Article

A Review of the Energy Policy in Greece in the Last 50 Years and Its Implications for Prosperity

G.-Fivos Sargentis [1,*], Romanos Ioannidis [1], Nikos Mamassis [1], Vassilios Zoukos [2] and Demetris Koutsoyiannis [1]

[1] Laboratory of Hydrology and Water Resources Development, School of Civil Engineering, National Technical University of Athens, 9, Heroon Polytechneiou Str., 15772 Zographou, Greece; romanos.ioannidis@gmail.com (R.I.); nikos@itia.ntua.gr (N.M.); dk@itia.ntua.gr (D.K.)

[2] Independent Researcher, 18345 Athens, Greece; vzoukos@otenet.gr (V.Z.)

* Corresponding author. E-mail: fivos@itia.ntua.gr (G.-F.S.)

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ABSTRACT: This paper elucidates the development of electricity production and distribution in Greece from the 1950s to date, in correlation with national and European energy policy. During this period, Greece experienced a multifaceted energy transition, including both the transition of ownership of energy generation companies from public to private and a transition from an energy mix in which coal (lignite) served as a major and inexpensive resource to a mix in which wind power, solar power and natural gas gained a primary role, but with high costs for energy generation. The correlation between electrical energy consumption and economic growth is explored in this context, revealing an increase in consumption before the 2009 recession and a decline thereafter. The study investigates the correlation between escalating electricity prices and legislative dependencies that mandated the purchase of wind- and solar-generated electricity at exorbitant rates, the closure of cost-effective lignite units, and the reliance on natural gas—a commodity susceptible to geopolitical shifts. It also shows that, given the structure of the Greek energy mix, the increase in the share of wind and solar energy in the mix is directly related to the increase in the price of electricity. Highlighting the importance of energy costs for prosperity, this paper underscores, through the detailed review of the Greek energy "landscape", that the major determinants of electricity prices are both the accessibility to natural resources but also their proper and judicious management.

Keywords: Prosperity; Renewable energy; Cost of electricity; Human progress

1. Introduction

Energy is a primary resource for human societies, and its availability is therefore an important issue for prosperity. Many studies have documented the relationship between energy transitions and their broader impacts on national economies and public welfare. Stern [1] highlighted the transformative role of energy infrastructure in fostering industrialization and improving living standards. Sovacool and Brown [2] explored how energy policies and technological innovations have shaped economic resilience and environmental sustainability globally. Moreover, the challenges of balancing renewable energy integration with economic stability have been examined in diverse regions, pointing to the need for harmonized policy approaches [3,4]. Lomborg [5,6] and Tol [7], challenges the cost of energy transition, which has become obvious lately by the increased energy cost in Germany resulting from "green" politics [8] which led to a collapse of the industrial production [9]. These insights underline the importance of examining a country's energy evolution within a global framework, to assess how past strategies align with or diverge from international trends. In this paper, we have chosen Greece as an ideal case study country, because of the multiple crisis that this country suffered in the last 15 years.

Indicators of energy with prosperity can be found in the correlation between energy consumption with Gross Domestic Product (GDP) per capita, and life expectancy. Those correlations were studied with a contemporary focus by Sargentis et al. [10], with conclusions that were also relevant to the recent energy crisis, e.g., as covered by the press, with "The Economist" arguing that "Expensive energy may have killed more Europeans than COVID-19 last winter" [11] as higher prices of energy caused energy poverty which reduced energy consumption in households. The direct correlation of the value of money with the price of energy, which is demonstrated in the recent work of Sargentis and Koutsoyiannis [12], is an additional indication to this claim. It is clear that a hundred US$ in a country where the cost of electricity is 1 US$ per kWh would have less purchasing power compared to a country where electricity costs 0.1 US$ per kWh, as more of the available funds would be consumed by basic energy needs which are attached to the products of the supply chains.

Furthermore, this shift highlights the importance of comprehending the consequences of such changes for both the industry and consumers. Considering that the Water-Energy-Food nexus forms a fundamental basis for prosperity [13,14] (e.g., households utilize electricity for various purposes such as cooking and heating, farmers depend on electricity for pumping underground water, and most bakeries rely on electricity for baking bread), it becomes evident that the cost of energy is intricately connected to the overall cost of living [15].

In recent years, there has been an ongoing discussion in Greece regarding the increasing price of electricity and energy poverty [16]; however, in both the public political debate and the media coverage of this discussion, any reference to a historical time series of the price of kWh is absent. For this reason, in this work, we traced and depicted such data, in order to facilitate public discussion on quantitative terms and enable progress in this area. In addition, we carried out various correlations of the price of energy with other timeseries like GDP per capita and others. Our investigation confirmed that, while GDP per capita in Greece was rising until 2008, energy consumption also followed a positive trend. However, during the recent recession, this trend reversed. This correlation provides an additional point of connection between the consumption of energy and prosperity.

We note at this point that in this paper, to avoid ambiguity, we explicitly refer to Wind And Solar Energy Sources (WASES), rather than using the broader term renewable energy. Hydropower is the major renewable energy source but is omitted from our discussion, despite the fact that it has a significant contribution to national Greek economy [17,18] and leads the Global energy mix [19–21]. This choice was made because both the percentage and the role of hydropower in the Greek energy mix have been stable, mostly, during the study period (and particularly during the last 3 decades when hydroelectric development has come to a complete stop). Thus, no impacts are to be expected.

This study investigates the historical evolution of Greece's energy sector, emphasizing the transitions in energy policy and their socioeconomic impacts. It combines extensive time-series data with a detailed analysis of the interplay between energy prices, consumption, and economic prosperity. Unlike previous studies, this work offers a quantitative analysis of how privatization, legislative decisions, and the integration of renewable energy have shaped the energy landscape. The findings challenge common assumptions about renewable energy economics and provide critical insights for future policymaking. This comprehensive analysis sheds light on the Greek context and offers insights into broader European and global renewable energy strategies.

2. History of the Greek Energy Policy

In the 1950s, only a small share of the population of Greece had access to electricity [22] as the country was emerging from World War II (WW2) and subsequent civil war and the living standards were at a pre-industrial level. The rules for the electrical supply were described at those times by Law 2979/1922 [23] and the rules for the use of hydropower were described in the Legislative decree of 1923 [24].

The development of modern Greece was set up by knowledge and guidance directly or indirectly provided by the USA, which was behind Greek politics since the end of WW2 and the civil war [25]. The political aspects related to the reconstruction of Greece were based on the concept of the "New Deal". The New Deal encompassed a set of initiatives, public infrastructure projects, financial changes, and regulatory measures implemented by President Franklin D. Roosevelt in the USA from 1933 to 1938 [26]. The New Deal was based on the thoughts of John Maynard Kyenes [27], Frank Knight [28] and, Adolf A. Berle, Jr., and Gardiner Means [29]. Berle and Means argued about the modern corporation and private property and supported that social control of the companies would not prevent their functionality, but would rather be useful. They also argued that only the large companies dominating their markets are able to pioneer new technological solutions and improve production.

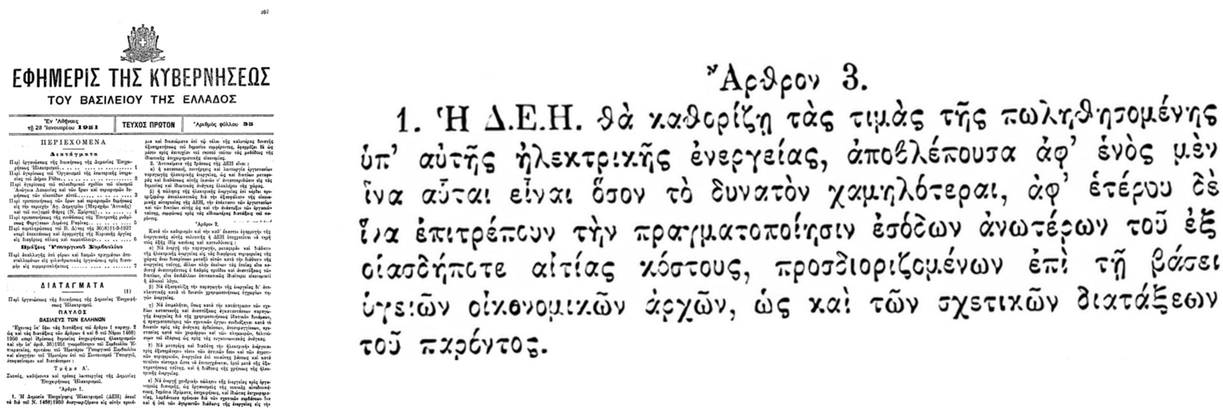
Other ideological influences of this era were those by William Trufant Foster and Waddill Catchings [30] and by Alvin Harvey Hansen [31]. Forster and Catchings advocated long-term public infrastructure projects, at a time when only few economists argued in favor of expanding the role of the state in the economy. In addition, Hansen supported the possibility of economic recovery through state interventions [32].

