 L.3175/2003.

be provided to potential RES investors[120]. However, some institutional dysfunctions were issued, which were characterized by a high degree of complexity with establishing regulations regarding the types of businesses that were entitled to aid schemes and limiting their ability to be entitlement (e.g. didn't even contain an annual timetable or a budget for aid schemes). Adding to the complexity of the situation was the high delays of evaluation, which delayed significantly their funding with a type of a scoring system that was characterized later on as so complex that a peculiarly and extremely high percentage of around 98 % of submitted projects was dysfunctional approved.

Two years later L. 3468/2006 was enacted on "Generation of Electricity from Renewable Energy Sources and Cogeneration of High Efficiency Electricity and Heat and other provisions" with the purpose to incorporate into the Greek legislation the provisions of Directive 2001/77/EC and guarantee the prioritization and promotion of electricity generated not only by RES, but also from cogeneration of heat and power (CHP)[121]. Special mention was given explicitly to the protection of the climate since it constitutes both an environmental and energy objective of the state, which can be achieved parallel to the main purpose of promoting electricity production by RES and CHP[122].The implementation of the aforementioned EU directive imposed the first national legally binding target relevant with the percentage of participation that electricity produced by RES should have in the Greek energy mix. Particularly, at that time the percentage of electricity produced by renewables was meant to reach 20, 1% by the end of 2010 and approximately 29% by the end of 2020[123]. With the employment of aid measures that objectives became more plausible. Especially with prioritizing the infusion of energy generated by RES into the system guarantees of origin were issued that confirmed the time of production, the net amount of thermal or cooling energy produced in that period, its energy source, the location of the power plant and its installed capacity[124], basically mapping the entire energy system of Greece. Those guarantees were issued by the ''Hellenic

[120] Official Government Gazette of the Hellenic Republic, Issue A' 261/23.12.2004.
[121] Official Government Gazette of the Hellenic Republic, Issue A' 129/27.6.2006.
[122] Art. 2 of Law 3468/2006.
[123] Art. 27 § 9 L.3468/2006.
[124] Art. 15 § 1 & 17 L.3468/2006.

Electricity Market Operator'', the ''Operator of non-interconnected islands'' and the ''Center of Renewable Energy Sources'' (CRES)[125] depending on the type of energy source and the geographic position of the station. These competent bodies had by law access to RES stations and their information in order to confirm that all the requirements for the issuance of those guarantees are lawfully met[126]. The issuance of those guarantees contributes to the perpetual operation of electricity trading within the context of the internal market for energy and can provide the final consumers the opportunity to choose the type of energy they wish to consume and their provider in the future. While introducing some minor modifications in the licensing procedure it maintained the previous legislative framework and later on was amended by L.3851/2010[127] and L.4001/2011[128]. Practically, after its amendments it is considered as the main Law underpinning RES licensing.

Additionally, L. 3468/2006 defines the term hybrid power plants (HPP)[129] in the Greek legal order as a power plant which consists of a storage system, a controllable generation unit and has at least one form of RES power generation unit, which is going to be of help in understanding the project of Astypalea further ahead. Specifically, based on the provisions of the aforementioned law a power plant is defined as HPP a plant, which comprises at least of one RES unit and a storage system. Additionally, its total electricity absorbed from the grid shouldn't exceed 30% of the total stored electrical energy per year and its maximum installed capacity of the RES units can't exceed the installed capacity of the storage units, increased by 20%[130].

Specifically, the licensing procedure entails the RES producer needing first to obtain an electricity production license by the Minister of Development, who issues it after a positive recommendation made to him by RAE[131]. After fully evaluating various criteria from national safety, preservation of public health

[125] Art. 16 of L.3468/2006.
[126] Art. 18 of L.3468/2006.
[127] Official Government Gazette of the Hellenic Republic, Issue A' 85/4.6.2010.
[128] Official Government Gazette of the Hellenic Republic, Issue A'179/22.08.2011.
[129] Art. 2 §14c & § 28 L.3468/2006.
[130] Fiorentzis, K., Katsigiannis Y., Karapidakis, E., ''Full-Scale Implementation of RES and Storage in an Island Energy System''. Inventions, 5, 52, pp. 3, 2020. https://doi.org/10.3390/inventions5040052
[131] Art. 3 L.3468/2006.

and safety and the credibility of the applicant to complete the process based on its economic, scientific and technical thoroughness, the license is issued. Then the producer needs an installation license to proceed further with the investment. For the issuing of that license the applicant needs to connect to the Hellenic grid by the competent grid operator, then approve the ‘‘Environmental Terms and Conditions’’ and obtain a forest intervention permit. Additionally, the RES producers have to enter into a connection agreement with the competent utility and into a power purchase contract with either the ‘‘Hellenic Electricity System Operator’’ for the continental energy system or the ‘‘Hellenic Electricity Distribution Network Operator’’ in the case of non-interconnected islands[132]. Finally, the investor needs to obtain an operation license, which is dependent upon the completion of a small trial period regarding the operation regime of the RES station, in which the authorities are obligated to make regular control tests assuring themselves that all technical conditions are met and that safeguards are in place in case of an accident and to validate that the necessary operational and technical characteristics of the equipment used are fulfilled.

Additionally, the pricing of electricity was regulated especially when produced by RES power plants and was deemed to be determined on a monthly basis[133] and be formulated upon a guaranteed reference price per MWH, remaining stable for the whole duration of the power purchase contracts, which could be a period of 20 years or more depending on the parties agreement[134]. Also, a new feed-in tariffs system was introduced by modifying the previous aid scheme set by L. 2244/1994 and implementing different tariffs for different technologies, while offering a significant increase in tariffs for solar power and offshore wind systems. As a result, a growth of photovoltaic installations was recorded between 2006 and 2009, while their cost decreased significantly due to the fast rhythms of R&D in that field , reducing in 2010 the photovoltaic feed in tariff. Institutions were being established at that time with the aim to coordinate and promote RES investments in Greece, with one of the major participants being the ‘‘Committee for the Promotion of Large-scale Investment in the sectors of

[132] Art. 8 L.3468/2006.
[133] Art. 13 L.3468/2006.
[134] Art. 12 L.3468/2006.

RES and CHP'' within the Ministry of Development, while at the same time operating as an mediator to resolve disputes between investors and licensing authorities[135]. Another key institution was formulated the ''General Secretariat for Energy and Climate Change'' at the Ministry of Energy and Environment, whose tasks were expansive providing a vast variety of services for investors, while ensuring the fastest route for the fruition of their investment plans.

A major impact on the field of RES had L. 3851/2010 which accelerated of the evolution of renewables for the confrontation of climate change and other provisions relating to issues subjected to the jurisdiction of the Ministry of Environment, Energy and Climate Change[136] signaling the beginning of an investment era for RES in Greece with the introduction of a variety of changes, all of which were tailored exclusively for the development of RES. Its main objective was to incorporate Directive 2009/28/EC and amend L. 3468/2006 as to the RES participation level within the Hellenic energy system. It explicitly referred to 2020 as a reference year and set three distinct targets for Greece: A) RES production should equal 20% of the gross final energy consumption, B) electricity produced by RES should be at least 40% of the gross final electricity consumption, C) RES production has to be equal to 20% of the gross final consumption of energy used for heat and cooling purposes and D) RES should consist a 10% of the transportation sector[137].

A cardinal article of L. 3468/2006, 6A, was maintained, with which the establishment of offshore wind stations for the production of electricity by RES was finally permitted within the national maritime space of Greece. The law stipulated in detail explicitly their exact location, the available marine area they could occupy and their maximum installed capacity, which is subjected to a process of environmental evaluation as a measure to protect the environment[138]". Additionally, it entailed that all new buildings should cover their primary energy

[135] Art. 19 & 20 L.3468/2006.
[136] Supra note 127.
[137] Art. 1 L.3851/2010.
[138] Art. 6 L. 3851/2010.

needs completely by renewable energy technologies and CHP by the end of 2019[139].

An attempt was made to enhance the support and aid towards RES Investors by facilitating their investment decisions and establishing an independent RES agency, under the Ministry of Environment, Energy and Climate Change, with the sole purpose of advising RES investors in a wide variety of issues. Finally, the licensing procedure for RES of L. 3468/2006 was modified. Mandatory deadlines were set for all the intermediate stages of the licensing procedure facilitating a faster bureaucracy and simultaneously complying with the provisions of Directive 2009/28/EC. With the newly created "Fast Track Licensing" process advancements were sure to be made in the energy sector.

L.4001/2011 on "Operation of Energy Markets of Electricity and Natural Gas"[140] is of primal importance since it incorporated the ''Third Legislative Package'' of the EU on the liberalization of the energy market, while updating the regulatory framework of the Hellenic energy market. Nowadays it is better known as the ''network code''[141]. Starting, it considerably improved the procedure of photovoltaic licensing[142]. In fact, while photovoltaics were costly, this law stablished an encouraging plan for their use, by setting a small but important target of overpass the 4% of electricity demand with photovoltaics by 2020. Additionally, the special account of RES that was established by virtue of L.2244/1999[143], was subjected to the responsibilities of the ''Hellenic Electricity System Operator'', who gained at that point the duties and responsibilities of the ''Hellenic Electricity Transmission System Operator''[144], apart from some that were transferred to the ''Independent Electricity Transmission Operator''[145].

Moreover, L.4414/2016 on the "New support regime for Renewable Energy Power Plants and High-Efficiency Electricity and Heat Cogeneration and Provisions for the legal and operational separation of supply sectors" was enacted

[139] Art. 10 §4 L.3851/2010.
[140] Supra note 128.
[141] Farantouris, N.E. (ed.), Energy Networks and Infrastructure, Jean Monnet Chair in Law & Policies, NB, pp. 29-30, 2014.
[142] Art. 132 L.4001/2011.
[143] Art. 40 L.2244/1999.
[144] Art. 143 L.4001/2011.
[145] Art. 99 L.4001/2001.

with the aim to align Greek legislation with the "Guidelines on State aid for environmental protection and energy 2014-2020'' of the EU[146]. A new support regime was introduced for renewables to enhance their rate of development and achieve the EU targets that had been set to confront climate change[147]. The transition was smooth with some exemptions for smaller RES installations, which would remain eligible to receive the previously mentioned aid scheme of the feed in tariffs system[148]. The new aid

Scheme came to be known as "feed-in-premium system" and included both RES and CHP power plants, providing operating aid for the electricity produced by these plants which is meant to be absorbed by the interconnected energy network[149]. This operating aid is calculated based on a premium that is offered above the current market price of electricity. After its granting the power plants would be concluding power purchase agreements (PPAs) on operational aid with a premium with either only the ''Hellenic Electricity Market Operator'' or the ''Hellenic Distribution Network Operator'' or even both[150]. With the signing of the PPAs the power plants will start participating in the day-ahead market of electricity either directly or indirectly[151]. Additionally, from the beginning of 2017, RES producers are to participate in the electricity market through the newly established auctioning system, organized by RAE, while the feed in premium aid is to be granted based and through the auctions[152]. It is meant to be an innovative, transparent procedure that would amplify competition in the Greek energy market. The procedure was based on normal auctioning policies, in which the RES producers would bid their offers for their power plants and has the highest bid on that amount is selected. The first two pilot RES auctions were organized in 2016 and 2017, while regular auctions based on L. 4414/2016 and Ministerial Decision 828/2019[153], begun in 2018. Since then, the auctions system has run smoothly even in the case of wind and photovoltaic stations despite

[146] Official Journal of the European Union, C 200, pp. 1-55, 28 June 2014.
[147] Official Government Gazette of the Hellenic Republic, Issue A' 149/9.8.2016.
[148] Art. 4 §1B L.4414/2016.
[149] Art. 3 § 1 L.4414/2016.
[150] Art. 9 & 10 L.4414/2016.
[151] Art. 5 L.4414/2016.
[152] Art. 7 L.4414/2016.
[153] Official Government Gazette of the Hellenic Republic, Issue B' 3578/2019.

the lack of interest that existed at that time, due to the delayed licensing procedure.

For the implementing an internal energy market in which all EU energy markets would be unified the way each electricity market operated within Europe had to be altered and in the case of Greece that endeavor was accomplished with the enactment of L.4425/2016, as amended by the L.4512/2018[154], on "Urgent arrangements of the Ministries of Finance, Environment and Energy, Infrastructure, Transport and Networks and Labor, Social Security and Social Solidarity for the implementation of the fiscal target agreement''[155], which laid down the basis for the gradual reorganization of the national electricity system. The implementation of the "Target Model'' was based on the aforementioned national law, which included the EU Regulations 714/2009 for accessing the network[156] and Regulation 2015/1222 for the allocation of capacity and the management congestion of the network[157] aimed for the completion of an EU internal energy market. Four new wholesale energy markets were introduced: A) the ''forward market'', B) the ''day ahead market'' C) the ''intraday market'' and D) the ''balancing market", whose operation was regulated by RAE. Those markets hold a lot of similarities to the stock markets around the world and are the way for the operation of an organized energy stock exchange in Greece. Once introduced, both the wholesale market of mandatory pool and the "day-ahead schedule" were abolished. Basically, the implementation of the "Target Model" and the restructuring the ''Hellenic Electricity System'' are a means to an end, the reduction of CO2 emissions and the maximization of RES penetration into the EU market, which would be facilitated through the importing to and exporting of electricity produced by renewables. Hence, all the EU electricity systems needed to be reorganized.

[154] Official Government Gazette of the Hellenic Republic, Issue A'5/17.01.2018.
[155] Official Government Gazette of the Hellenic Republic, Issue A'185/30.09.2016.
[156] Official Journal of the European Union, L 211, pp.15-35, 14 August 2009.
[157] Official Journal of the European Union, L 197, pp. 24-72, 25 July 2015.

Additionally, L. 4426/2016 is one of the most important environmental legislations in our legal system nowadays, since it ratified the Paris Agreement on the United Nations Framework Convention on Climate Change[158].

Furthermore, L. 4512/2018 regulated the establishment and operations of the ‘‘Hellenic Energy Stock Exchange’’ and reorganized the ‘‘Hellenic Electricity Market’’, including various arrangements for the implementation of the structural reforms and regulating issues[159]. The ‘‘Hellenic Electricity Market Operator’’ had at that point to transferred all of its responsibilities relating to the operation of the market to “Hellenic Energy Exchange SA”.