The history of economic thought that applauded the New Deal cannot be exhausted in the above lines. It was an economic experiment in progress which was distinguished by faith in the intervention, the rationalization, the organization and the priority of the recovery of the internal market. It was accompanied by the belief in financial freedom and in the ability to perform excellent results [33–35].

The reformation of Greece is depicted in the Diary of Paul Porter [36] who was the envoy of the US president for the reconstruction of Greece and it was based on the New Deal. Therefore, immediately after the Greek state created the Public Power Corporation (PPC; in Greek Δημόσια Επιχείρηση Ηλεκτρισμού—ΔΕΗ) by the Law 1468/1950 [37], a contract was signed with the American company EBASCO for the modernization of the Energy Reconstruction Program [38,39].

Influenced by the economics of New Deal, the Royal Decree [40] (Figure 1) which formatted the organization of the administration of the PPC, stated in Article 3.

PPC shall determine the prices of the electrical energy sold by it aiming, on the one hand, for the prices to be as low as possible and on the other hand, to allow the realization of incomes higher than costs originating from any reason, determined on the basis of sound financial principles, as well as the relevant provisions of the present.


ΕΦΗΜΕΡΙΣ ΤΗΣ ΚΥΒΕΡΝΗΣΕΩΣ
ΤΟΥ ΒΑΣΙΛΕΙΟΥ ΤΗΣ ΕΛΛΑΔΟΣ

Ἄρθρον 3.

1. Ἡ Δ.Ε.Η. θὰ καθορίζῃ τὰς τιμὰς τῆς πωληθησομένης ὑπ' αὐτῆς ἠλεκτρικῆς ἐνεργείας, ἀποβλέπουσα ἀφ' ἑνὸς μὲν ἵνα αὗται εἶναι ὅσον τὸ δυνατὸν χαμηλότεραι, ἀφ' ἑτέρου δὲ ἵνα ἐπιτρέπουν τὴν πραγματοποίησιν ἐσόδων ἀνωτέρων τοῦ ἐξ οἱασδήποτε αἰτίας κόστους, προσδιοριζομένων ἐπὶ τῇ βάσει ὑγιῶν οἰκονομικῶν ἀρχῶν, ὡς καὶ τῶν σχετικῶν διατάξεων τοῦ παρόντος.

(**a**) (**b**)

Figure 1. (**a**) The first page of the Royal Decree (**b**) Article 3 of the Royal Degree.

There were successive laws and decrees [41–44] that determined the operation of the PPC until 1999. Thereafter, contrary to those ideas and theories, the so-called neoliberal thought [45,46] prevailed in economic politics. This advocates for minimal government intervention, privatization, and market-driven solutions, including the user-pays principle, in the provision of public infrastructures.

Following the Directive 96/92/EC [47], the Greek parliament voted the Law No. 2773/1999 [48], where the cost of the electricity market was liberated, and PPC became a private company by the Presidential Decree No. 333/2000 [49]. In this way, in 1999–2000, PPC lost its public character. After the Law No. 2773/1999 came into force, Combined Cycle Gas Turbine Power Plant (CCGT) units [50] owned by private companies were installed. The latter legislation aimed at increasing the consumption of imported natural gas instead of domestically produced lignite. Different pricing models were introduced during that period in the wholesale electricity market in order to secure the profitability of the CCGT units.

With these provisions, following additional EU directives [51,52] and the laws which implemented them to the Greek state [53–57], electricity, which until 1999 was considered as public good that should be sold at the lowest possible price, came closer to being a regular free-market product, sold with the aim of the involved companies' profit [58–61] rather than that of social prosperity. Hence, market models influenced the price of electricity, as also did the energy mix, determined by both market objectives and general energy policies.

The latter policies forced the development of WASES. As will be seen below, the price of energy has increased in correlation with the increase of WASES production of electricity. This correlation is supported by direct impacts to prices and is not subject to the common "correlation does not prove causation" principle. The exact reasons for this increase, however, can be found both in technical aspects of WASES, like e.g., low-capacity factors [62], andin institutional ones. Most important among the latter is the subsidies and the regulation by law of the prices of electricity originating from WASES, thus converting the market environment from liberal to controlled.

3. Materials and Methods

3.1. Summary of the Methodology

The methodology involves a multifaceted approach to investigate the dynamics of electricity pricing, consumption, and the influence of energy sources in Greece. The research starts by establishing a baseline for the price of electricity per kilowatt-hour (kWh) in current values (covering the period from 1968 to 2023).

To complement the pricing data, the study also includes per capita electricity consumption statistics from the World Bank and Our World in Data, covering the period from 1960 to 2022. This allowed us to estimate the annual cost of electricity per capita in present-day euros. Further, the study analyzes the impact of wind, solar power, and natural gas on the energy mix, alongside GDP per capita data from the World Bank, to examine the relationship between energy costs and economic performance.

The study's results outline a series of analyses and findings, leading to a discussion of the correlation between electricity prices and the generation mix, including lignite, natural gas, and renewable energy sources (WASES), while highlighting how economies of scale and technology adoption impact pricing. It also explores the relationship between GDP per capita, electric power consumption, and the ratio of energy cost to GDP per capita, providing insights into economic growth, recession impacts, and energy dependency.

3.2. Data Used

In order to estimate the cost of kWh for an average household in Greece, a request was submitted to the Hellenic Statistical Authority, which responded that there is no availability of such data. However, the primary data were finally accessed through PPC [63] (also provided in the Appendix A), in reports of the European Commission (1980–2003) [64,65], and in the Eurostat Database (2004–2023) [66]. The energy-price data collected by PPC, the reports of the European Commission and Eurostat Database were then converted in current values based on the Greek monetary unit evolution value (annual), which is referred on the general Consumer Price Index (CPI) [67].

Additionally, we used data from The World Bank (1960–2014) [68] and Ourworldindata [69] (2014–2022) for the electric power consumption (kWh per capita), estimating the annual cost of electricity per capita in present values in euro (1990–2023). Furthermore, we used the GDP per capita for Greece (1960–2022) by the World Bank [70].

3.3. The Price of Energy

The collected and processed data on the price of kWh for a typical household (with average energy consumption) in Greece are presented in Figure 2. Remarkable is the low prices during the decade 2000–2010 and the increased prices thereafter.

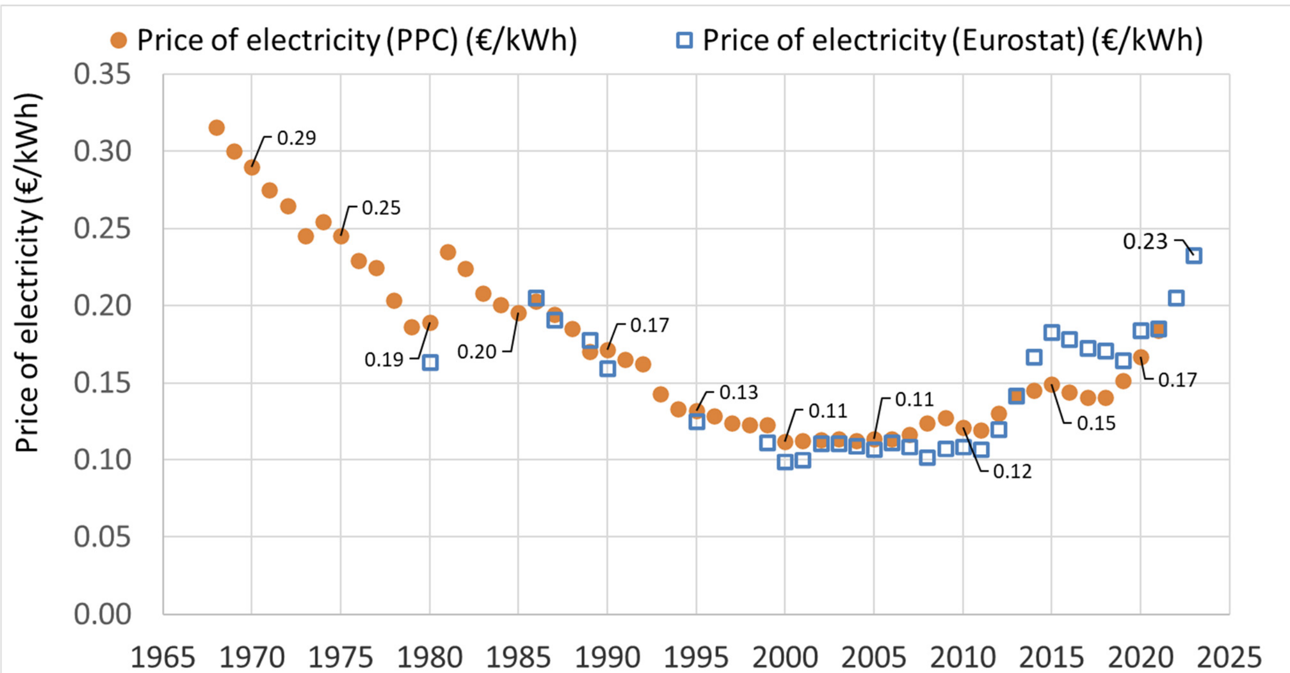


Figure 2. Prices of electricity after conversion (in current €/kWh) for a typical household in Greece 1969–2023 [63–66].

Using the above data, we analyzed the ratio between price of energy per capita to GDP per capita. We also estimated the ratios of WASES generation to total energy generation and natural gas generation to total energy generation. With the timeline of the energy prices at our disposal, we could now investigate the correlation of electricity prices with the changes in the structure of the energy mix in Greece as defined by the percentages of energy generated from lignite, natural gas, and WASES. This is presented in Section 4.

4. Results

4.1. GDP Per Capita and Electric Power Consumption

The comparison of GDP per capita and electric power consumption per capita in Greece (Figure 3) reveals a notable relationship between the two. Up to 2008, there is a clear upward trend in GDP per capita, indicating economic growth during this period. The formal declaration of a recession in 2009, as indicated by the Law 3845/2010 [71], marked a turning point in the economic trajectory. The recession is illustrated by a declining trend in both GDP and energy consumption per capita (Figure 3). The ratio of the cost of energy per capita to GPD per capita is shown in Figure 4.

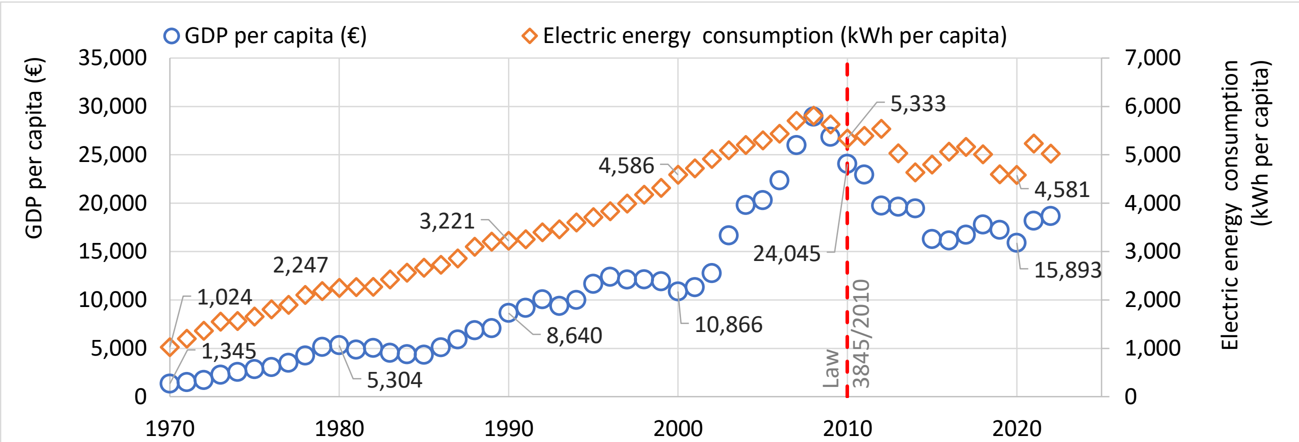


Figure 3. GDP per capita (€) [70]; Electric energy consumption (kWh per capita) 1990–2023 [72].

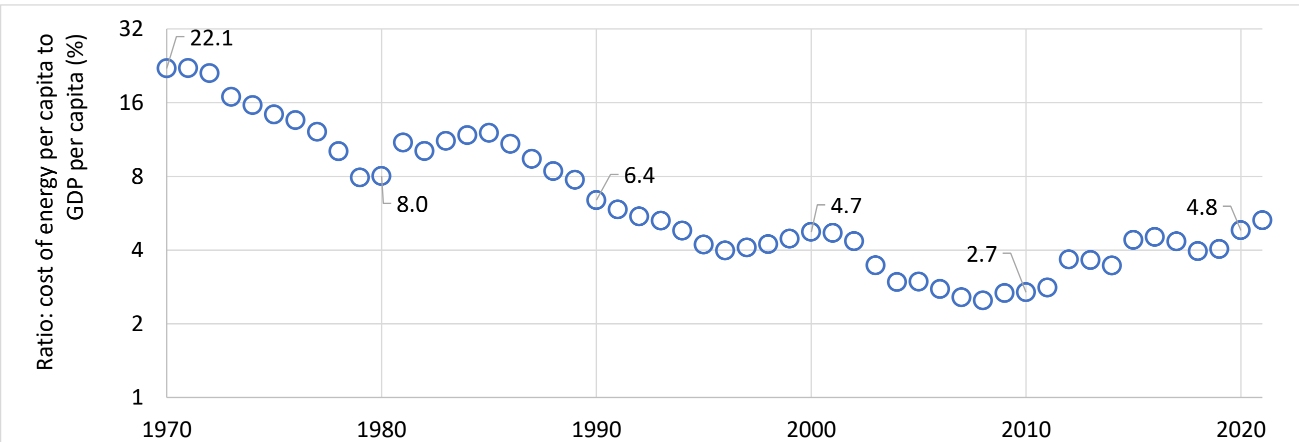


Figure 4. Ratio: Cost of energy per capita to GDP per capita.

Correlating these trends with electric energy consumption per capita (Figure 3), a significant pattern emerges. During the period of economic growth (1990–2008), there is a parallel increase in electric power consumption, suggesting a positive correlation between economic prosperity and energy usage. Conversely, in the recession period following 2009, there is a noticeable decline in electric power consumption, reflecting the economic downturn. This correlation emphasizes the sensitivity of electricity consumption to economic conditions, with increased economic activity driving higher energy demand, while economic contraction results in reduced energy consumption. Even if this period was a shock for households, the usage of energy was decreased and the prices of energy were rising, the ratio of cost of energy per capita to GDP per capita was increased showing the dependance in modern way of living with energy usage.

4.2. The Role of Energy Mix and Technology in Prices of Electricity (1990–1999)

The contribution of the different energy sources, namely lignite, natural gas, and WASES, in the energy mix is depicted in Figure 5.