Another recent Law that entailed various highly important and still in effect provisions for the promotion of RES production was L.4643/2019 on “The liberalization of the Greek energy market, the modernization of the Public Power Corporation (PPC), the privatization of the Public Natural Gas Company (DEPA) and the support of the renewable energy sources (RES) and other provisions"[160]. Included provision for the remuneration of the owners of RES and CHP stations who had concluded contracts on operational aid with a premium[161]. The owners of stations who had already concluded contracts on operational aid with a premium per L. 4414/2016 and those who had concluded power purchase contracts per the 12th article of L. 3468/2006, and haven’t received an investment aid, are being provided the opportunity to participate in the wholesale markets introduced with L.4425/2016, under the condition that their station has been operational for less than 4 years[162]. Moreover, the conditions under which RES stations could be granted individual aids are being regulated and provided those whose installation individual capacity exceeds 250 MWh or their combined installation capacity exceeds the same MWh, can be exempted from the competitive procedures of 7th article of L. 4414/2016[163]. Hybrid power plants were entitled to a support regime, by receiving operational aid, which would be decided by the Ministry of Energy and Environment who is

[158] Official Government Gazette of the Hellenic Republic, Issue A’187/6.10.2016.
[159] Supra note 154, at part C, art. 77 L. 4512/2018
[160] Official Government Gazette of the Hellenic Republic, Issue A’ 193/3.12.2019.
[161] Art. 19 L.4643/2019
[162] Art. 20 L.4643/2019
[163] Art. 21 L.4643/2019

authorized to decide upon the conditions and procedures according to which operational aid can be awarded operational aid or even on how the agreements can be concluded and any other related matter[164]. Moreover, issues relating the positioning of RES stations were specified in more detail. Finally, the owners of RES stations, from the 1st of January 2020, who had RES plants with installation capacity or with maximum capacity of production that equals or exceeds 400 KWh, and have concluded operational aid agreements and their stations operate since the 4th of July 2019 become responsible for the deviations caused having a balancing responsibility for the amount they usually provide to the system[165]. Basically, these stations are charged with balancing costs even though they may not bear always the responsibility themselves for any kind of delay of the procuring of the contacted amount, taking into consideration that such delay may be even attributed to delays of the connection with the network that the ‘‘Hellenic Electricity Distribution Network Operator’’ could be responsible for[166].

L. 4602/2019 was mainly on “Research, exploitation and management of the geothermal potential of the country, establishment of the Hellenic Authority for Geological and Mining Research, ownership separation of gas distribution networks and other provisions”[167] followed with the introduction of amendments to the RES support regime and especially to the one being enforced as regards to small photovoltaic plants. Moreover, the way with which feed-in-tariffs were calculated changed, and will no longer be calculated based of the average system marginal price that existed on the day ahead market. Finally, per L.4602/2019, any kind of legal entity is not entitled to conclude agreements and receiving operational aid without participating in competitive procedures with more than 2 power plants of the same technology[168].

Greece in its effort to promote and maximize the use of electricity produced from RES up until 2030 enacted L. 4685/2020 on ‘‘the Modernization of environmental legislation, incorporation into Greek legislation of Directives

[164] Art. 22 L.4643/2019.
[165] Art. 26 §3 L.4643/2019.
[166] Hellenic Electricity Distribution Network Code, approved by RAE decision no. 395/2016, Official Government Gazette of the Hellenic Republic Issue B’ 78/20.1.2017.
[167] Official Government Gazette of the Hellenic Republic, Issue A’ 45/9.3.2019.
[168] Art. 72 §7 L.4602/2019.

2018/844 and 2019/692 of the European Parliament and of the Council and other provisions" [169].Practically, it brought quite a lot of significant changes in the energy sector. Its content was relevant with the simplification of environmental permits, the simplification of RES licensing, forest maps alterations, settings for residential densities and zoning of natural areas and waste management. It radically simplified the RES licensing procedure replacing the production licenses that were issued by RAE with a certificate issued upon the submission of an application file[170]. An electronic registry is being established in which applicants will be able to apply for the issuing of the aforementioned certificate during the first 10 days of either February, June or October each year, under the condition though that they meet certain criteria[171]. Therefore, in comparison to RAE issuing the licenses via a meticulous and extensive evaluation of a number of criteria such a faster way is introduced permitting the owners of the respective stations to generate electricity, a certificate can be is issued electronically within a short predetermined deadline and holds its validity for 25 years with the possibility of a 25 year extension if needed. RES licensing procedure is further accelerated since the approval of Environmental Terms and Conditions is meant to be valid for 15 years[172], as opposed to previous legislations according to which the period of validity was 10 years. However, that was feasible only under the condition that the circumstances remained completely unchanged. Also, the deadlines for the issuing of environmental licenses are reduced to 3 months if the respective application folder is completed or within 4 or 5 months depending on whether or not objections are submitted and a public consultation is needed to take place in order to reach a final decision[173]. Finally, all RES plants power generation from photovoltaic or solar-thermal power generation with an installation capacity between 1 and 0,5 MWh, could be released of the obligation to receive approval of ''Environmental Terms and Conditions''[174]. As for wind power plants of 60 kW and hybrid plants with a total installed capacity of RES stations up to 100 kW if installed by educational or

[169] Official Government Gazette of the Hellenic Republic, Issue A' 92/07.05.2020.
[170] Art. 11 L.4685/2020.
[171] Art. 11 §2 L.4685/2020.
[172] Art. 1 L.4685/2020.
[173] Art. 2 L.4685/2020.
[174] Art. 61 L. 4710/2020.

research institutions they are also exempted from having an approval of ‘‘Environmental Terms and Conditions’’ [175].

L. 4685/2020 also introduced crucial provisions as to the positioning of RES stations. Indicatively it abolished provisions according to which photovoltaic stations could be exceptionally constructed on land of high agricultural productivity and set some specific terms for their installation in those areas[176]. Additionally, a centralized governance model was introduced as regards to the management of the protected areas of Greece (e.g. Natura 2000 areas), in an effort to resolve the problems that the competent decentralized bodies were facing, from the shortage of administrative resources to the subsequent lack of scientific data on the biodiversity or the protected habitats[177]. In this respect, reference is made to the specific criteria that need to be met in order for an area to be characterized as environmentally protected, as well as for the specialized environmental studies that are needed for the installations to be placed in those areas[178]. Photovoltaic stations can be constructed into 2 of the 4 areas that are characterized as protected per the provisions of this law[179]. Finally, the Law includes provisions regarding the mapping of Greece’s forests, regulating the illegality and irregularity of constructed housing facilities within forested areas[180].

L. 4710/2020 on the ‘‘Promotion of electric mobility (e-mobility) and other provisions’’ projects. Its main Aim is: A) the extension of the use of low and zero emissions vehicles, B) the development of recharging infrastructure, in particular publicly accessible and C) the formation of a regulatory framework for the e-mobility market.

L. 4843/2021 ‘‘Implementation of Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 "on amending Directive 2012/27 / EU on energy efficiency", adaptation to Regulation 2018/1999 / EU of the European Parliament and of the Council Of 11 December 2018 on the

[175] Art. 126 L.4685/2020.
[176] Art. 128 L.4685/2020.
[177] Art. 26, 27 of L.4685/2020.
[178] Art. 44-47 of L.4685/2020.
[179] Art. 44 of L.4685/2020.
[180] Art. 47 L.4685/2020.

governance of the Energy Union and Climate Action and in the delegated Commission Regulation 2019/826 / EU of 4 March 2019, "amending Annexes VIII and IX to Directive 2012 / 27 / EU of the European Parliament and of the Council on the content of comprehensive assessments of the efficiency of efficient heating and cooling "and related arrangements for energy efficiency in the building sector, as well as the strengthening of Renewable Energy Sources and competition in the electricity market, and other urgent provisions.''[181]. The main aim of the L.4843/2021 is enhancing energy efficiency and energy savings, in particular through intervention programs on buildings, the even greater penetration of Renewable Energy Sources (RES), as well as better operation and consequent strengthening of competition in the electricity market.

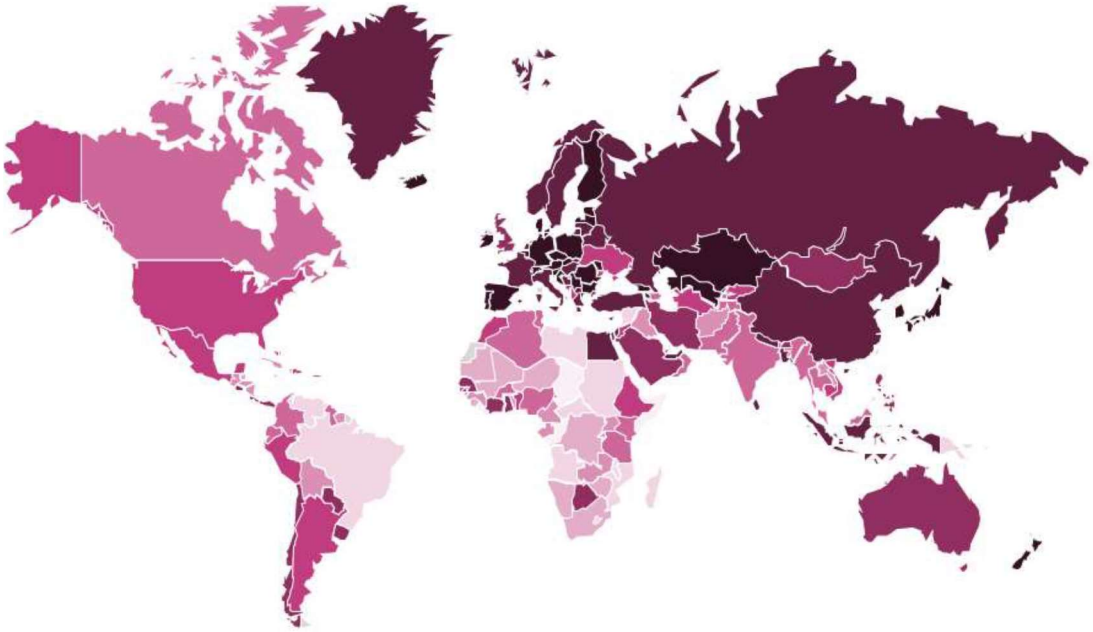
As far as energy islands all the above mentioned legislations can influence and arrange the legal parameters and the administrative steps for the initialization of an initiative of that magnitude, but also for the continuous operation of it in the long run horizon. Meticulous analysis and focus on each provision of each presently active law needs to be taken into account for the proper management and preparation of the project. In any case of legislative change the project should have the necessary classes in order for the project to remain as much unaffected as possible.

Governance Performance Index:

The ‘‘Governance Performance Index’’ as a sub-index of the ‘‘Global Sustainable Competitiveness Index’’ is a specialized tool, based on quantitative data series that aims at evaluating the performance of a country’s regulatory framework and infrastructure environment in order to facilitate sustainable competitiveness in the present state of world affairs. The regulatory and infrastructure framework of a country should enable an environment in which its’ natural, social and intellectual capital can advance and generate anew, while sustaining existing wealth and maintaining or even further scale up the conditions of living of its citizens[182].

[181] Official Government Gazette of the Hellenic Republic, Issue A’193/20.10.2021.
[182] Supra note 58, at 41.

Figure 12: The Governance World Map[183]



Dark areas are meant to indicate high, light areas low levels of Governance quality.

Greece as shown in figure 12 belongs to the part of the world that indicates higher than the average levels of governance. Additionally, the country's ranking 47th out of the 180 countries included, with a score of 57.8[184]. The analysis of individual indicators suggests a deep connection between the governance framework of a state and its economy. Basically, countries who choose to cut investments (e.g. in infrastructure) and countries with a large and regulating wise, uncontrolled, domestic investment market, and those with a low industrial base have all shown a gradual declining more often and tend to recover far slower than countries with higher investments, smaller domestic financial markets and more advanced industrial base. In the case scenario of an abrupt increase of the financial market size of a country in short term horizon it most likely to indicate an imminent burst of a bubble. Moreover, sustainable and competitive economies are usually characterized by high efficiency systems and policies. Thus, Greece in order to remain in its present position and try to reach even further ahead it needs an efficient and firm system of governance that will attract investments. Practically, sustainable governance means efficient governance systems that have guarantees against authorism with clear assigned

[183] Ibid., 42.
[184] Ibid., 44.

and shared responsibilities between the authorities of each county[185]. Therefore, Greece shows an efficient regulating system that functions quite smoothly, but still needs a lot of improvements that are to provide the necessary legal footing to future investments in the country and especially in the energy sector. In the recent years it is said that the advancements of the energy sector are to and will revolutionize our way of living and the conditions not just in already advanced urban cities, but especially in remote islands of the Greek Archipelago, thus filling all with high expectations and anticipation not just from a regulatory or policy stand point but also from the economic assets these projects are meant to bring, which will sustain the living conditions of the inhabitants of the Islands by creating a variety of job opportunities. Thus, an energy project is not a unilateral effort but a multilateral opportunity.

The Environmental Aspect:

The Kyoto Protocol:

Starting from the Kyoto Protocol, which was adopted on the 11th of December 1997 and entered into force on 16 February 2005, its main purpose is and always was the protection of the environment and the decrease of GHG emissions. Currently, 192 Parties have signed the Kyoto Protocol including Greece. The Kyoto Protocol is based on the ‘‘United Nations Framework Convention on Climate Change’’ also known as UNFCCC, and commits industrialized countries and economies in transition to reduce greenhouse gases emissions (GHG) in the atmosphere. The UNFCCC was entered into force on the 21st of March 1994 with 197 countries ratifying it. As it is a basic aim it had set the prevention of “dangerous” human interference with the ecosystem[186]. The Convention, taking some bases of it, asks of the signatory countries to adopt certain environmental friendly policies and measures on mitigating while providing periodically a report on the state of fairs. Basically, it only binds developed countries placing a heavier burden on them under the *principle of “common but differentiated responsibility and respective capabilities”*[187], recognizing that they are responsible for a large amount of GHG emissions in the atmosphere. Additionally, it

[185] Ibid., 47-49.
[186] https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change
[187] https://unfccc.int/kyoto_protocol

sets a binding set of emission reduction targets for 37 industrialized countries and transition transitioning economies in the European Union. All these targets result to an average 5% emissions reduction compared to 1990s levels over a five year period from 2008 to 2012, also known as the first commitment period.