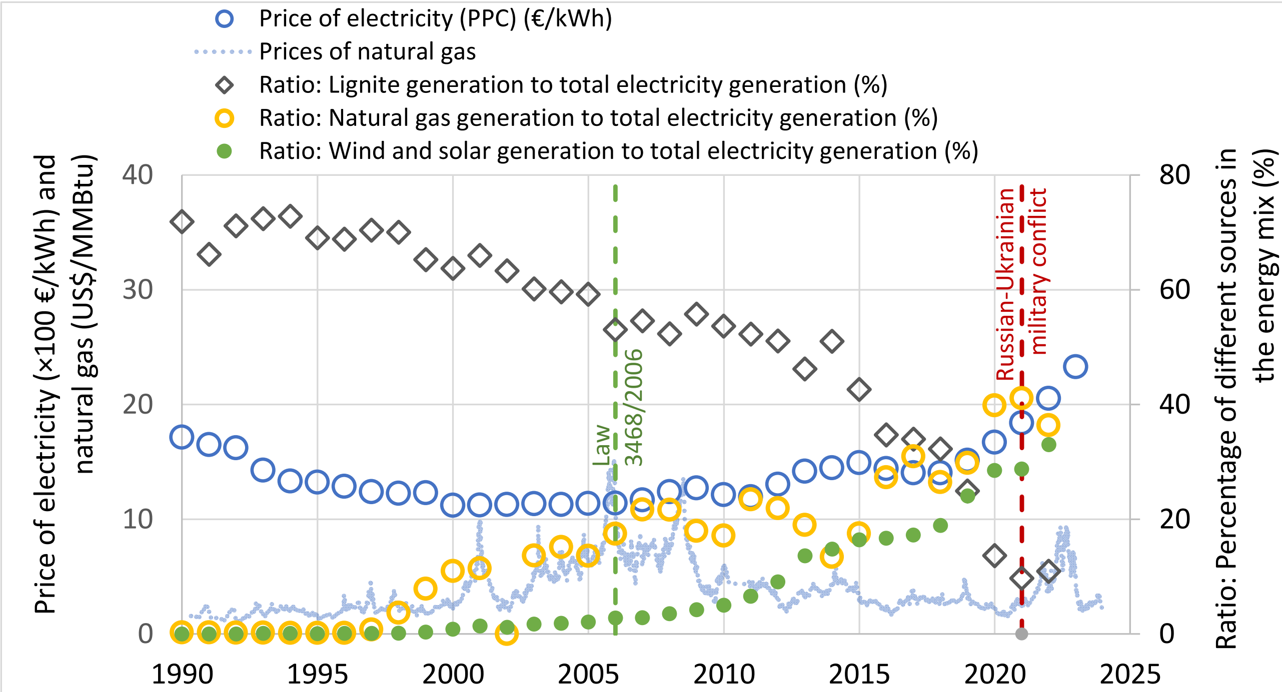


Figure 5. Prices of electricity and natural gas [73] and percentage of different sources in the energy mix 1990–2023 [74].

During the period from 1990 to 1999, lignite accounted for approximately 70% of the energy mix, showcasing a substantial reliance on this particular energy source in Greece. PPC played a pivotal role during this time, adapting to technological advancements and capitalizing on economies of scale. The curve illustrated in Figure 6 indicates that, as the proportion of energy generated from lignite increased, there was a concurrent decrease in energy prices.

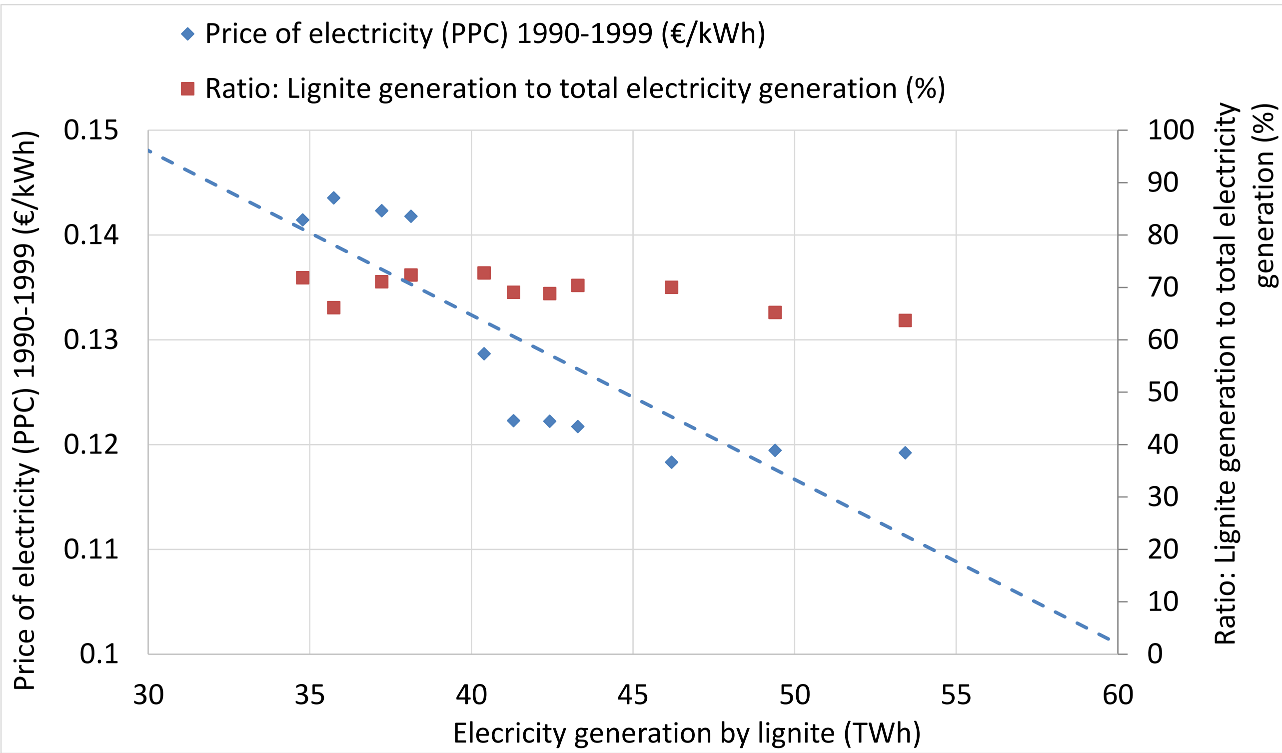


Figure 6. Price of electricity in relation to electricity generation by lignite. For comparison the ratio of lignite generation to total electricity generation is also plotted.

This alignment suggests that PPC strategically leveraged technological progress and economies of scale to optimize energy production, emphasizing its commitment to providing affordable energy to the population. This strategy strikes a balance between energy affordability and the use of domestic resources to meet the population's energy needs, aligning with PPC's mission to provide cost-effective energy solutions. Discussion—The role of politics in prices of electricity (2001–now).

Two significant processes are to be highlighted regarding Greece's energy sector as it enters the new millennium: the privatization of PPC and the "de-carbonation" process. These two processes, however, are not only relevant to Greece, as they have involved most European countries to varying degrees. The former, the privatization of national energy infrastructure, underscores a shift in perspective, treating energy as a product rather than a public good, which had implications for market dynamics and consumer relations. The latter, *i.e.*, the effort for decarbonization, refers to the European Union's policies known as combating climate change [75]. This move signifies a commitment to the technologies of WASES, reflecting a trend toward reducing reliance on fossil fuels for electricity generation.

One critical decision which arguably had major implications for the price of energy in Greece was the law 3468/2006 [76] (Figure 6). Koutsoyiannis [20] noted:

> *This law…determines prices for different renewable energies ranging between 73 and 500 €/MWh, which indicates a generous subsidy, given that even the retail price for household connections is lower (currently 53 €/MWh at night).*

The introduction of Law 3468/2006 [76] marked a significant policy shift in Greece's energy sector, stipulating that the price of generated electricity from WASES should be approximately up to 24 times higher than that generated from lignite [77]. A distinctive feature of this legislation was the network's obligation to purchase wind and solar energy, regardless of its utility.

Gradually, after 2000 a noteworthy surge in WASES is observed (Figure 6) [78,79]. Despite the logical expectation that economies of scale and technological advancements would drive down unit costs with increased quantities, Figure 7 indicates a counterintuitive trend. Contrary to the expectation that a greater presence of WASES would result in lower electricity prices (in the popular imagination, they are thought of as gratis), it is observed that as the share of energy from WASES in the energy mix grows, electricity prices also increase (Figure 7). This observation opposes the conventional understanding that a higher abundance of WASES, would naturally lead to cost reductions. Apparently, this pattern contradicts the fundamental role of PPC, as stated in its institutional law.

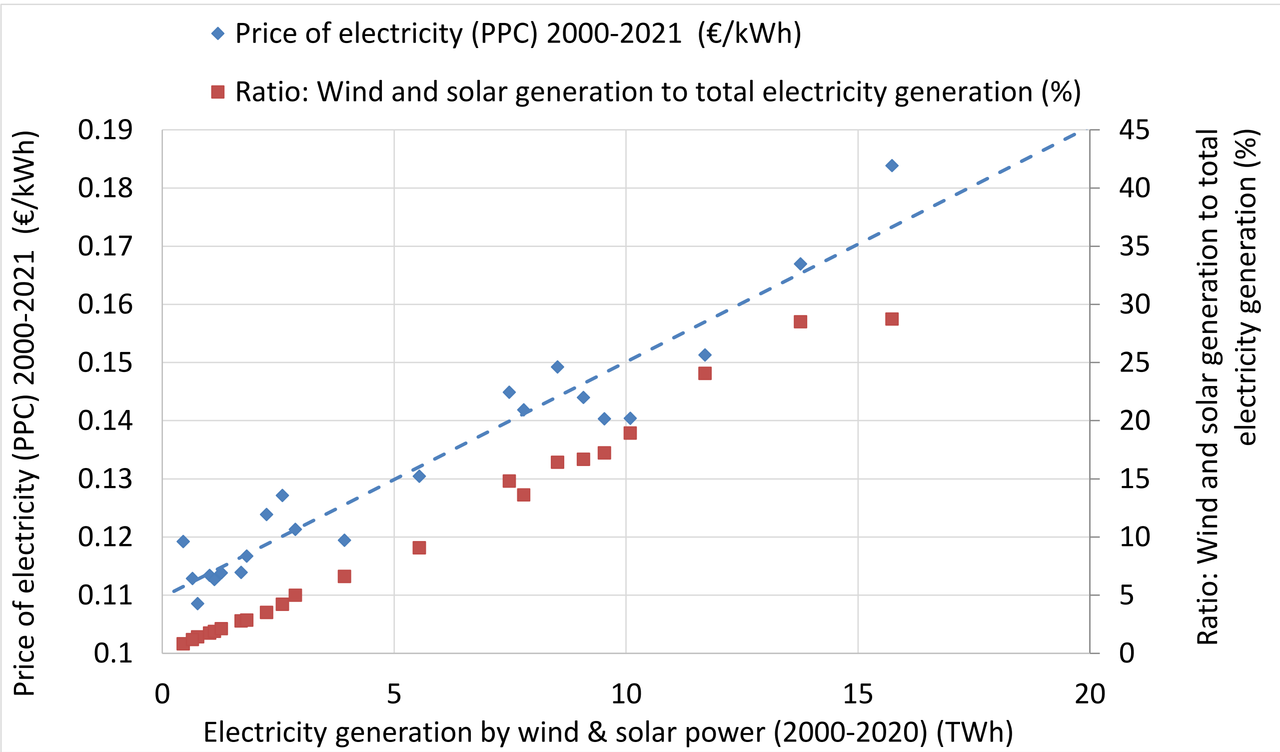


Figure 7. Price of electricity in relation to electricity generation by WASES. For comparison the ratio of wind and solar generation to total electricity generation is also plotted.

While economies of scale favor the use of lignite [80], which results in cheaper electricity, there is a reverse trend for WASES. The more electricity is generated from wind and solar energy, the more expensive it becomes. Similar trends are observed elsewhere, such as in California, which leads the way in the installation of WASES in the United States [81]. As a result, it seems that electricity prices in California are much higher than the national average [82].

This phenomenon prompts a deeper analysis of the factors influencing the cost dynamics of wind and solar power. Potential considerations may include the complexity of integrating WASES into existing energy infrastructures, the need for complementary technologies to address intermittency issues, or specific policy and market dynamics affecting the pricing structure. Addressing this apparent discrepancy between expectations and observed costs is essential for understanding the role of WASES.

Furthermore, recent legislative measures have introduced a complex framework for determining electricity prices [83,84]. While these regulations aim to address various aspects of the energy market, data show that the availability and affordability of resources have played a crucial role in influencing electricity prices. This fact is also highlighted by the role of the increase in the price of natural gas, which is influenced by geopolitical conflicts. With the change in pricing policy in 2016, natural gas is the crucial determinant of the electricity price, as it is usually the last source entering the energy mix.

The emergence of geopolitical issues in 2022 disrupted the natural gas market (Figure 5), leading to increased prices. Consequently, this geopolitical impact resulted in a notable rise in electricity prices, emphasizing the interconnectedness of global events and energy market dynamics. On the contrary, even though electricity production from oil had a significant share (15.3%) in 2008, the skyrocketing of oil prices [85] did not affect the price of electricity, as domestically produced lignite contributed 52.3% in the generation of the energy mix.

In terms of public opinion, this was a highlight for a shift towards a more detailed investigation of practices and policies defining energy prices. Relevant questions had already been raised in the context of the impact of WASES: (a) in water-energy and food nexus [86,87]; (b) landscape [88–93] and (c) to the stochastic dynamic of the energy production of WASES (stability of the energy grid) [94–97].

The implemented policies have resulted in a substantial increase in the price of electricity in Greece, a trend that is evident across the entire European Union in 2023 (Figure 8). The average cost of electricity price in EU in 2002 was 0.21 €/kWh while in 2023 was 0.27 €/kWh (increased 19%). The average cost of electricity price in Greece in 2002 was 0.11 €/kWh while in 2023 was 0.23 €/kWh (increased 109%). Furthermore, if those price changes are also seen from the perspective of lower customer power of the average person due to the high inflation changes of the last two decades the importance of those results for prosperity is even higher.

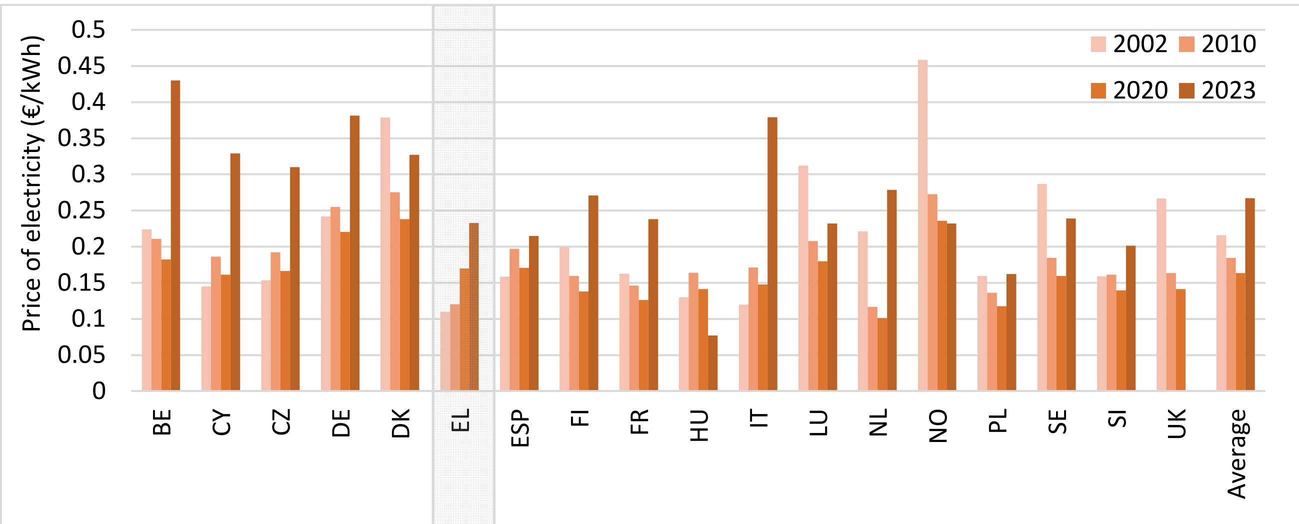


Figure 8. Price of electricity (depreciated in current €/kWh) in countries of EU (2002, 2010, 2020, 2023) [66]. The shade part indicates the evolution of prices in Greece.

5. Conclusions

Our work delves into Greece, as a detailed case study, but its inferences refer to all European and other countries that are intertwined in such policies and politics. In Greece, the production and distribution of electricity evolved from being a public good, produced from a cheap natural resource (lignite), to becoming a profitable commodity due to larger contribution of expensive technologies, and eventually resulting in a higher cost to the consumers. The cause of this was primarily found in both the technical and legislative aspects and the integration of wind energy, solar energy and imported natural gas to the national energy mix. We also used the processed data to examine how electricity consumption correlates with economic development. We found that, before the 2009 recession, energy consumption was increasing, whereas after the recession—particularly during the economic crisis of the 2010s—it showed a declining trend. A critical issue raised from this work is the transparency in energy pricing and its correlation with political conditions. The historical analysis of Greece's energy market reveals how both novel political views and a lack of clarity in the financial mechanisms behind renewable energy subsidies and market reforms transformed the energy market and contributed to overall inefficiencies in the price market. As the investment in WASES is in question for their impact: (a) in Water-Energy and Food nexus; (b) in landscape and (c) in their stochastic nature of energy production [98] (stability of the energy grid), Greece and other nations undergoing similar transitions should include the increasing cost of electricity price in relevant discussions. Scientific and social study of all the above-mentioned parameters of renewable energy management and design can enhance social cohesion and foster public trust and economic stability. Moving forward, societies should re-evaluate the energy transition costs and incorporate public consultation.