On the 8th of December 2012, the ‘‘Doha Amendment’’ to the ‘‘Kyoto Protocol’’ was adopted for a second commitment period setting targets from 2013 and until 2020. During that second commitment period signatories were committed to reduce GHG emissions by at least 18% below the threshold of 1990 levels in an 8 year period. One of the most important elements of the Kyoto Protocol was the establishment of flexible market mechanisms, which allowed for the trading of emissions permits. Gradually, the EU ‘‘Emissions Trading System’’, known with the acronym EU ‘‘ETS’’ was set up in 2005 enabling the countries to produce a certain fixed amount of GHG emissions in the atmosphere, through the allocation and auctioning of allowances[188]. In the present the ‘‘ETS’’ is currently entering its 4th phase aiming to reduce GHG emissions by 43% compared to 2005 levels[189]. The EU ‘‘ETS’’ started and continues to consist the cornerstone of the European Union’s policy to effectively combat climate change and as a key tool it reduces greenhouse gas emissions in the most cost effective way, while maintaining a fair balance in the market honoring its competiveness.

The Paris Agreement:

Following into the footsteps of the Kyoto protocol and the ETS the global community, or at least 196 countries signed the Paris Agreement of the 12th of December 2015, which was entered into on the 4th of November 2016. As a legally binding international treaty on climate change its primal aim was to set clear boundaries on limiting global warming to a borderline below 2 degrees Celsius and preferably 1.5, compared to pre-industrial levels. Greece is also one of the signatory countries from the signing of the agreement in the 22nd of April 2016 and then ratifying it on the 14th of October 2016[190]. This long-term

[188] https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en
[189] https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/revision-phase-4-2021-2030_en
[190] https://unfccc.int/node/61072

temperature goal can be reached through global peaking of greenhouse gas emissions enabling countries to achieve a climate neutrality by mid-century. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. By 2020, countries submit their plans for climate action known as ‘‘Nationally Determined Contributions’’ (NDCs). Additionally, the Paris Agreement provides a framework for financial, technical and capacity building support the countries needing it. In the agreement it is restated that developed countries should also lead in providing financial assistance to countries that are less equipped and more vulnerable, while for the first time voluntary contributions by third parties are also encouraged. Climate finance is a must as it is needed for mitigation, because large-scale investments are required to significantly reduce emissions. Thus, climate finance is equally important for the adaptation of green polices, as significant financial resources are a necessity to mitigate the adverse effects of climate change[191].

Per Article 4 §2 of the agreement each party requires to prepare, communicate and maintain its own nationally determined contributions known as NDCs that it intends to achieve. Currently, 194 countries have submitted their first NDCs and 13 their second[192]. Greece has already submitted its' first on the 14th of October 2016 and has followed with the submission of an updated form on the 18th of December 2020[193].

Global Climate Summit of Glasgow:

This year's global climate summit in Glasgow, called COP26, aimed to finalize ground rules on how NDCs are to be put in action. Countries were being asked to come forward with their ambitious 2030 emissions reductions targets and plans that align with reaching the net zero by 2050. Specifically, 197 countries were called to report their progress. Additionally, governments were asked to provide tighter deadlines for updating their plans to reduce CO2 emissions. Main emphasis was given to the financing from developed countries to support climate actions in developing countries and to mobilize all available financial

[191] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
[192] https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx (All NDCs included)
[193] https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=GRC

sources to reach the level needed to achieve the goals set by the Paris Agreement, including a significant increase in the support provided for developing country Parties even beyond $100 billion per year in some cases[194]. Over 120 countries, representing about 90% of the world's forests, pledged to halt and reverse deforestation by 2030, while more than 100 countries agreed to cut emissions of methane by 30% until 2030, based on the Global Methane Pledge that was launched in COP26 summit[195]. Moreover, more than 40 countries, including some of the major coal-users of the world such as Poland, Vietnam and Chile have agreed to shift away from coal in the near future. Furthermore, the United States and China pledged to continue their climate cooperation to reduce methane emissions, transition smoothly to clean energy and promote decarbonization, while retaining the 1.5°C goal. As for green transport, more than 100 national governments, cities, states and major car companies have signed the ''Glasgow Declaration'' on zero-emission cars and vans, which is planning to end the sale of internal combustion engines by 2035 in leading markets, such as the EU market, and by 2040 worldwide. Even after those achievements the UN Secretary-General stated that the steps taken are indeed *''encouraging but far from enough with the emissions gap remaining a devastating threat, which represents an injustice for the developing world''* leaving a lot to be expected from the environmental policies of the future in order for the 2050 emissions' target to be achieved.*[196]* Ahead of COP26, IEA's recent World Energy Outlook of 2021 (WEO-2021) in mid-October, concluded that even if all the currently announced pledges were to be implemented in full and in time, the world would be headed for approximately 2.1 °C by the end of this century. Based on IEA's updated analysis of the new targets of COP26 summit in addition to the already in effect measures taken to tackle the rise of the earth's temperature if all of them were to be met, they would hold the rise of global temperature to 1.8 °C by the end of the century. This is considered of pinnacle importance, since it shows how far have the environmental policies reached

[194] https://unric.org/en/cop26-a-snapshot-of-the-agreement/
[195] https://ec.europa.eu/commission/presscorner/detail/en/statement_21_5766
[196] https://unric.org/en/un-secretary-general-encouraging-signs-in-glasgow-but-not-enough-2/

and that they have indeed succeeded into holding global warming to below 2 °C[197].

National Energy and Climate Plan:

Greece as Mediterranean's most diverse and bountiful environmental hub is an area that immense care should be given to the protection of its environment. Based on WWF, an 1.5°C and 2°C increase would mean for Greece's ecosystems: A) with an +1,5°C increase the forested areas that burn annually will increase by 41%, while the extreme heatwaves that normally occur once every 20 years will increase by 173% and heavy rainfall will increase by 10%, B) with an +2°C aggravation of the temperature would mark a 62% increase in forested areas burning annually, a 478% increase in extreme heatwaves and a 21% increase in heavy rainfall[198]. Thus, based on the current scientific data the Greek governments have to adopt ambitious policies for climate protection, pursue net zero-emissions economic activities and aggravate the year percentage of renewable energy production in the total energy mix of the country.

The Final National Energy and Climate Plan (NECP) of Greece as per its publication on the December 2019, is the Greek government's strategic plan for climate and energy issues, setting out a comprehensive roadmap regarding the fulfilment of specified energy and climate objectives by 2030 (Clean Energy Package targets)[199]. After the deposition of the draft NECP the European commission assessed the plan and revised it creating with the cooperation of the Greek Government and the Ministry of the Environment and Energy the final NECP was formulated. As an initial effort it was considered to be a fairly well-developed strategy that covers a wide range of the important areas and provides a comprehensive narrative of the necessary objectives, policies and measures[200]. In this context the set goals were updated and furthered as much as possible. The NECP has a set of objectives for 2030 starting from climate

[197] https://www.iea.org/commentaries/cop26-climate-pledges-could-help-limit-global-warming-to-1-8-c-but-implementing-them-will-be-the-key

[198] https://www.wwf.gr/en/our_work/climate_and_energy/

[199] Vasilakos Nikolaos, ''Energy transition challenges and development priorities for the Greek energy sector in the coming decade'', EUI RSCAS, 2019/37, Florence School of Regulation, Energy, Electricity. Retrieved from Cadmus, European University Institute Research Repository, at: http://hdl.handle.net/1814/63045

[200] European Commission, Summary of the Assessment of Greece's Draft National Energy and Climate Plan 2021-2030.

change and emissions with a reduction of greenhouse gas (GHG) emissions by more than 42% compared to emissions in 1990 levels and more than 56% compared to emissions in 2005, thusly exceeding the main EU targets. These objectives for reducing GHG emissions are also the basic prerequisite for making possible the transition to a climate neutral economy by 2050. As for renewable energy sources (RES) the NECP contained, a much higher objective concerning the share in gross final energy consumption with a minimum share of 35%. This is higher than the EU objective for RES of 32% until 2030. The energy transformation that's taking place in power generation is to make the RES share in electricity consumption to exceed 60%. As for energy efficiency, there is s quantitative objective for final energy consumption in 2030 per the final NECP. This objective is fully compatible with the relevant EU goal. The 38% energy efficiency improvement achieved in final energy consumption, compared to the EU objective of 32.5% up until 2030. Basically, while benefiting the environment and honoring the EU relevant objectives, this pioneering objective will strengthen the competitiveness of the Greek economy, while protecting the right of access of the end-users to energy. The NECP aims towards a set of energy efficiency improvements and measures, some of which are related with energy efficient buildings and transports. One of the key objectives that will most definitely be of great value to the zero-emissions target would be the lignite ''phase-out'' that is planned to be completed in the following decade and put an end to the use of lignite for power generation activities in Greece by 2028 (Table 1). The NECP also includes corresponding measures for other strategic objectives that serve its environmental-friendly policy: A) the speeding up of electrical interconnection of the Greek islands, B) the launching of the new electricity market model, C) the strengthening of already existent energy interconnections, D) the developing of strategic storage projects, E) the digitizing of energy networks, F) the promoting of e-mobility and new technologies in the energy sector, G) the coupling of the final energy consumption sectors with the power production sector ,H) the developing of new financial instruments and I) the growth of initiatives for R&D that are to promote an economic competitive model of Greece[201].

[201] Ibid.

Table 1: Summary of national objectives in the context of the NECP[202].

Year of objective: 2030	Final NECP	Initial NECP draft	New NECP objectives compared to EU objectives
RES share in gross final energy consumption	**≥35%**	**31%**	**More ambitious than the corresponding core EU objective of 32%**
RES share in gross final electricity consumption	**61-64%**	**56%**	
Final energy consumption	**16.1-16.5 Mtoe** **(≥38% compared to the 2007 predictions)**	**18.1 Mtoe (32%)** (referring to 17.3 Mtoe without ambient heat)	**More ambitious than the corresponding core EU objective of 32.5% and attainment of the objective on the basis of a new EU indicator for reducing consumption compared to 2017**
Share of lignite in power generation	**0%**	**16.5%**	

National Adaptation Strategy (NAS):

On 22 December 2019, the Ministry of Environment and Energy (previous Ministry of Environment, Energy and Climate Change), the ‘‘Academy of Athens’’ (Biomedical Research Foundation) and the ‘‘Bank of Greece’’ marked an update of collaboration with the mean to address to significant issues of zenith significance: A) the effect of environmental change at country level through explicit variation activities and B) add on the experience of ‘‘Bank of Greece’’ and its ‘‘Climate Change Impacts Study Committee’’ (CCISC) on monetary and different effects of environmental change. The participation concerned, bury alia, drafting the National Adaptation Strategy. With the help of the Bank of Greece and the Ministry of Environment and Energy's Directorate of Climate Change and Air Quality, the CCISC drafted a first draft of the National Adaptation Strategy (NAS). A public consultation was held on the draft NAS. An informal ad-hoc working committee comprised of members of the CCISC, Bank of Greece officers, and the Directorate of Climate Change and Air Quality evaluated the

[202] Ibid., 43.

consultation's outputs. The NAS was further developed and completed by the Directorate of Climate Change and Air Quality. Specifically, Article 45 of L. 4414/2016[203] ratified the final National Adaptation Strategy.

The general goal of Greece's adaptation methodology is to fortify the country's flexibility to the effects of environmental change and to make conditions for all around educated and farsighted choices that address dangers and openings coming about because of an evolving environment. The NAS gives an underlying five-year skyline for building the limit with respect to transformation and focusing on and executing an underlying arrangement of activities. Because of the critical vulnerability encompassing environmental change and its effects, just as in the light of the most recent data and improvements, the perspectives on the most ideal way of elevating transformation should be continually placed in another unique situation, which calls for constant assessment, preparing, and concentrated investigation. Against this foundation, the main draft of the NAS gives a chance to fostering an essential way to deal with variation to environmental change, which gets rolling a continuous course of correction, refreshing, and realignment.

Key targets that the NAS address are: A) the setting up and improving of the dynamic system in regards to transformation issues both in the transient skyline and in the long haul, B) the connection variation with the advancement of a maintainable development model through the execution of local/nearby activity plans C) the advancement of variation activities and approaches in all areas of the Greek economy, with accentuation on the most weak ones, D) the production of observing, assessment and update component for transformation activities and strategies and E) the structure of transformation limit while raising public mindfulness.

The NAS is viewed as the initial phase in a ceaseless and adaptable cycle for arranging and executing the vital change measures at public, local, and nearby levels. The NAS sets the overall targets, rules, and method for execution of an advanced, successful, and creating variation methodology in accordance with the UN Framework Convention on Climate Change, the European Adaptation

[203] Supra note 147.

Strategy, the European Directives, and global experience. It expects to switch the abilities of Greece's public specialists, economy, and society everywhere, in a mean to address the effects of environmental change in coming years.

The NAS proposes potential transformation activities for all natural and financial areas that are probably going to be altogether influenced by environmental change in Greece: for example normal biological systems and biodiversity; agribusiness and food security; ranger service; fisheries and hydroponics; water assets; seaside zones; the travel industry; human wellbeing; energy and industry; transport; the constructed climate; social legacy; protection industry. These need areas have been recognized through the environment effect and weakness appraisal directed by the CCISC in 2011. The NAS traces Greece's essential direction pointed toward giving guiding rules. Accordingly, it does not pass judgment on the attainability of individual variation measures and activities at the nearby/provincial level or endeavor to rank the proposed measures and activities. The last choice, the prioritization, and booking of the fitting activities and measures are the substance and embodiment of the thirteen (13) Regional Adaptation Plans which will be formed dependent on the particularities of every Region. In accordance with article 42 of L. 4414/2016, the NAS is looked into to some extent once like clockwork and amended if fitting or fundamental. So, the NAS ought to be looked into by 2026. Compliant with article 44 of L. 4414/2016, the National Climate Change Adaptation Committee (NCCAC) is the conventional coordination and warning body at the public level for transformation strategy observing, assessment, definition, and execution and should be counseled for NAS amendment.

Local Initiatives:

The EU ‘‘Covenant of Mayors’’ (CoM) for Climate and Energy unites great many nearby states deliberately dedicated to carrying out the bigger EU environment and energy action plans including local island initiatives of Andros, Kea, Syros, Milos, Ios, Oia, Lipsi, Leros, Nisyros, Tilos, Crete, Skyros, Limnos and Kythira, which have already submitted their own action plans and are to come into fruition[204]. The actions undertaken by the EU Covenant of Mayors expand further

[204] https://www.covenantofmayors.eu/plans-and-actions/action-plans.html (advanced search via Greece – Commitments – Population XS (< 10,000).)

to the main land of Greece and generally try to organize the signatories into committing to developing a Sustainable Energy and Climate Action Plan within two years and then implementing it. Basically, it is the world's largest movement for local climate and energy actions bringing together thousands of local governments voluntarily committed into implementing EU climate and energy objectives. As a drive, the EU Covenant was dispatched by the European Commission in 2008, with the goal of drawing in and supporting civic chairmen to focus on arriving at the 2020 EU focuses for GHGs and energy-related issues, by presenting the first-of-its-sort arrangement of a granular perspective. The achievement was extraordinary and immediately went past assumptions by drawing in new nearby and provincial specialists of Europe and then some. The 2020 Covenant of Mayors assembled 180 Greek municipalities.

In 2014, the European Commission dispatched the Mayors Adapt drive. In view of similar standards as the Covenant of Mayors, this sister drive was zeroing in on transformation to environmental change. Civic chairmen Adapt welcomed nearby legislatures to exhibit authority in variation and was supporting them in the turn of events and execution of neighborhood transformation systems. The Mayors Adapt drive has accumulated 61 Greek urban areas (districts).

The Covenant of Mayors and Mayors Adapt initiative authoritatively converged on the event of the 15th of October 2015 in the European Parliament. The new Covenant of Mayors for Climate and Energy is both more eager and expansive going: signatory urban areas presently vow to effectively uphold the execution of the EU target of 40% GHG-decrease until 2030 and consent to embrace a coordinated way to deal with environmental change relief and transformation and to guarantee admittance to get, manageable and reasonable energy for all.

Delaminating in an attempt of interpretation of their political responsibility into down to earth measures and tasks, the Covenant signatories focus on submitting, inside two years following the date of the neighborhood committee choice, a ‘‘Sustainable Energy and Climate Action Plan’’ (SECAP) laying out the key activities they intend to embrace. Specifically, the arrangement will include a ‘‘Baseline Emission Inventory’’ to follow alleviation activities and a ‘‘Climate Risks and Vulnerability Assessment’’. The transformation technique can either

be important for the SECAP or created and mainstreamed in a different arranging archive.

In June 2016, the Covenant of Mayors entered a significant new period of its set of experiences when deciding to unite with one more city drive, the Compact of Mayors. The subsequent "Worldwide Covenant of Mayors for Climate and Energy" is the biggest development of nearby legislatures focused on going past their own public environment and energy goals. Completely in accordance with the UN Sustainable Development Goals and environment equity standards, the Global Covenant of Mayors will handle three central points of contention: environmental change moderation, variation to the unfriendly impacts of environmental change, and *all-inclusive* admittance to get, perfect and reasonable energy.

Regional Adaptation Plans (RAAPs):

Per Article 43 of L.4414/2016[205] the 13 Regional Authorities of Greece are to develop and implement ‘‘Regional Adaptation Action Plans’’ (RAAPs), which minimum technical specifications are already set by the same law. The RAAPs content has been further elaborated by Ministerial Decision 11258/2017, which provides detailed specifications for the content of the RAAPs. Basically, the MD requires Regional Authorities to carry out multi-sectoral climate impact and vulnerability assessments. The climate risks and impacts are to be identified by sector and geographical area, which are meant to drive decision making action plans at regional level. Each RAAP after surveying the potential measures and actions included in the NAS, and the circumstances enveloping them, are to form regional action plans. The adaptation actions per sector or geographical are to be prioritized based on cost-effectiveness and cost-benefit analysis of each specific case. The effectiveness of all the actions depends on their degree of prevention, mitigation and restoration capabilities. The RAAPs are meant to bring forward a wider economic, environmental and social advancement. Any interested party will also be able to get involved and propose solutions and measures for the adaptation plans through public consultation processes. The development of the 13 RAAPs of Greece is still ongoing with several parallel

[205] Supra note 147.

RAAP studies provided the pointers for the policy measures that should be selected[206]. However, until today, no RAAP has been endorsed. It was expected that the majority of the RAAPs will have been endorsed by the respective Regional Councils by the end of 2019. The RAAPs are to be subjected to evaluation and revision at least once every seven years, respectively. Per Art. 43 of L.4414/2016, the RAAPs are reviewed at least once every seven years and revised if appropriate or necessary. In short, the RAAPs' review is scheduled to start in 2026. In addition, the Art. 44 of L.4414/2016 requires the National Climate Change Adaptation Committee (NCCAC) to be consulted for RAAPs' revision.

The ''Green Fund'':

The ''Green Fund'' of Greece was set up under L. 3889/2010[207] with its revenue emanating from various sources from energy distributors, excise tariffs on petrol, fines issued for the construction of unauthorized buildings and from environmental fines[208]. The main objective of the fund is to stimulate growth through protecting the environment and providing administrative, economic, technical and financial support for programs, measures, interventions and initiatives to improve and restore the environment and combat climate change. From 2011, a number of legislative provisions were adopted diverting Green Fund appropriations in other directions and expending its functions. Under L. 4111/2013[209], the appropriations for Green Fund initiatives and administrative expenditure were put under a cap limiting its use to 2,5% of the total every year[210]. Basically, the Green fund is an initiative of gathered resources that are meant specifically for the fulfilling of various objectives relating to the energy sector in general and especially to climate.

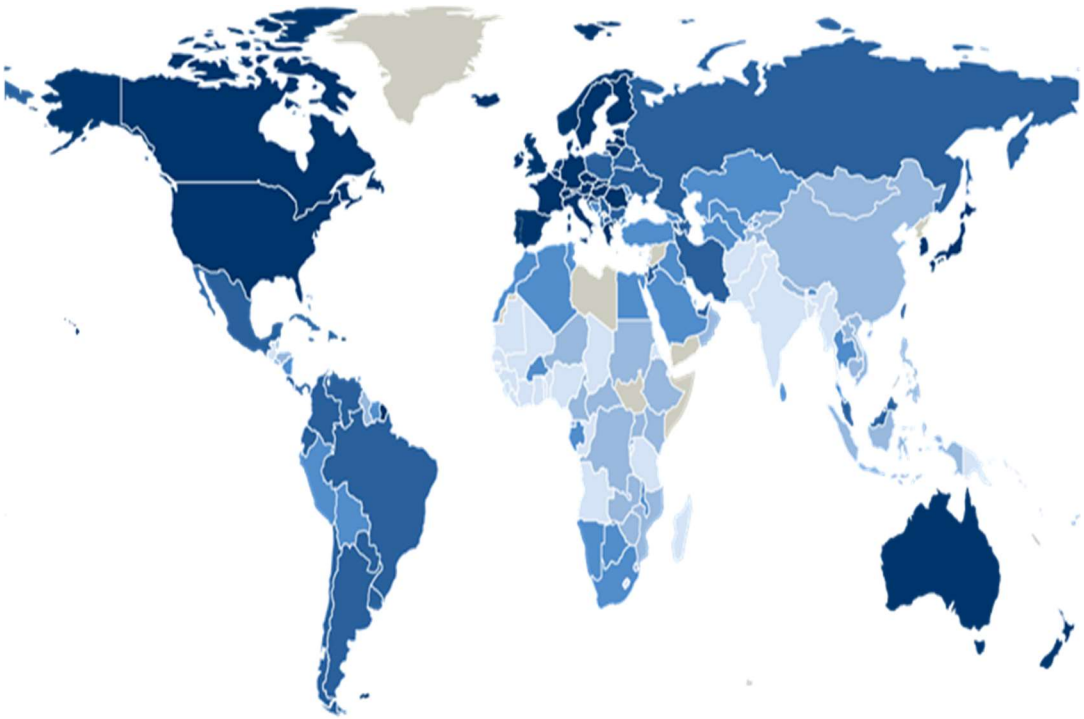
Environmental Performance Index:

The Environmental Performance Index (EPI) provides a data based summary of the state of sustainability around the world. It uses 32 performance indicators across 11 issued categories and ranks 180 countries on environmental health

[206] https://www.adaptivegreece.gr/en-us/adaptation-to-climate-change
[207] Official Government Gazette of the Hellenic Republic, Issue A', 182/14.10.2010.
[208] Art. 1 L.3889/2010
[209] Official Government Gazette of the Hellenic Republic, Issue A', 18/25.01.2013
[210] Art.63^{A} §16 L.4111/2013

and ecosystem vitality, as well as Greece. With the assistance of EPI it can be visible at a national scale how close our own country is to established environmental policy targets. The index provides a scorecard that highlights leaders and laggards in environmental performance, while providing an annual report as a practical guide for the countries' score in order to possibly aspire toward a more sustainable and environmental friendly future. Basically, if a country has a variety of environmental targets sets in its legal provisions and a general government policy that abides to them while completing them in the process, its score should be over the average at the very least. The overall EPI rankings indicate which countries are best addressing the environmental challenges that every nation faces. Going beyond the scores the data can provide an analytical performance by issue category, policy objective, peer group, and country, which hold its own unique value for policymakers. This holistic approach and comparative perspective can be could quite helpful in understanding the environmental state of our world and the policy choices of each county.

Figure 13: Rankings in the 2020 Environmental Performance Index for 180 countries[211]



[211] Environmental Performance Index (EPI) report, pp.17, 2020.

Specifically, in the case of Greece the county's score in the 2020 report of the ''Environmental Performance Index'' (EPI) was 69.1, ranked in the 25th place globally and in the 3rd regionally in the Eastern Europe[212]. The EPI is consisted out of the factor of ''Environmental Health'' in a 40% of the overall score and out of ''Ecosystem Vitality'' in a 60%. The Environmental Health scores measure how well countries are protecting their populations from environmental health risks include air Quality, sanitation & drinking Water, heavy metals, and waste management. The ''Ecosystem Vitality'' scores measure how well countries are preserving, protecting, and enhancing ecosystems and is made up of seven categories: biodiversity & habitat, ecosystem services, fisheries, climate change, pollution emissions, agriculture, and water Resources. As for the global ''Environmental Health'' scores, and regional rankings Greece had a score of 80.6 with the 28th place and regionally the 2nd [213].Whereas, in Global rankings, ''Ecosystem Vitality'' scores, and regional rankings Greece's place was 28th with a score of 61.4 and regionally the 12th place[214]. Considering that placing in the top 30 countries of the world in the basic indexes is quite an accomplishment, regionally it seems that in some categories Greece is among the leaders of the region, while in other it ranks too low. It is apparent that Greece's environmental policy is sustainable and following global trends and initiatives in its own way yielding major results in most cases, but there's quite a lot of factors to be taken into account to further criticize the general effort of the country. When rankings and EPI scores are viewed for the last decade the changes in EPI scores by peer group become apparent showing the overall picture of each country for that time period. In the case of Greece the average score was 69.1 at the 16th place in the EU-27 group, while the group's average was 70.7, showing that even with the consequences of the 2008 economic crisis, the country ranked on the average of the European Union based on EPI data[215]. Great mention should be given also to the emerging markets ranking, in which Greece

[212] Ibid., 18
[213] Ibid., 20.
[214] Ibid., 22.
[215] Ibid.,33.

ranked second based on the amassed data of the last decade, showing the progress that has been done investment wise. Even though that's a great step compering the above mentioned score of Greece with the rest of the OECD countries, our country ranks 24th among the 36 countries of that category[216]. Thus, again slightly below average but not any position that should cause too much of an alarm. Is logical for the country to not be competitive enough to lead all categories, but the steps taken that are mentioned in the aforementioned analysis of the environmental policy and initiatives of Greece show a will for change and growth. The path of Greece in all the above mentioned categories, based on the EPI report, is considered positive per the available data, but not fast paced. Viewing the sub-indexes of EPI, the ''Environmental Health scores'' 10 year changes per peer group show the same results[217] and the ''Ecosystem Vitality scores'' in the same 10 years per peer group again in the same level as the previous data, ranking Greece 21st out of the 27 EU countries. Whereas Greece is in the 4th place out of the 27 emerging markets, which shows the results of the Government's efforts both in the business sector and in the environmental protection policies, since the country is in the 23rd out of the 36 OECD members, which balances the scales in favor of the current policy measures that show actively positive results. One could expect due to the economic stagnation from the 2008 crisis and then the Covid-19 pandemic that these indexes would rank Greece at a worse position. As it seems even under those conditions Greece has kept a stable standard policy, which leaves a lot to be expected in the future.

The legislative background needed for such an effort exists and is regularly updated based on the policies of the EU, but as it is logical not all efforts show fast results. Especially, in an area of energy transition, which a lot of caring and thought has already been given for the environment, a certain level of patience and stability should be provided by legislations to avoid confusion and short-term results. The main focus should be timelessness in Greece's legislative route aiming for long-term results even after the passing of this transitional energy-related era.

[216] Ibid.,34.
[217] Ibid.,35-36.

The Case of Greece:

The Greek Market:

Greece's energy sector can be easily viewed as an attractive prospect for both domestic and foreign investments, a key factor that significantly boost the Greek economy's competitiveness, particularly in the current market conditions. For this reason, the development of the Greek energy market is a fundamental principle for the creation of a development model, which aims to create wealth by maximizing our county's domestic potential. The key policies are, first and utmost the protection and effective governance of natural resources, the diversification of the domestic energy mix via an accelerated transition to renewable energy sources (RES) and the improvement of energy conservation while reducing energy consumption.

The liberalization of the Greek energy market began in 1999 for the electricity sector and in 2005 for the natural gas sector providing the necessary stand point for major investments in the sector. In 2006, a legal framework was implemented to promote the production of electricity from RES to meet the national targets set by EU policies for the reduction of GHG emissions. This framework was substantially reformed in 2010 to simplify, as much as possible, the licensing process and lead in a smooth way to the preferable energy mix and domestic growth that is meant to pave the way to the decreasing as the very least of our county's dept. Finally, in 2011, applicable Greek laws were harmonized and aligned with the provisions of the EU's 3rd Energy Package.

The main challenges encountered from the Greek energy market are the significant use of fossil fuels for the production of electricity and generally the high energy consumption. Additionally, the county has chosen to use for decades lignite as a strategic choice, despite its environmental impact and consequences, due to the fact that it is an abundant low-cost source of fuel that is readily available. Steadily and gradually, there's a significant effort for decommissioning the old lignite electricity production units and replacing them with hybrid stations based on natural gas and RES. Furthermore, the national energy balance is still dominated by imported hydrocarbons mainly oil and in a lesser extent natural gas, which has decreasing over the last decade with the

fast turn towards RES and the expansion of the domestic energy network (e.g. the interconnection of Cyclades or bigger projects such as TAP)[218].