Overall, the analysis of real-world data on energy production, consumption, and price, in the case of Greece, is an indication of the following: Aspirations of modern economic thinking related to energy (also labelled as contemporary "green" ideologies [98]), namely the market "liberation" and transformation of energy from a good to a commodity, the introduction of the natural gas to replace conventional fossil fuels, and the rapid development of WASES, are all prone to lead to substantial increases of energy costs and decline of social prosperity. These factors reversed the trends of several decades in the 20th century, during which prosperity increased as energy costs steadily declined. In this regard, we propose that even though the future of national and European energy policies should include environmental, ecosystem, and landscape considerations, emphasis should also be placed on ensuring that policies should not be benefiting industries (by means of subsidizing) at the cost of European citizens.

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Author Contributions

Conceptualization G.-F.S.; methodology G.-F.S.; validation G.-F.S., D.K., N.M., R.I.; formal analysis, G.-F.S.; investigation, G.-F.S., V.Z.; data curation, G.-F.S.; writing—original draft preparation, G.-F.S., D.K.; writing—review and editing G.-F.S., R.I., D.K.; visualization, G.-F.S.; All authors have read and agreed to the published version of the manuscript.

Ethics Statement

Not applicable.

Informed Consent Statement

Not applicable.

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Declaration of Competing Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data Availability Statement

The databases utilized are thoroughly outlined and referenced in the citation provided within the text, and they are publicly available. Price data by PPC are given in Appendix A.

Appendix A

Year	Price of Electricity (PPC) (Drachma/kWh)	Year	Price of Electricity (PPC) (€/kWh)
1968	1.2130	2002	0.0755
1969	1.1840	2003	0.0786
1970	1.1770	2004	0.0803
1971	1.1490	2005	0.0840
1972	1.1550	2006	0.0868
1973	1.2370	2007	0.0915
1974	1.6270	2008	0.1011
1975	1.7760	2009	0.1050
1976	1.8850	2010	0.1050
1977	2.0680	2011	0.1068
1978	2.1110	2012	0.1184
1979	2.3000	2013	0.1275
1980	2.9180	2014	0.1285
1981	4.5090	2015	0.1301
1982	5.2130	2016	0.1245
1983	5.8100	2017	0.1227
1984	6.6330	2018	0.1235
1985	7.7200	2019	0.1334
1986	9.8450	2020	0.1454
1987	10.9930	2021	0.1621
1988	11.8950		
1989	12.4260		
1990	15.0640		
1991	17.3070		
1992	19.7250		
1993	19.8490		
1994	20.5470		
1995	22.2220		
1996	23.3540		
1997	23.7850		
1998	24.6460		
1999	25.3720		
2000	23.8850		
2001	24.7360		

References

1. Stern DI. The role of energy in economic growth in "Ecological Economics Reviews". *Ann. N. Y. Acad. Sci.* **2011**, *1219*, 26–51.
2. Sovacool BK, Brown MA. Competing Dimensions of Energy Security: An International Perspective. *Annu. Rev. Environ. Resour.* **2010**, *35*, 77–108. Available online: https://ssrn.com/abstract=3445381 (accessed on 15 November 2024).
3. IEA. *World Energy Outlook 2020*; IEA: Paris, France, 2020. Available online: https://www.iea.org/reports/world-energy-outlook-2020 (accessed on 15 November 2024).
4. REN21, Renewables 2024. Global Status Report, Global Overview 2024. Available online: https://www.ren21.net/wp-content/uploads/2019/05/GSR2024_GlobalOverview_Full_Report_with_endnotes_web.pdf (accessed on 15 November 2024).
5. Lomborg B. Welfare in the 21st century: Increasing development, reducing inequality, the impact of climate change, and the cost of climate policies. *Technol. Forecast. Soc. Chang.* **2020**, *156*, 119981. doi:10.1016/j.techfore.2020.119981.
6. Lomborg B. 'Net Zero' Fails the Cost-Benefit Test. *Wall Str. J.* **2023**. Available online: https://www.wsj.com/articles/net-zero-fails-the-cost-benefit-test-paris-climate-accord-cop28-748ae52d (accessed on 15 November 2024).
7. Tol RSJ. Costs and benefits of the Paris climate targets. *Clim. Chang. Econ.* **2023**, *14*, 2340003. doi:10.1142/S2010007823400031.
8. Reuters. Germany's 2023 CO_2 Emissions Fall to Lowest in 70 Years but Drop Not Yet Sustainable—Study. Available online: https://www.reuters.com/business/environment/germanys-2023-co2-emissions-fall-lowest-70-years-drop-not-yet-sustainable-study-2024-01-04/ (accessed on 15 November 2024).

9. Wall Street Journal. Volkswagen Hits the Net-Zero Wall. The German Company'S Layoffs and Pay Cuts Are a Warning to America about Biden-Harris Climate Policies. Available online: https://www.wsj.com/opinion/volkswagen-layoffs-net-zero-electric-vehicles-europe-4d182e15?st=HMRHTi (accessed on 15 November 2024).
10. Sargentis G-F, Lagaros ND, Cascella GL, Koutsoyiannis D. Threats in Water–Energy–Food–Land Nexus by the 2022 Military and Economic Conflict. *Land* **2022**, *11*, 1569. doi:10.3390/land11091569.
11. The Economist. Expensive Energy May Have Killed More Europeans than COVID-19 Last Winter. Available online: https://www.economist.com/graphic-detail/2023/05/10/expensive-energy-may-have-killed-more-europeans-than-covid-19-last-winter (accessed on 15 November 2024).
12. Sargentis G-F, Koutsoyiannis D. The Function of Money in Water–Energy–Food and Land Nexus. *Land* **2023**, *12*, 669. doi:10.3390/land12030669.
13. Sargentis G-F, Mamassis N, Kitsou O, Koutsoyiannis D. The role of technology in the water–energy–food nexus. A case study: Kerinthos, North Euboea, Greece. *Front. Water* **2024**, *6*, 1343344. doi:10.3389/frwa.2024.1343344.
14. Sargentis G-F, Defteraios P, Lagaros ND, Mamassis N. Values and Costs in History: A Case Study on Estimating the Cost of Hadrianic Aqueduct's Construction. *World* **2022**, *3*, 260–286. doi:10.3390/world3020014.
15. Sargentis G-F. Issues of Prosperity: Stochastic Evaluation of Data Related to Environment, Infrastructures, Economy and Society. Ph.D. Thesis, National Technical University of Athens, Athens, Greece, 2022.
16. Papada L, Kaliampakos D. Measuring energy poverty in Greece. *Energy Policy* **2016**, *94*, 157–165. doi:10.1016/j.enpol.2016.04.004.
17. Koutsoyiannis D, Ioannidis R. The Energetic, Environmental and Aesthetic Superiority of Large Hydropower Projects over Other Renewable Energy Projects. In *Proceedings of the 3rd Hellenic Conference on Dams and Reservoirs*; Hellenic Commission on Large Dams: Zappeion, Athens, 2017.
18. Ioannidis R, Koutsoyiannis D. Evaluating the Landscape Impact of Renewable Energy Plants. In Proceedings of the Geophysical Research Abstracts, Vienna, Austria, 23–28 April 2017; Volume 19, p. 5297.
19. Mamassis N, Efstratiadis A, Dimitriadis P, Iliopoulou T, Ioannidis R, Koutsoyiannis D. Water and Energy. In *Handbook of Water Resources Management: Discourses, Concepts and Examples*; Bogardi JJ, Joyeeta Gupta KD, Wasantha N, Léna S, van Nooijen RRP, Navneet K, Eds.; Springer: Cham, Switzerland, 2021.
20. Koutsoyiannis D. Scale of Water Resources Development and Sustainability: Small Is Beautiful, Large Is Great. *Hydrol. Sci. J.* **2011**, *56*, 553–575.
21. Ioannidis R, Koutsoyiannis D. *A Generic Quantification of the Landscape Impacts of Wind, Solar and Hydroelectric Energy Works*; Argonne National Laboratory: Lemont, IL, USA, 2023.
22. The Exciting Story of Electricity in Greece—The Role of the Public Power Corporation (ΔΕΗ) Available online: https://www.imerisia.gr/oikonomia/23303_kai-egeneto-fos-i-synarpastiki-istoria-toy-ilektrismoy-stin-ellada-o-rolos-tis-dei (accessed on 15 November 2024).
23. Law: 2979/1922 about Electrical Installations. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19220100137 (accessed on 15 November 2024).
24. Legislative Decree: (1) 20.08.2023. On the Exploitation of the Power of Running Water. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19230100198 (accessed on 15 November 2024).
25. Svolopoulos K. *Konstantinos Karamanlis. Archive. Facts and Texts*; Fundation of Konstantinos G. Karamanlis, Ekdotiki Athinwn: Athens, Greece, 1955.
26. Hiltzik M. The New Deal: A Modern History. 2011. Available online: https://books.google.gr/books?hl=en&lr=&id=GSsB9ttHnXwC&oi (accessed on 15 November 2024).
27. Keynes JM. *The General Theory of Employment, Interest and Money*; Palgrave Macmillan: London, UK, 1936. Available online: https://scholar.google.com/scholar_lookup?title=The+General+Theory+of+Employment,+Interes (accessed on 15 November 2024).
28. Knight F. *Risk, Uncertainty and Profit*; Houghton Mifflin Company: Cambridge, MA, USA, 1921. Available online: https://fraser.stlouisfed.org/files/docs/publications/books/risk/riskuncertaintyprofit.pdf (accessed on 15 November 2024).
29. Berle AA, Means GC. *The Modern Corporation and Private Property*; Macmillan Co.: New York, NY, USA, 1933. Available online: https://edisciplinas.usp.br/pluginfile.php/106085/mod_resource/content/1/DCO0318_Aula_0_-_Berle__Means.pdf (accessed on 15 November 2024).
30. Foster WT, Catchings W. *The Road to Plenty*; Houghton Mifflin: Boston, MA, USA, 1928.
31. Hansen AH. *Full Recovery or Stagnation?*;W. W. Norton & Co: New York, NY, USA, 1938.
32. Kaldor N. Full Recovery or Stagnation? Alvin Harvey Hansen. *Econ. J.* **1939**, *49*, 91–94. doi:10.2307/2225186.
33. Koutsoyiannis D, Sargentis G-F. Entropy and Wealth. *Entropy* **2021**, *23*, 1356. doi:10.3390/e23101356.
34. Sargentis G-F, Iliopoulou T, Dimitriadis P, Mamassis N, Koutsoyiannis D. Stratification: An Entropic View of Society's Structure. *World* **2021**, *2*, 153–174. doi:10.3390/world2020011.
35. Sargentis G-F, Ioannidis R, Bairaktaris I, Frangedaki E, Dimitriadis P, Iliopoulou T, et al. Wildfires *vs*. Sustainable Forest Partitioning. *Conservation* **2022**, *2*, 195–218. doi:10.3390/conservation2010013.