To increase the competitiveness of the energy market and reduce the effects on climate change, Greece's main objective until 2020 was the achievement of the binding national target of 20% of RES in gross final energy consumption with specifically 40% of RES in electricity production and 20% in heating and cooling and 10% in transport. After achieving that milestone Greece aimed even higher to the 2030 EU policy goals and the 2050 zero-emissions target looking to the future with a bright and vivid energy sector oriented to protect the environment and provide unhindered energy in fair prices to all its citizens.

In order to witness and understand in a general way our economy the sub-index of ''S&P Global BMI'', the ''S&P Greece BMI'' can be employed, which includes all the country's eligible companies domiciled in Greece[219]. The aggravating of their economic activity can be a measurement of the overall economy, showing if Greece is an attractive destination for investments. In the spawn of the last 10 years anyone that had invested in Greek companies had a -5.56% annual loss. In the last 3 years that return would be 10.23% and in the last year 61.39% stating at that point that our economy is a fragile one with its ups and downs, its way is positive in 2021 even though the Covid-19 pandemic influence all aspects of the economy, while being faced with major readapting problems to the new status quo in the business sector and specifically in the energy sector. Additionally, it should be mentioned that energy investing is one of the factors that currently boosting our economy's future prospects and the completion of domestic and interstate projects will most definitely have a positive impact on the over liquidity and competiveness of our economy. Thus, based on the sub-index Greece wasn't an attractive destination for investments, but its positive direction is visible from the resent data of 2021, which still holds a lot to be expected.

Relating CO2 emissions Greece has gone leaps ahead from the symbolic start point of 1990. Based on the International Energy Agency (IEA), Greece's total

[218] David L. Schwartz, ''The Energy Regulation and Markets Review'', Law Business Research, Chapter 9,pp.108-109, June 2012

[219] https://www.spglobal.com/spdji/en/indices/equity/sp-greece-bmi/#overview

CO2 emissions since 1990 until 2019 have decreased significantly by 18,92% from 69.86 Mt to 56.64[220] being another testimony to the overall policies that the Greek state implemented over the years relating the protection of the environment. As for RES consumption and their role in the energy mix of the country based on IEA data sets and specifically on the Renewable share in final energy consumption (SDG 7.2) of Greece between 1990 and 2018 from 7,8% in the 90s the RES consumption energy share has gone up to 17,9% in 2018 revealing their fundamental entanglement in the overall energy mix[221]. Generally, the total primary energy supply (TPES) from 1973 to 2016 of Greece shows its dependence on oil and coal is still apparent as depicted in figure 14.

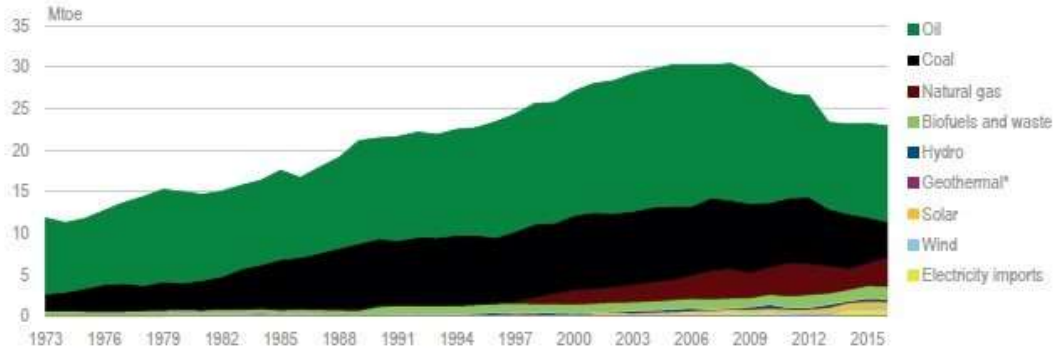


Figure 14: Total primary energy supply (TPES) from 1973 to 2016[222].

Specifically, concerning the Greek islands based o IEA's 2017 report on Greece's energy mix and policies there's a relatively high share of oil use in power generation, which stems from thermal generation units that are located on the Greek islands that have no electricity interconnection to the mainland[223]. As a main policy the projects that aim for the self-sufficiency of the remote islands of Greece try to minimize the old electricity generation stations and turn towards hybrid installations and RES to cover their energy demand.

The Astypalea Case:

As an island Astypalea is energy wise isolated and its energetic modification into a cleaner zero emissions island is innovative the least. Its significance is high since it is considered to be one of the first "Smart Green Island" in Greece. Hopes of researchers and bureaucrats are to apply the same method across

[220] https://www.iea.org/countries/greece (total CO2 emissions)
[221] https://www.iea.org/fuels-and-technologies/renewables (indicator SDG 7.2 - Greece)
[222] IEA (2017), World Energy Balances 2017, www.iea.org/statistics/.
[223] International Energy Agency, ''Energy Policies of IEA Countries: Greece 2017 Review'', pp.12, 2017.

the Aegean in a variety of isolated Islands with different conditions, while maintaining and honoring the graphic environment of these islands and reducing the degree of pollution. For the Astypalaia community the importance of starting from establishing stations for electric car can hopefully lead to further investing in order to abolish the older electricity generating facilities and transform them into new innovative hybrid stations that could in the future be further advanced with hydrogen generating units. In the present time the project that Volkswagen has undertaken is to facilitate the electric cars needed for the startup of the program and the necessary refueling stations[224].

Figure 15: Information about the Island of Astypalea[225].

Specifically, about 1,300 people live on Astypalea and more than 70,000 tourists visit the island every year. There are approximately 1,500 vehicles available for use in the island, which are all powered by combustion engines. The project aims to convert the island's vehicle fleet to e-vehicles as fast as possible making it the first region in the world to achieve completely emission-free traffic. The vision of Astypalea started from the signing of a Memorandum of Understanding on 4th of November 2020 by Prime Minister of Greece Kyriakos Mitsotakis and

[224] https://www.astypalea-sustainable-island.gr/en/
[225] Volkswagen, Smart & Sustainable Island, Factsheet, 2020-11-04. https://www.volkswagenag.com/en/sustainability/engagement/smart-sustainable-island.html
Alternatively at: https://www.volkswagen-newsroom.com/en/press-releases/volkswagen-group-and-greece-to-create-model-island-for-climate-neutral-mobility-6583.

the CEO of the Volkswagen group Herbert Diess. In that venue, ‘‘Enterprise Greece’’ as the official investment and trade promotion agency of the Greek State, which operates under the auspices of the Ministry of Foreign Affairs, is tasked with providing the necessary facilitation to the continuing of the initiative. Volkswagen has undertaken to provide support and above all the corresponding e-vehicles needed and its comprehensive expertise in the development of a functional mobility system for the island. The three car models chosen for this purpose are the e-up! , ID.3 και ID.4 representing three separate car classes. Volkswagen will provide benefits exclusively for the residents of Astypalea making the cost of buying an electric car decrease significantly[226]. Moreover, the Hellenic state has developed a special subsidy program called “e-astypalea[227]” for the locals to promote the purchase of electric cars, bicycles, motorcycles, vans and private charging points and spread them across the whole island[228]. Additionally, to establishing events for the test-driving of these cars, in which anyone test-drive the electric cars of ‘‘Kosmocar’’ and then rent a car to see for oneself their innovative initiative, some electric scouters SEAT MÓ eScooter 125 were were given to the Astypalea police station, the coast guard, the civil aviation agency and the local municipal authority. That is the first pebble in the way for the Volkswagen Group to achieving the grand goals of the Paris Agreement and create a climate neutral Astypalea by 2050, and thus developing a "go back to zero" sustainability strategy for the island[229]. At the same time, a network of private and public charging stations will be created. Highlights of the project are the new car sharing and ride sharing services, which are to radically modernize public transport via the use of a mobile application[230]. They are meant to replace the old bus network and to serve all corners of the island, while being operational all year round. Alongside car sharing e-cars, e-scooters and e-bikes will also be integrated with compelling price facilitations. In total,

[226] https://www.astypalea-sustainable-island.gr/en/xrimatodotika-programmata/
[227] https://smartastypalea.gov.gr/vehicle-electrification/
[228] https://www.enterprisegreece.gov.gr/newsletters/newsletter-articles/smart-sustainable-astypalea-project-moving-forward/
[229] https://www.astypalea-sustainable-island.gr/en/newsroom/volkswagen-group-and-greece-to-create-model-island-for-climate-neutral-mobility
[230] https://smartastypalea.gov.gr/smart-mobility/

the number of vehicles on the island is estimated to decrease by a third to 1,000 cars, while mobility will be significantly improved.

Additionally, the transformation will also include an energy revolution to renewable electricity generation stations. Astypalea's power supply is almost exclusively dependent upon diesel generators, which produce almost 5,000 tons of CO2 emissions per year. Specifically, the power system of the island is fed from three identical diesel power stations, with 1MV peak each of them, while there are 320 kWp of photovoltaic (PV), with an annual production of electricity close to 531 MWh as measured in 2019. Moreover, the island has significant wind potential allowing for the installation of wind turbines, as most of the neighboring islands of the Dodecanese complex[231]. In the imminent future, its power is planned to predominantly come from solar energy. A state of the art hybrid RES system is to be installed, which is designed to prioritize the supply of integrated electric vehicle charging stations network of the island. As an initial step is the installation of a solar field with an output of 3 megawatts by 2023 (Phase 1 of figure 16). This is meant to supply 100% of the electric cars and up to 50% of the island's total energy supply with green emissions free energy and by phase 2 the aim is set up to 70%. The new founded hybrid energy system will also include a back-up battery with a storage capacity of 7 MWh, which will keep the network balanced and its solar energy used optimally. In phase 2 of the initiative the proportion of renewable energy will be extended further by 2026 with the potential addition of wind turbines, and will almost cover 80% of electricity requirements of the island. The main aim of the new energy system will not just be to reduce CO2 emissions but also to reduce energy costs. The Greek government estimates an energy saving of more than 25% of the total energy consumption of Astypalea.

[231] Fiorentzis, K., supra note 128, at 4.

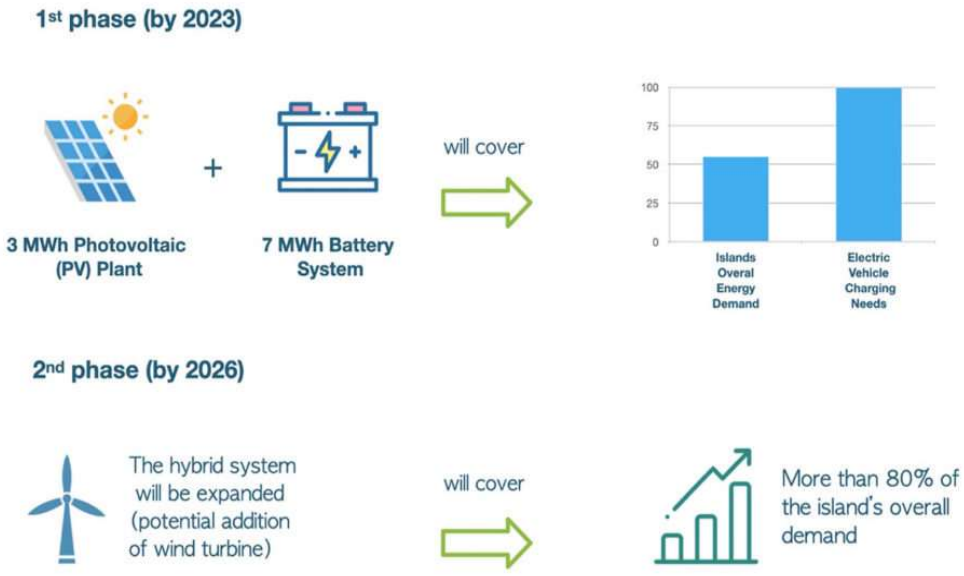


Figure 16: The hybrid energy system[232].

Moreover, the project will also be monitored academically by various studies. It is significant far beyond just the plain of Greece or more precisely just an isolated island and its end goal is serve as a unique testing ground of vital importance for future similar projects all around the world. In the ‘‘micro world’’ of a small island as Astypalea is the opportunities and challenges that governments all around the world are confronted with as the economy and society transforms can be observed as if in fast forwarded time lapse. To understand the interconnection of these factors better, scientists have their own crucial role and will actively be involved in the project providing their scientific insights. Specifically, for that purpose experts from the University of Strathclyde in Scotland and the University of the Aegean in Greece will be regularly consulting the people of Astypalea and gathering their feedback on the changes to be made[233]. That study aims prominently into helping and systematically incorporating the perspective of the island’s community, while gaining fundamental understanding of the transformation process that is undergone. In due time these results

[232] https://smartastypalea.gov.gr/charging-and-energy/
[233] https://smartastypalea.gov.gr/research-and-study/

will be made public providing the scientific stepping stone for future initiatives[234].

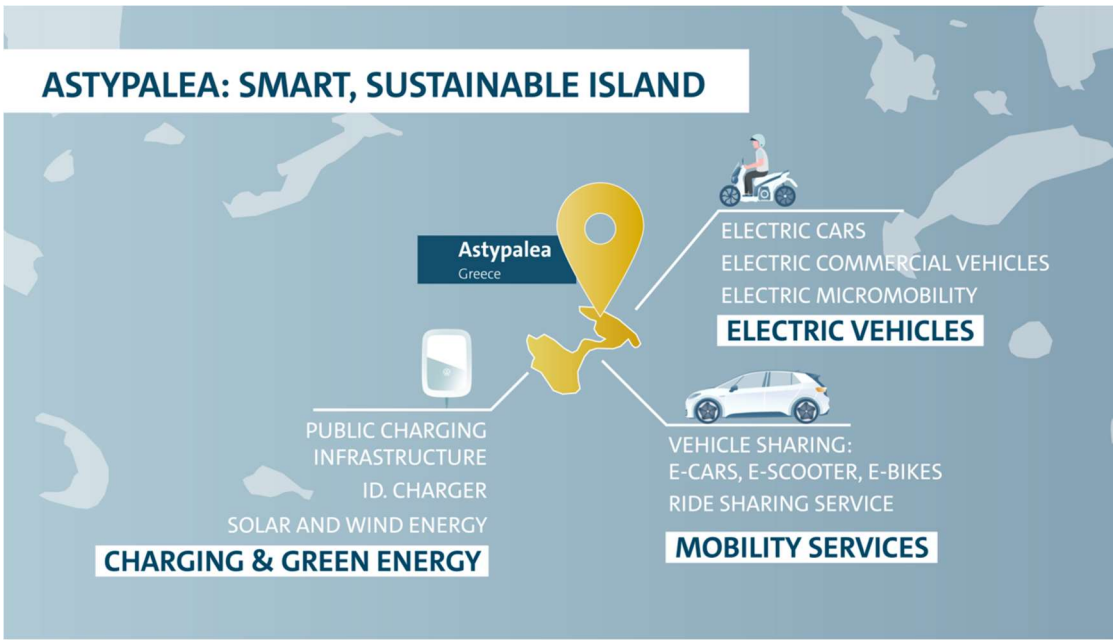


Figure 17: Astypalea's e-mobility, smart mobility solutions and green power generation innovative initiative[235]

The Tilos Case:

Clean and renewable energy sources are a need of our age, in order to sustain the present energy needs. Especially, in islands as Tilos, which are remote and the interconnection with the main land electricity network is difficult and not cost-efficient, there is a need to transcend them into zero-emissions sectors of the Greek energy network under the umbrella of the European Union's target of 2050. The Tilos project that began in February 2015 and was concluded in its biggest part within 4 years making Tilos a novelty, the first ''autonomous renewable green energy island'' in the Mediterranean. It belonged to ''European Horizon 2020'' initiative, which aimed at securing Europe's global competitiveness and was the main financing instrument of Tilos' endeavor for research and innovation and many more different projects in the EU for the years 2014 to 2020[236]. The main objective of the program was to maximize the

[234] https://www.astypalea-sustainable-island.gr/en/newsroom/astupalaia-smart-and-sustainable-island-ii
[235] https://www.volkswagenag.com/en/news/2020/11/volkswagen-group-and-greece-to-create-model-island-for-climate-n.html
[236] https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

use of RES in the energy mix of the island. The total cost of the project amounted to 13.74 million €[237]. A new prototype, hybrid system for electricity production and storage consisting was used, which included a 800 KW wind turbine, a 160 KW photovoltaic park and a 2.4 MWh/800 KW NaNiCl2 FIAMM battery for energy storage. Additionally, it was designed in order to achieve the highest possible electricity autonomy and balance between recurrent Renewable Energy Systems (RES) used to produce electricity production and electricity demand.

The Tilos project isn't just an energy project that aims for Tilos energy security but also it focuses on island regions which constitute high priority areas limited in Greece. The basic idea is to create a platform that will enable the technological exchange of the know-how between islands, by exploiting the experience gained through the operation of the smart grid system of the island of Pellworm in Germany, and by implementing the new hypothesis driven used or theorized for similar systems in other close alike islands. Indicatively other participating islands include the island of Pellworm in Germany, which was already mentioned, La Graciosa of Spain and Corsica of France.

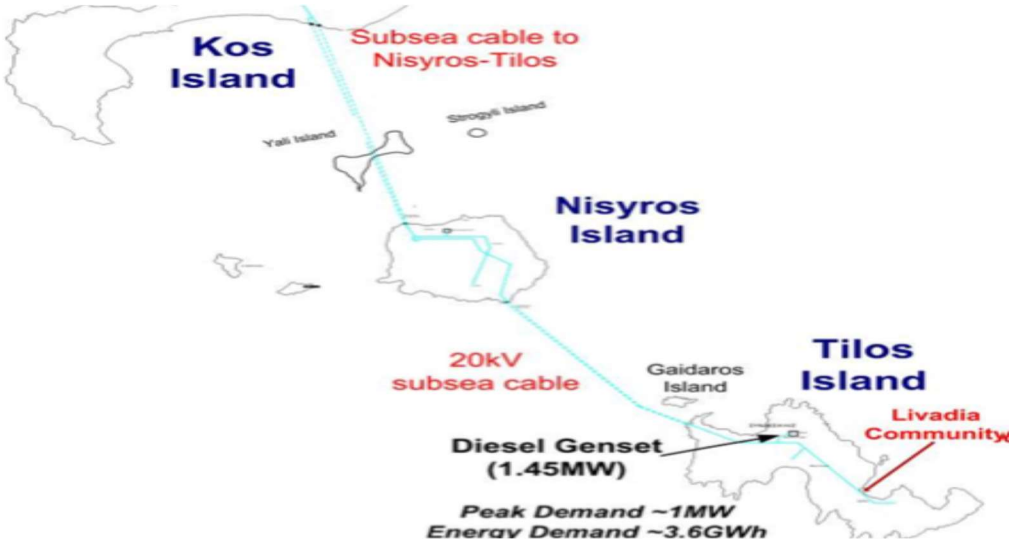
The whole project is divided into 12 work packages (WPs), which comprise its two main stages of implementation. The first stage is the ‘‘System Setup’’ and the second is the ‘‘System Demonstration & Application results’’. Tilos is still a multinational European demonstration and research project, which engaged 13 participating enterprises and institutes from 6 EU currently member states (Germany, Greece, Sweden, Italy, Spain and France) and the United Kingdom, with the primal coordinator of the Technological Educational Institute of Piraeus (TEIP) from Athens in Greece[238].

Up until that project, Tilos was dependent for its current electricity needs, which were about 3.2 GWh per year with an annual peak demand about 1 MW, upon an oil-fired power station situated in the neibouring island of Kos island, through

[237] G. Notton, M. Nivet, D. Zafirakis, F. Motte, C. Voyant and A. Fouilloy, "Tilos, the first autonomous renewable green island in Mediterranean: A Horizon 2020 project," 15th International Conference on Electrical Machines, Drives and Power Systems (ELMA), pp. 102-105, 2017.
doi: 10.1109/ELMA.2017.7955410.
[238] ibid.

an undersea interconnection that reaches the island after first crossing from another close island Nisyros (Figure 18).

Figure 18: The electrical interconnection of Kos, Nisyros and Tilos.



Unfortunately, the past system showed persistent faults from the undersea cable causing the island suffers from repeated black-outs especially during the summer period. Despite a back-up diesel generator of 1,45 MW does exist on the island in case of similar black-out events, it cannot be imminently activated since it is manually operated.

As for the availability of RES, the island of Tilos has a good solar and wind coverage enabling the use of both wind turbines and photovoltaic (PV). As shown on the global irradiation and solar electricity potential of Greece (Figure 19) and the ‘‘Average Wind Speed’’ map for the local region around Tilos (Figure 20)[239].

[239] G. Notton, supra note 236, at 103

Figure 19: Global irradiation and solar electricity potential of Greece

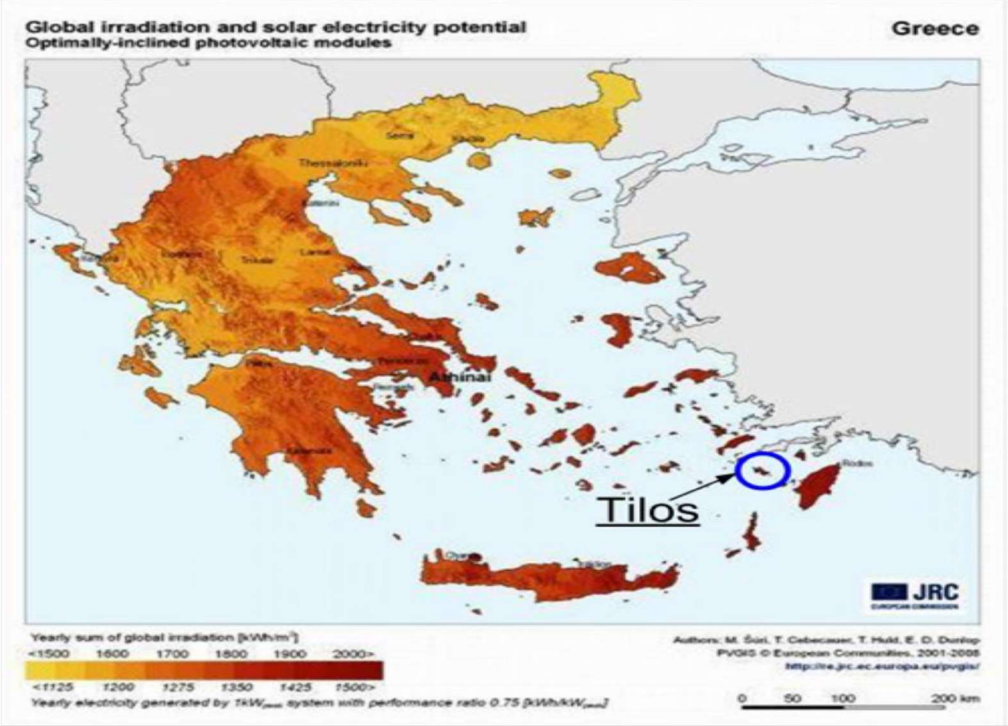
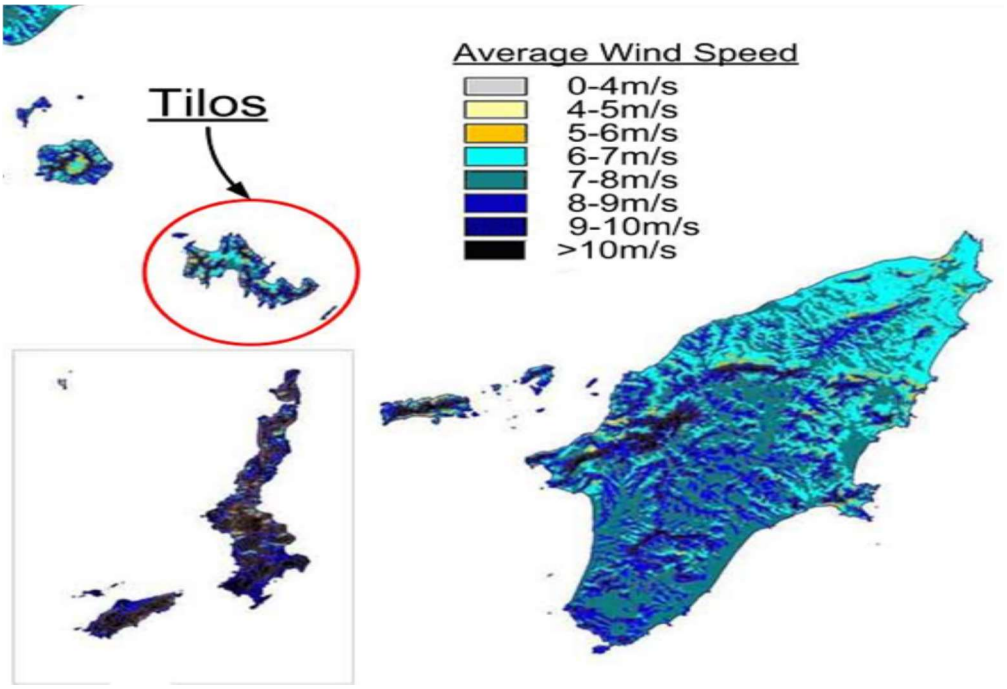


Figure 20: Average wind speed in Tilos, Greece

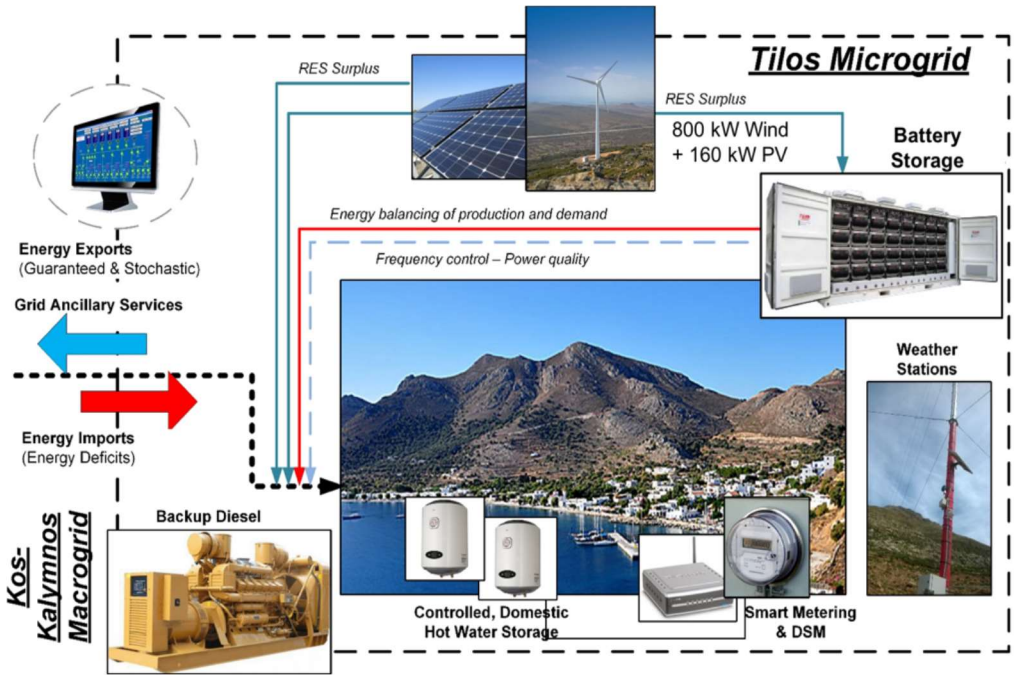


Facing energy security of supply problems due to the insufficient grid interconnection with the underwater cables of the electricity system of Kos and the great

potential of high-quality solar and the medium to high quality wind potential of the island points out to the development of a micro-grid, which is meant to serve the community of Livadia and distribute its power generation capacity to the rest of the island.

The main objective of the Tilos project is to provide the electricity for the whole island, as already mentioned using a hybrid photovoltaic/wind/storage energy system (Figure 21). This system is designed to operate with a storage a prototype battery system that will support the operation of a smart micro-grid enabling multiple tasks from synergy with wind and PV power, micro-grid energy management, maximization of RES penetration, grid stability, export of guaranteed energy, ancillary services to the main grid to the synergy with ‘‘Demand Side Management’’ (DSM). ‘‘Smart meters’’ and ‘‘DSM’’ devices are to be installed in selected loads of system demand side so as to allow grid and voltage regulation and short-term energy management in order to achieve optimum battery storage operation by controlling load levels[240].