36. Porter P. *Diary. A Miracle Is Needed for Greece (Ζητείται ένα θαύμα για την Ελλάδα)*; Metamesonychties edt (Μεταμεσονύκτιες εκδόσεις): Athens, Greece, 2008. ISBN: 960- 7800-17-6.
37. Law 1468/1950. about the Establishment of a Public Electricity Company. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19500100169 (accessed on 15 November 2024).
38. Compulsory Law 1566/1950. Regarding the Sanctioning of the EBASCO of the Contract and Regulation Concluded on July 20, 1950, Issues Related to the Implementation of the Energy Act Reconstruction Program". Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19500100256 (accessed on 15 November 2024).
39. Law 1633/1951. Regarding the Sanctioning and Modification of the Under No. 1566/50 Compulsory Law "On the Sanctioning of the EBASCO House of the Contract and Regulation Concluded on July 20, 1950 Issues Related to the Implementation of the Energy Act Reconstruction Program". Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19510100010 (accessed on 15 November 2024).
40. Royal Decree (1) 28.1.51 Regarding the Organization of the Public Enterprise Administration of Electricity. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19510100035 (accessed on 15 November 2024).
41. Legislative Decree 3523/1956 On the Organization of the Distribution of Electricity. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19560100174 (accessed on 15 November 2024).
42. Royal Decree 20.1.1951. Permission for an Electrical Installation in the Town Atsikis (Lemnos) to Triantaphyllon Spyridelli Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19510100026 (accessed on 15 November 2024).
43. Compulsory Law 100/1967. Regarding the Amendment and Completion of the Provisions "Regarding Establishment and Organization of the Administration of Public Electricity Company" and Other Relevant Provisions. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19670100142 (accessed on 15 November 2024).
44. Law 4491/1966. On the Insurance of the Personnel of the Public Company of Electricity. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19660100001 (accessed on 15 November 2024).
45. Hayek FA. *The Constitution of Liberty*; University of Chicago Press: Chicago, IL, USA, 1960.
46. Friedman MA. *Program for Monetary Stability*; Fordham University Press: New York, NY, USA, 1960.
47. Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 Concerning Common Rules for the Internal Market in Electricity. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31996L0092 (accessed on 15 November 2024).
48. Law No. 2773/1999, Liberalization of the Electricity Market. Regulation of Energy Policy Issues and Others Provisions. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=19990100286 (accessed on 15 November 2024).
49. Presidential Decree No. 333/2000 Conversion of the Public Electricity Company into a Public Company and Approval of Its Statutes. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20000100278 (accessed on 15 November 2024).
50. Combined Cycle Gas Turbine Power Plant—An Overview. Available online: https://www.sciencedirect.com/topics/engineering/combined-cycle-gas-turbine (accessed on 15 November 2024).
51. Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 Concerning Common Rules for the Internal Market in Electricity and Repealing Directive 96/92/EC—Statements Made with Regard to Decommissioning and Waste Management Activities. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0054 (accessed on 15 November 2024).
52. Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 Concerning Common Rules for the Internal Market in Electricity and Repealing Directive 2003/54/EC. Available online: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009L0072 (accessed on 15 November 2024).
53. Law 4062/2012 Exploitation of the former Elliniko Airport—Program SUN—Promotion of the Use of Energy Let from Renewable Sources (Incorporation Directive 2009/28/EC)—Biofuel Sustainability Criteria and Biofluids (Incorporation of Directive 2009/30/EC). Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20120100070 (accessed on 15 November 2024).
54. Law 4389/2016 Emergency Provisions for the Implementation of the Agreement on Fiscal Objectives and Structural Reforms and Other Provisions. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20160100094 (accessed on 15 November 2024).
55. Law 4425/2016 Urgent Regulations of the Ministries of Economy of Environment and Energy, Infrastructure, of Transport and Networks and Labour, Social of Insurance and Social Solidarity for the Implementation of the Fiscal Agreement Goals and Structural Reforms and Other Provisions. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20160100185 (accessed on 15 November 2024).
56. Law 4512/2018 Settings for the Implementation of the Structural Reforms of the Economic Program Available online: http://elib.aade.gr/elib/view?d=/gr/act/2018/4512 (accessed on 15 November 2024).
57. Law 5037/2023 Renaming of the Energy Regulatory Authority in Waste, Energy and Regulatory Authority Waters and Expansion of Its Object with Responsibilities over Water Services and Urban Waste Management, Strengthening of Water Policy—Modernization of the Law Regulation for the Use and Production of Electricity Energy from Renewable Sources through of Incorporation of EU Directives 2018/2001 and 2019/944—More Special Provisions for the Renewable Energy

Sources and Its Protection Environment. Available online: http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20230100078 (accessed on 15 November 2024).
58. ΕΣΑΥ. Hellenic Association of Independent Electricity Companies. Available online: https://www.pir.gr/ (accessed on 15 November 2024).
59. Law 4001/2011. For the Operation of Energy Electricity Markets and Natural Gas, for Exploration, Production and Hydrocarbon Transmission Networks and Other Arrangements. Available online: https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20110100179 (accessed on 15 November 2024).
60. Independent Electricity Transmission Operator (ΑΔΜΗΕ). Available online: https://www.admie.gr/ (accessed on 15 November 2024).
61. Approval of the RES Operator Code and Guarantees of Origin in Accordance with Par. 3 of Article 117E of Law 4001/2011 (ΦΕΚ Α΄ 179/ 22.08.2011). Available online: https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20180202307 (accessed on 15 November 2024).
62. Boccard N. Capacity Factor of Wind Power Realized Values *vs.* Estimates. *Energy Policy* **2009**, *37*, 2679–2688.
63. Stagakis I. *Invoice, Tariff Policy & Market Operation Director*; PPC: Athens, Greece, 2024.
64. European Commission, Eurostat, Electricity Prices—Data 1990–2003, Publications Office of the European Union, 2003. Available online: https://op.europa.eu/en/publication-detail/-/publication/515a3117-dbea-4311-89d4-c83a3a034b46/language-en/format-PDF/source-298324327 (accessed on 15 November 2024).
65. European Commission, Eurostat, Electricity Prices 1980–1989, Publications Office, 1990. Available online: https://op.europa.eu/en/publication-detail/-/publication/df3a6ae1-d1cc-11e6-ad7c-01aa75ed71a1/language-en/format-PDF/source-302128299 (accessed on 15 November 2024).
66. Eurostat Database. Available online: https://ec.europa.eu/eurostat/data/database (accessed on 20 January 2022).
67. Evolution of Monetary Unit Value of Greece (Per Annum), Based on the General CPI, Excel File. Available online: https://www.statistics.gr (accessed on 15 November 2024).
68. Electric Power Consumption (kWh per Capita)—Greece. Available online: https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?locations=GR (accessed on 15 November 2024).
69. OurWorldinData. Greece: Energy Country Profile. Available online: https://ourworldindata.org/energy/country/greece (accessed on 15 November 2024).
70. World Bank. GDP per Capita (Current US$)—Greece. Available online: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=GR (accessed on 15 November 2024).
71. Law 3845/2010. Measures for the Implementation of Its Support Mechanism of the Greek Economy from the Member States of the Zone of the Euro and the International Monetary Fund. Available online: https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20100100065 (accessed on 15 November 2024).
72. Ourworldindata. Energy Consumption by Source. Greece. Available online: https://ourworldindata.org/grapher/energy-consumption-by-source-and-country?stackMode=absolute&country=~GRC (accessed on 15 November 2024).
73. Prices of Natural Gas. Available online: https://www.investing.com/commodities/natural-gas (accessed on 20 January 2022).
74. EU Energy Statistical Pocketbook and Country Datasheets. Available online: https://energy.ec.europa.eu/data-and-analysis/eu-energy-statistical-pocketbook-and-country-datasheets_en#country-datasheets (accessed on 15 November 2024).
75. European Parliament. Fact Sheets on the European Union. Combating Climate Change. Available online: https://www.europarl.europa.eu/factsheets/en/sheet/72/combating-climate-change (accessed on 15 November 2024).
76. Law No. 3468/2006 Electricity Production from Renewables Energy Sources and Cogeneration of Electricity. Available online: https://www.et.gr/api/DownloadFeksApi/?fek_pdf=20060100129 (accessed on 15 November 2024).
77. Koutsoyiannis D. The Unavoidable Uncertainty of Renewable Energy and Its Management. In Proceedings of the European Geosciences Union General Assembly 2016, Geophysical Research Abstracts, Vienna, Austria, 17–22 April 2016; Volume 18, EGU2016–18430. doi:10.13140/RG.2.2.36312.70400.
78. Ioannidis R, Mamassis N, Efstratiadis A, Koutsoyiannis D. Reversing Visibility Analysis: Towards an Accelerated a Priori Assessment of Landscape Impacts of Renewable Energy Projects. *Renew. Sustain. Energy Rev.* **2022**, *161*, 112389. doi:10.1016/j.rser.2022.112389.
79. Sargentis G-F, Siamparina P, Sakki G-K, Efstratiadis A, Chiotinis M, Koutsoyiannis D. Agricultural Land or Photovoltaic Parks? The Water–Energy–Food Nexus and Land Development Perspectives in the Thessaly Plain, Greece. *Sustainability* **2021**, *13*, 8935. doi:10.3390/su13168935.
80. Kolovos CJ. Mining in consistency with long term planning: A key element to social acceptance. In Proceedings of the 6th Intern, Conference on Sustainable Development in the Minerals Industry (SDIMI), Milos Island, Greece, 30 June–3 July 2013; Volume 30.
81. Institute for Energy Research. California's Energy Path Is Not One to Emulate. Available online: https://www.instituteforenergyresearch.org/the-grid/californias-energy-path-is-not-one-to-emulate/ (accessed on 15 November 2024).

82. EIA U.S. Energy Information Administration. Electricity Data Browser. Available online: https://www.eia.gov/electricity/data/browser/#/topic/7?agg=1,0&geo=vvvvvvvvvvvvo&endsec=8&linechart=ELEC.PRICE.US-RES.Q~ELEC.PRICE.CA-RES.Q (accessed on 15 November 2024).
83. Doulos I. The Greek Electricity Market—Current Situation and Developments Available online: https://www.researchgate.net/publication/336810114 (accessed on 15 November 2024).
84. Mamassis N. Electric Mix Tragedy. Available online: https://youtu.be/u8xXq8J6SEE?si=Xm72Cu0IoM-ryWoo (accessed on 15 November 2024).
85. Crude Oil Prices—70 Year Historical Chart. Available online: https://www.macrotrends.net/1369/crude-oil-price-history-chart (accessed on 15 November 2024).
86. Sargentis G-F, Kougkia M. Vulnerabilities of water-energy and food nexus in cities of digital era. *Insight—Civ. Eng.* **2024**, *7*, 608. doi:10.18282/ice.v7i1.608.
87. Sargentis G-F, Ioannidis R. *The Impacts of Altering Biodiversity to the Water-Energy-Food Nexus: Case Study North Euboea, Greece, Discover Water*; Springer-Nature: Berlin, Germany, 2024. doi:10.1007/s43832-024-00165-y.
88. Ioannidis R, Sargentis G-F, Koutsoyiannis D. Landscape design in infrastructure projects—Is it an extravagance? A cost-benefit investigation of practices in dams. *Landsc. Res.* **2022**, *47*, 370–387. doi:10.1080/01426397.2022.2039109.
89. Ioannidis R, Koutsoyiannis D. A Review of Land Use, Visibility and Public Perception of Renewable Energy in the Context of Landscape Impact. *Appl. Energy* **2020**, *276*, 115367. doi:10.1016/j.apenergy.2020.115367.
90. Wolsink M. Wind Power and the NIMBY-Myth: Institutional Capacity and the Limited Significance of Public Support. *Renew. Energy* **2000**, *21*, 49–64.
91. Sargentis G-F, Dimitriadis P, Ioannidis R, Iliopoulou T, Koutsoyiannis D. Stochastic Evaluation of Landscapes Transformed by Renewable Energy Installations and Civil Works. *Energies* **2019**, *12*, 2817. doi:10.3390/en12142817.
92. Manta E, Ioannidis R, Sargentis G-F, Efstratiadis A. Aesthetic evaluation of wind turbines in stochastic setting: Case study of Tinos island Greece. In Proceedings of the European Geosciences Union General Assembly 2020, Geophysical Research Abstracts, Online, 4–8 May 2020; Volume 22, EGU2020- 5484. doi:10.5194/egusphere-egu2020-5484.
93. Sargentis G-F, Ioannidis R, Chiotinis M, Dimitriadis P, Koutsoyiannis D. Aesthetical Issues with Stochastic Evaluation. In *Data Analytics for Cultural Heritage*; Belhi A, Bouras A, Al-Ali AK, Sadka AH, Eds.; Springer: Cham, Switzerland, 2021. doi:10.1007/978-3-030-66777-1_8.
94. Vrettou SE, Trompouki A, Iliopoulou T, Sargentis G-F, Dimitriadis P, Koutsoyiannis D. Investigation of stochastic similarities between wind and waves and their impact on offshore structures. In Proceedings of the EGU General Assembly 2022, Vienna, Austria, 23–27 May 2022, EGU22-3082, doi:10.5194/egusphere-egu22-3082.
95. Sargentis G-F, Ioannidis R, Dimitriadis P, Malamos N, Lyra O, Kitsou O, et al. Energy Self-Sufficiency in Rural Areas; Case Study: North Euboea, Greece. *Adv Env. Eng Res*. **2024**, *2*, 10016.
96. Smith O, Cattell O, Farcot E, O'Dea RD, Hopcraft KI. The effect of renewable energy incorporation on power grid stability and resilience. *Sci. Adv.* **2022**, *8*, eabj6734. doi:10.1126/sciadv.abj6734.
97. Schmietendorf K, Peinke J, Kamps O. The impact of turbulent renewable energy production on power grid stability and quality. *Eur. Phys. J. B* **2017**, *90*, 222. doi:10.1140/epjb/e2017-80352-8.
98. Sargentis G-F, Koutsoyiannis D, Angelakis A, Christy J, Tsonis AA. Environmental Determinism *vs.* Social Dynamics: Prehistorical and Historical Examples. *World* **2022**, *3*, 357–388. doi:10.3390/world3020020.