Figure 21: The Hybrid energy system that supports the island of Tilos



Additionally, as for the social acceptance of the project, in the specific case of Tilos, the overall rate is quite high reaching an 45% positive, while 53% had a

[240] G. Notton, supra note 236, at 104.

neutral view. Generally, as shown in figure 22 the local are supportive with sustainable energy technologies with an 82% positive view, but due to their lack of expertise and understanding of the general implications and values of an initiative of that magnitude, experience a confusion on what the ideal measures for the energy self-sufficiency of their island, while grasping the main feel of the benefits, which can be economical, environmental, with household services that improve the standards of living of the local and with energy security being the dominant benefit across the entire sample.

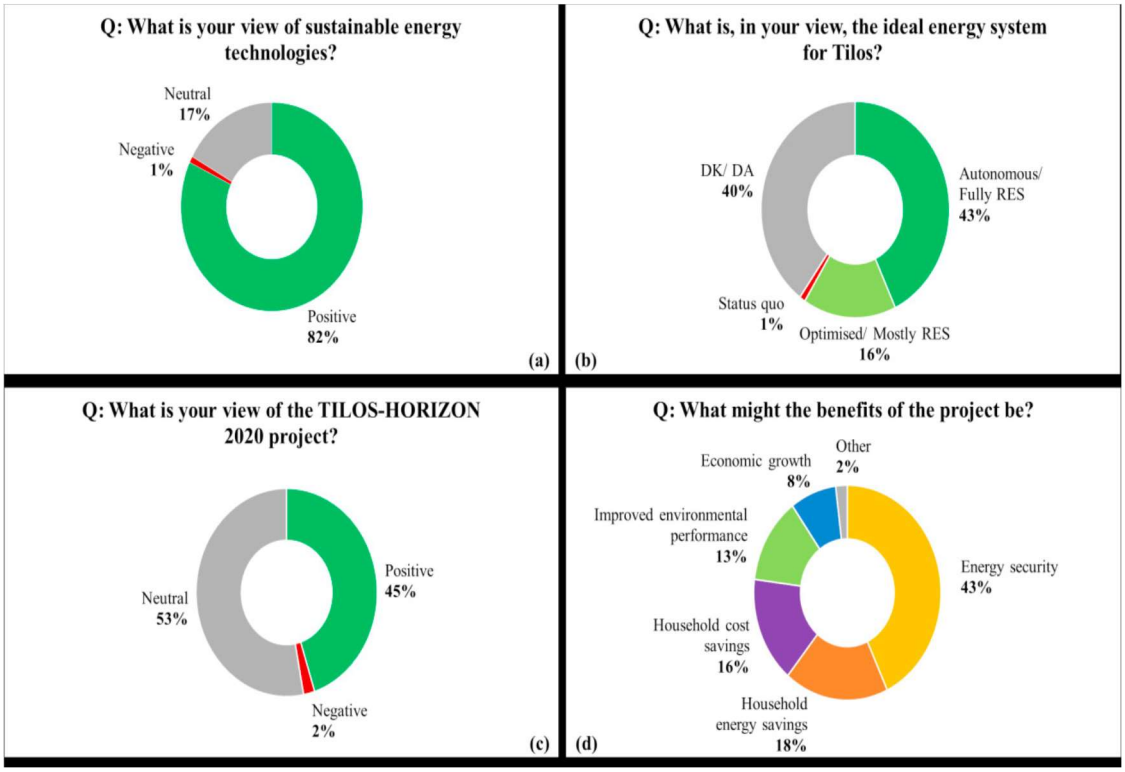


Figure 22: Public acceptability of sustainable energy technologies in Tilos, Greece[241].

The rate of social acceptance of the sustainable energy solutions is the highest among results, with 82% of local participating in the study having a positive view. Thus, showing that local aren't negative against robust ideas, but there's usually great deal of confusion or ignorance against specific measures taken

[241] Phedeas Stephanides, Konstantinos J. Chalvatzis, Xin Li, Nikos Mantzaris, Michalis Prodromou, Christiana Papapostolou, Dimitris Zafirakis, ''Public perception of sustainable energy innovation: A case study from Tilos, Greece'', Energy Procedia, Volume 159, pp. 249-254, 2019, ISSN 1876-6102, https://doi.org/10.1016/j.egypro.2018.12.058. (https://www.sciencedirect.com/science/article/pii/S1876610218313535)

especially when these measures are to be implemented on ‘‘someone’s back-yard’’. Making local sometimes to be risk averse, since they are comfortable with the way their energy system works. In the case of Tilos, the social acceptance was high enough since the energy system in many occasions in the summer months hindered the daily lives of the inhabitants, thusly only 1% was negative to sustainable energy technologies, 2% had an negative view of the 2020 Horizon project of Tilos, 1% preferred the status quo energy system of Tilos and 0% considered that the project could emanate no benefits for the island.

Remarks for Future Projects:

As both Tilos project and after it Astypalea project are a valid effort towards an energy secure Greece with autonomous energy islands, based on the prioritization of RES use and the protection of the environment, the next project which is going to start in 2021 is in the island of the Dodecanese complex, Halki. As an effort it emanated from the proposed initiative of the local community with a detail plan in October 2020[242], which showed their serious intent to follow the steps of the aforementioned projects into becoming the first eco-island in Greece. The project emanated from the Greek initiative ‘‘GR-eco islands’’. Originally, the project was a means of reducing fossil fuel dependency and promoting the phasing out, while replacing them with alternative and other sustainable energy sources. Energy independence is beyond doubt one of the strong guiding principles for the island’s clean energy transition as was in the aforementioned brother projects. Of course that project too belongs to the general ‘‘Clean Energy for Islands Initiative’’ of the EU. Showing the will of Greece for a gradual transition with a stable strategic preparation of the isolated islands to enter similar project and obtain their energy self-sufficiency.

Moreover, as mentioned, the geopolitical and geostrategic position of the islands of the Greek Archipelago makes them of primal value for the foreign policy of Greece. Especially, in delicate cases such as Kastelorizo the planned energy transition of the island and its autonomy can influence the territorial rights of Greece and the update the standard of living of the inhabitants. As a

[242] https://euislands.eu/document/clean-energy-transition-agenda-halki

project it hasn't yet started, however it is included in the future agenda of the state. The Institute of Energy for South-East Europe (IENE) issued a study on the island of Kastellorizo considering its autonomy feasible and of great importance. The autonomous electricity system of the island is dependent upon 7 diesel generators, which have a high run cost and are to be gradually abandoned, while the new RES technology infused stations are created. Renewable energy sources will be incorporated with up-to-date energy storage mechanisms that are meant to reform the design of the Electrical System of Kastellorizo Island and focus on the utilization of its solar and wind potential[243], while a backup station will provide assistance. Similar plans of incorporating cutting edge energy technologies can and are meant in the future to be implemented in energy islands projects that are far away from the main electric power grid.

European Projects:

Some of the many projects hosted by the EU, under the umbrella of the 0-emmisions target of 2050, are indicative the ''ESBØ project'' of Hvaler Island in Norway and Orust in Sweden, ''Samsø project'' of Denmark and the ''El Hierro project'' of Spain. Each of these projects represent a significant effort of the integration from fossil fuel dependence of the isolated EU islands towards their energy self-sufficiency.

ESBØ Project:

As the Greek projects aim towards the zero-emissions target via their energy transition to environmentally friendlier ways of producing energy, other EU projects aspire to complete the same end goal, such as the Hvaler Island in Norway and Orust in Sweden. Both of these fraternal islands in their purse of carbon neutrality have joined the "Interreg Europe", which helps regional and local governments across the EU to develop and deliver better policy on research and innovation, small and medium-sized enterprises (SMEs) competitiveness, low-carbon economy and environment and resource efficiency[244]. As one of the

[243] Institute of Energy for South-East Europe (IENE) "Energy Transition of the Island of Kastellorizo", IENE STUDY (M. 45), December 2018 at https://www.iene.eu/iene-presented-study-on-the-energy-transition-of-the-island-of-kastellorizo-in-a-special-event-in-athens-p5351.html or https://www.iene.eu/articlefiles/kastellorizo%20executive%20final%20eng.pdf.

[244] https://www.interregeurope.eu/about-us/what-is-interreg-europe/

projects harbored by “Interreg Europe”, ESBØ project (Et Smart og Bæredygtigt Øysamfund[245]) includes a variety of pilot installations that test climate-smart solutions within solar, wind, water applications. One of the main focus areas of the project is the island’s energy systems which have undertaken the mission to increase the share of renewable energy and decrease energy consumption. Specifically, on Hvaler Island, the project explores a model for how citizens, associations, businesses and the municipality can own a windmill facility together. Another basic goal for the two islands is to find good promotion models for the use of solar energy. The project is a joined collaboration between the Norwegian municipality of Hvaler and the Swedish municipality of Orust. It started at the September of 2017 with its completion planned until August 2020. The project has a total budget of 1,393,565 € and has received funding from the EU “InterReg” fund 452,908 €[246].

Samsø Project:

Samsø is a small island of 3.726 inhabitants, which is located in central Denmark that has managed to achieve in 10 years 100% self-sufficiency from local renewable energy sources for its electricity needs and with 70% of its’ heat emanating from renewable energy sources. In 1997 it was appointed Denmark's Renewable Energy Island, which was followed by a 10-year energy plan. The Samsø project is one of the tree islands included in the ‘‘Smart Islands Energy Systems project’’ (SMILE) that is aiming to develop nine smart grid solutions in three large-scale pilot projects in different EU regions with similarities in topographic characteristics but with dissimilar policies[247]. Now with project “Samsø 2.0” the island aims to phase out the island completely from fossil fuel use by 2030. Specifically, the island owns its 100% CO2 neutrality to the 10 offshore windmills, which make up for the heat produced from non-renewable sources and private transportation. As for the island’s electricity, it is produced by 11 land-based wind-turbines, while its heating is based on three straw-based district heating systems and one district heating plant combining small to medium sized pieces of wood and solar energy. Additionally, 300 houses have

[245] Translated as ‘‘A Smart and Sustainable Island Society’’.
[246] https://nordregioprojects.org/carbon-neutral-islands/two-islands-one-goal-carbon-neutral-hvaler-norway-and-orust-sweden/
[247] https://www.h2020smile.eu/

invested in individual renewable energy heating systems[248]. Since 2014, significant advancements are made, the ferry between the island and Denmark's inland runs on biogas being produced by a multi-functional biogas plant located on the island. Basically, this plant functions as the island's organic waste management converting them into biofuel. Moreover an important factor of the project is the locals' involvement, which is coordinated by the local energy agency, the local office of development, the municipality of Samsø and a municipally-owned energy company. Additionally, the ''Samsø Energy Academy'' as resource center on renewable energies, which was established in 2007 and funded by Samsø municipality's profits from the off-shore wind power generators, is the leading coordinator all the aforementioned entities. Citizen involvement has already provided positive outcomes with local ownership amounting to 90% of the island's windmills.

El Hierro Project:

The El Hierro island of Spain with approximately 10 600 inhabitants is another novelty of a project as a 100% renewable island. As a consequence of the topography, El Hierro, an active volcanic island, could not be interconnected via underwater cables with Spain's main power grid. Instead, it used be dependent upon approximately 40 000 barrels of oil each year, to power its electricity generators. In 2014, El Hierro launched the ''Gorona del Viento'' power plant, a wind and water turbine farm which set the stage for its full energy independence in 2015, when the island went 100% renewable for the first time.

El Hierro's ''100% Renewable Project'' is managed by various public and private enterprises of the island with the assistance of the Canary Islands Institute of Technology and the Autonomous Community of the Canary Islands. The project's cost amounted up to €65 million and it was partly funded with a €35 million European Union grant. It entailed the installation of an 11,5 MWh wind farm and an 11,3 MWh hydroelectric pumped storage plant that is capable of providing the island's inhabitants with 80% of their energy needs. Currently, the ''Gorona del Viento'', a wind-hydro power plant covers all the energy needs of the island,

[248] https://www.renewables-networking.eu/cities on the category ''Best Practices for renewables deployment at city level in the EU'', report on ''100% renewable energy island - Samsø Island, Denmark''.

with an annual share of RES close to 60%, which under certain circumstances often reaches peaks of 100%. In February 2018, the island successfully functioned independently for 18 consecutive days with renewable energy only. In the future and specifically in the next 20 years, this system is expected to provide annual savings of at least 18.700 tons of CO2 emissions and €2 million, equivalent to the 5.000 tons of diesel fuel that is no longer needed. Additionally, the island is planning to reinvest the expected €4 million per year profits from the developing of solar heating and electric-vehicle systems by 2020.

This project is considered a model for other islands that are isolated from their country's mainland's energy grid, such as Astypalea and Tilos of Greece. Each island project as a whole can serve as an experiment pointing out possible energy mixes, with the other combination of solutions as e-mobility. Moreover, the El Hierro's initiative is supported by its citizens expecting the green island credential to increase the islands tourism, ensure its future energy security create new jobs. In most cases, these aspects are more appealing and easier to understand by the public than climate change and emission reductions policies[249].

Non-EU Projects:

As in the case of the Greek islands there are quite a lot of remotely located islands outside the geographical boundaries of the European Union, such as the island of Maui of the Hawaiian island complex and the island complex of Maldives in the Indian Ocean. As already mentioned an island's energy transition is a multilevel and purposive intervention that requires locally produced renewable energy resources that have lower cost that the imported energy resources in order to create a diverse energy mix, which is based upon the existence or the future potential of a modernized energy grid. Three key areas seem to be of primal importance: the existence of local RES, the modernization of the grid and the storage of the energy surplus in order to be used upon request based on the needs of the island.

[249] https://www.renewables-networking.eu/cities on the category ''Best Practices for renewables deployment at city level in the EU'', report on ''100% Renewable island - El Hierro, Spain''.

The Case of Hawaii:

The Hawaiian Islands consist of six major islands: Kauai, Oahu, Molokai, Lanai, Maui, and the island of Hawaii. Hawaii has the highest dependence on oil among the fifty U.S. states deriving nearly 90% of its primary energy from oil. An Initiative was created in 2008 in order to increase the portion of renewable energy in Hawaii's energy mix to 40% until 2030, which was codified into law in 2009. In the island of Maui the Jump Smart Maui project (the "Maui project") was implemented from 2011 to 2016 in order to install and operate the necessary infrastructure to assist the island's transition to clean energy. The project was mainly focused in the transportation sector, but also updated the electrical grid to introduce more renewables and utilize and distribute energy resources more efficiently, such as the energy required for electric vehicles. Specifically, the Maui project presented a community-scale live demonstration of a futuristic technology design for automated load balancing of distributed energy resources and vehicle batteries as electricity storage systems of a two-way smart grid. The project integrated 13 electric vehicle stations with 44 ports and also 280 home chargers. The number of electric vehicles in Maui was around 80 on starting the project in 2011 and in 2016 the number went up to around 780. Basically, that project consisted the necessary step that help promote RES technologies and solutions among the island complex of Hawaii.

Additionally, the island complex undertook an obligation for energy efficiency purposes to reduce electricity use by 4300 GWh by 2030. In 2015 it established legally binding the goal of 100% RES for the future, while strengthening its short-term objectives from 25% to 30% in 2020, along with the long-term targets of 70% RES share by 2040 and 100% by 2045.

Hawaii's energy transition has shown a steady and consistent growth in RES from 2009 to 2018. The photovoltaic (PV) system installations grew, while the island in order to cope with high its dependency on oil and very high electricity prices, focused its renewable energy transition on a diversified portfolio of available renewable energy technologies including solar, wind, geothermal and ocean RES. Its early growth stage was primarily dominated by wind generation

projects in Maui, Hawaii, and Oahu and geothermal and hydro production in Hawaii[250].

The Case of Maldives:

The island complex of Maldives is located in the Indian Ocean and is considered part of South Asia. The Republic of Maldives is directly south of India and southwest of Sri Lanka. Basically, the Maldives is an archipelago that rests between the Arabian Sea and the Indian Ocean. As a ‘‘Small Island Developing State’’ (SIDS), Maldives has faced energy insecurities and needs to formulate a policy for the installation and maintenance of different capacities of renewable energy. Specifically, the energy insecurity of Maldives is mainly attributed to the over 1,190 small islands that disperse over 90,000km2 making the effort of installing RES systems quite difficulty, since their interconnection could be challenging and the most plausible solution could be small non-interconnected smart grids. Thus, the case of Maldives is mainly sustainable development challenge that has to be durable to the weather of the area (e.g. the tsunami of 26 December 2004), while considering the environment and the long-run viability of the project. By identifying the energy insecurities of Maldives and their strategic choices other remote islands can be benefited and led to a tested sustainable development plan.

The island complex is mainly dependent on imports of a variety of petroleum types. Diesel is the major importing energy resource among these and accounts for approximately 72% of the total fuel imports, while the outer islands account for 39% of the total electricity generated excluding the country’s capital. The island state’s electricity generation consumes mostly imported fuel. Specifically, the oil imports accounted for 31.2% of merchandise imports of 2012. Additionally, the limited storage capacity of the islands is also a major issue that needs to be resolved. By 2015, approximately 64% of the diesel bunkering capacity of the country was based on one small island called Funadhoo, near Malé. Transportation of the imported fuel was also a problem that caused for the rise of

[250] Taedong Lee, Mark B. Glick, Jae-Hyup Lee, ‘‘Island energy transition: Assessing Hawaii's multi-level, policy-driven approach’’, Renewable and Sustainable Energy Reviews, Volume 118, pp.1-4, 2020. ISSN 1364-0321. https://doi.org/10.1016/j.rser.2019.109500.

electricity tariffs. There was a period that different tariffs were implemented depending on the production scale, which changed according to the population size supported, the efficiency of production, and cost of transportation of the fuel.

The Government of Maldives is making an effort to reduce steadily their dependence on imports, while making the necessary policies and plans for development of the energy sector and the use of RES. In 2017 the government decided to reduce the import duty of diesel between 10% and 15%. This was followed in 2018 to a complete exemption of import duty on diesel. However, as the population on most of the islands is quite small that requires less fuel to fully function. Therefore, instead of buying in bulk at a lower rate, the powerhouses purchased small quantities from nearby suppliers making the fuels cost rise. Thus, the government's policy failed.

Maldives faces a lot of difficulties into adapting their energy network to the possible extreme weather conditions. Renewable energy resources has the potential to play a pinnacle key role in enhancing the energy security of the state, while decreasing the reliability of the system to imports. Additionally, the islands are small, which is one of the main challenges, since solar installations need the appropriate space to install in order for uninterrupted light to be available.

The Maldives energy policy is to introduce hybrid systems that use RES and the conduction of projects to install solar panels in government and private buildings, and to facilitate research in wind, solar, ocean currents, and wave energy that can be used in the future to minimize electricity expenses[251]. Maldives energy insecurity which is basically as mentioned related to fossil fuel availability, prices will continue to exist for a long period, as diesel-based power systems continue to function. A design of hybrid diesel-solar photovoltaic system with energy storage capabilities can very well provide the necessary solution for the Maldives[252]. Before the implementation of any plans and policies

[251] Mohamed Shumais, Ibrahim Mohamed, ''Dimensions of Energy Insecurity on Small Islands: The Case of the Maldives'', ADBI Working Papers, no. 1049, pp. 1-12, December 2019.
[252] Wijayatunga Priyantha & George Len & Lopez Antonio & Aguado Jose, ''Integrating Clean Energy in Small Island Power Systems: Maldives Experience'', Energy Procedia, 103, pp. 274-279, 2016. DOI:10.1016/j.egypro.2016.11.285

regular monitoring can help identify the technical faults and areas of interest which technical expertise is lacking in order to be corrected and adjusted for the most sustainable use possible to avoid failed policies of the past and promote adequately RES use.

Discussion:

Following the above given data and individually derived conclusions in each project there can be witnessed some basic points that are followed in the case of Greece. The overall try is promising, while providing an evolving and adequate legal framework, which is based on the EU directives and its general guidance. Maintaining a cautious approach the de-carbonization of the state's energy generation stations and the positive approach of the environmental measures taken show great promise for the future until the goal end of 2050. By belief the progress of the island initiative in Greece is crucial, as already stated, but leaves a lot way to be covered and the expectation of the Union and the end-users are high.

As for the fellow EU projects that have already yielded results, their approach has been followed by Greek projects. The common aim of all these projects is: A) to increase the share of RES in the island's energy mix, B) to smoothly decrease fossil fuel dependency, C) to implement robust ideas and new technologies, D) to decrease energy consummation. Specifically, the aforementioned Greek projects of Astypalea and Tilos have rightfully earned their respective tittles as the ‘‘First Smart Green Island’’ and as the ‘‘First Autonomous Renewable Green Island’’ implementing hybrid energy solutions and taking advantage of the geographic positioning of the island and its RES capabilities.

As for the non-EU projects their development and planning is quite similar to the effort of the EU. However, some of these projects (e.g. Maldives) have faced extreme weather conditions making their overall implementation challenging. Their means and targets show similarities with the EU emissions target, by turning towards RES and trying to minimize energy imports and consumption, while implementing storing and administration strategies for their available energy production. Overall, the EU projects are well organized endeavors equivalent with those of non-EU projects and in many cases facing

less adversities, while using very similar methodologies to provide smart energy solutions.

Conclusions:

The case of Greece is and always was peculiar due to its geographic location making energy security and development a geostrategic goal especially in the case of the Greek islands. Additionally, even though the Greek economy has gone through the economic crisis of 2008 its energy security indicator and the progress of sustainable development in the Greek islands is immense. Even though the debt of Greece is close to 200% of its GDP, the innovative and proactive policies of energy could strengthen our economy and provide an important comparative advantage to get back on a positive track with all the advantages provided by the know-how of energy development and sustainability and the careful use of the EU subsidies. As many advances and steps as we have taken in the field of energy development in our country there's a need to continue in order to further expand the use of RES in the energy mix.

The indexes presented each point out some advantages and disadvantages of Greece's various endeavors in the energy sector. Starting from the ''International Energy Security Risk Index'', in which Greece's score was 1076 with a yellow indication, the second lowest category of risk, which on its own it shows that Greece can attract investments and provide them a high degree of energy security. Compared with the EU member states Greece's score is at the average, which shows its level of competitiveness in the EU energy market. Therefore, Greece should focus on its competitiveness and attract via energy investments financial resources, updating and creating additional infrastructure even for the most remote locations of the country, its islands mainly, while seizing a comparative advantage in the energy sector.

Secondly, the ''Energy Trilemma Index'' places Greece at the 39th place of the index's categorization with scores that reflect the effort made in the energy sector the past decade. Additionally, the increase in low carbon electricity generation in Greece in 2021 energy mix and the augmentation of RES and natural gas share, with a far lower energy intensity shows that the ''Environmental Sustainability'' rate is on the increase. As for the decreasing documented score in

‘‘Energy Equity’’, that can be attributed to the rise of electricity costs in 2021, along with the decreasing incomes caused by the halting of the market due to the Covid-19 pandemic. As for RES, Greece’s effort surpassed the renewable energy mix target of 2020 and continues to be on route for the CO2 emissions reduction target of 2030, while being paired with an increase in Import independence and microeconomic and political stability, Greece is highly enabled to achieve a balanced and improved score in the ‘‘Energy Trilemma Index’’.

Thirdly, the ‘‘Global Sustainable Competitiveness Index’’ (GSCI) shows that Greece is one of the least competitive countries in the EU. Its economy does not yet have a valuable comparative advantage while still being on the verge of developing it. Nonetheless, the county’s overall rank of sustainable competitiveness is 42nd out of 180 countries and per the data its competitiveness is at a very high level with a score of 49.6.

Fourthly, the ‘‘Global Sustainability Index’’ shows that Greece has surpassed successfully its 2020 target and is on track for the next target of net-zero emissions target of 2050. The key points of its national energy strategy are to eliminate lignite coal reliance from its energy mix while increasing its renewable energy share. Specifically, Greece is ranked 33rd on the index, which can be attributed to the environmental policies of the county and the high degree of environmental responsibility.

Fifthly, the ‘‘Environmental Sustainability Index’’ (ESI) provides Greece with a score of 50.1 to 60, which signifies that there are still a lot to be done for the protection of the environment in our country. The developed countries of the EU seem to be over the average score, indicating the degree of environmental sustainability policies in the Union. Even though, the state of environmental sustainability of the EU and the world has changed already ESI can be a useful historical reference for the ground covered the past two decades by the various initiatives and the environmental policies. The zero-emissions target and the energy transitions targets of the EU member states have definitely contributed to the improvement of the environmental sustainability of each EU member state.

Sixthly, the ‘‘Environmental Performance Index’’ (EPI) shows that Greece’s environmental policy is sustainable and follows global trends and initiatives. There’s still many factors to be taken into account to criticize the general effort of the country further. Due to the economic stagnation from the 2008 crisis and then the Covid-19 pandemic, one could expect that these index would rank Greece at a far worse position. Nonetheless, Greece is at the 25th place globally and 3rd regionally in the Eastern Europe. As it seems, even under those conditions, Greece has kept a stable standard policy, which leaves a lot to be expected in the future. The legislative background needed for such an effort exists and is regularly updated based on the policies of the EU, but as it is logical, not all actions show fast results. Primarily, in energy transition, in which a lot of caring and thought is already given for the environment, a certain level of patience and stability should be provided in the legislative stage to avoid confusion and short-term results. The main focus should be timelessness in Greece’s legislative route aiming to long-term results that protect the environment even after the passing of this transitional energy-related era.

Seventhly, the ‘‘Governance Performance Index’’ as a sub-index of the ‘‘Global Sustainable Competitiveness Index’’ ranks Greece 47th out of 180 countries with a score of 57.8. The analysis of individual indicators suggests a deep connection between the Governance framework of a state and its economy. Basically, countries who choose to cut investments (e.g. in infrastructure) and countries with a large and regulating wise, uncontrolled, domestic investment market, and those with a low industrial base have all shown a gradual declining more often and tend to recover far slower than countries with higher investments, smaller domestic financial markets and more advanced industrial base. In the case scenario of an abrupt increase of the financial market size of a country in short-term horizon it most likely to indicate an imminent burst of a bubble. Moreover, sustainable and competitive economies are usually characterized by high efficiency systems and policies. Thus, Greece in order to remain in its present position and try to reach even further ahead it needs an efficient and firm system of governance that will attract investments. Practically, sustainable governance means efficient governance systems that have guar-

antees against author-ism with clear assigned and shared responsibilities between the authorities of each country. Therefore, Greece shows an efficient regulating system that functions quite smoothly, but still needs a lot of improvements that are to provide the necessary legal footing to future investments in the country and especially in the energy sector. In the recent years it is said that the advancements of the energy sector are to and will revolutionize our way of living and the conditions not just in already advanced urban cities, but especially in remote islands of the Greek Archipelago, thus filling all with high expectations and anticipation not just from a regulatory or policy stand point but also from the economic assets these projects are meant to bring, which will sustain the living conditions of the inhabitants of the Islands by creating a variety of job opportunities. Thus, an energy project is not a unilateral effort but a multilateral opportunity.

Finally, a successful energy mix which should include RES can definitely guarantee energy sufficiency, boost sustainable development and contribute towards Greece's economic balance. As for the impact of Covid-19 on the European Green Deal, in the case of Greece, the long-term plan for the de-carbonization will not be significantly affected and the path towards renewable energy projects has been not been derailed[253]. In any kind of energy project and especially in the islands' projects that are planned to take place in Greece, a holistic approach is necessary in the all the stages of the project (from the planning phase to the implementation and to the conservation of the project) taking into account the following factors in order to ensure the longevity of the project: A) the energy security aspect by either using already available statistical data for the country of interest or by gathering the necessary data from scratch (the use of indexes is advised for a holistic approach of the course of action the state of reference took in the years before the project), B) the sustainability factor of the project which has to be examined not just for the project's reference years, but also for its continuation and maintenance, C) the governance factor, in which the legal parameter of the project is included, is crucial to start and implement the project while balancing the rights and obligations of the parties and ensuring

[253] George N.Tzogopoulos, ''Greece economy briefing: Green Energy in Greece'', China-CEE institute, vol.33,no.2, pp.1-4, October 2020. ISSN: 2560-1601

the necessary fail-safes are included in the contract (e.g. type of contract, arbitration clause or agreement and stabilization and adaptation clauses if needed), D) the environmental aspect of the project, which is included in the environmental sustainability of energy security and in the governance legislative factor that includes environmental legislations and initiatives and can affect the project in all its phases. Therefore, a strategy for the planning of a project should include a study of the aforementioned parameters that influence the most a project, while taking into account the course of the state for at least one decade.

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