

Abstract

Successive energy crises necessitate the use of renewable energy sources such as solar and wind, they can be properly complementary with other sources. We have presented solar and wind energies and their importance in the current status, their future in Albania, from the statistical point of view, including in terms of representative generation parameters. It will be discussed for the assessment of wind and solar potential, feasibility analysis for different regions in Albania. Statistical evaluation in terms of technical parameters, capacity for power installation, generation and generalization on economic parameters. The originality of this study is to present a comprehensive basis for assessing future growth and the potential development of wind and solar power in Albanian electricity supply mix.

Introduction

Albania has outstanding solar insolation within most of its territory at more than 1 500 kWh/m² annually, with highs of 1 753 kWh/m² annually, particularly in the western part of the country. The country has some of Europe's highest number of sunshine hours per year, presenting significant potential for developing solar PV for power generation and solar thermal for heating purposes. On average, the country enjoys 220 sunshine days or 2 700 hours of sunshine per year. [18, 21, 22] At the end of 2018, 10 MW of solar PV was connected to the grid. In addition, the solar Feed in Tariff support scheme introduced increased applications for the construction of solar PV plants of up to 2 MW. Between 88 applications received, 12 have been authorized for construction, which amounts to a total capacity of 24 MW. In November 2018, 100 MW of solar PV was approved for construction following the first auction for solar PV. However, the power purchase agreement for this project has not been signed. Following another auction round in January 2020, a further 140 MW of solar will be built in Karavasta, of which 70 MW with the off-taker at EUR 24.89/MWh while will sell the rest at market price. The latest auction bidding round was launched at the end of 2020 for the construction of a 100 MW solar PV plant in Durrës with a price ceiling of EUR 55/MWh.

Albania currently has small systems of wind power installed, and no significant wind power plants. However, 70 applications for the construction of wind plants up to 3 MW have been received. Of these, three have been authorized for construction with a total capacity of 9 MW. Furthermore, at the end of 2020, a 150 MW wind tender was launched, restricted to projects with a minimum capacity of 30 MW and a maximum capacity of 75 MW. (MIE, 2020). Albania's annual average wind speeds range between 3.3 m/s and 9.6 m/s. The most suitable areas for wind power production, with capacity factors typically varying from 22% to 25%, have annual average values ranging between 5.8 m/s and 7 m/s. According to IRENA's estimates, Albania has a cost-competitive wind potential of up to 7400 MW under the low-cost capital scenario. IRENA's CESEC study proposes a wind installed capacity of 616 MW by 2030, with an annual generation potential of up to 1794 GWh (IRENA, 2020).

Solar Photovoltaics

According to IRENA's study on the cost-competitive renewable energy potential in southeast Europe, Albania's technical potential for solar PV deployment is estimated at 2378 MW, with the production of 3706 GWh annually (IRENA, 2017). IRENA's CESEC study proposes in its REmap scenario a solar PV installed capacity of 1074 MW by 2030, with an annual generation potential of 1697 GWh. Figure 10 shows suitable areas for solar PV development and highlights zones of the highest potential for development in Albania. These zones are assessed by combining resource potential with protected areas, land use, topography, population growth, and proximity to transmission lines and are ranked by scores between 0% and 100% – identifying the degree of the feasibility of an area to host a utility-scale solar PV project. [11]

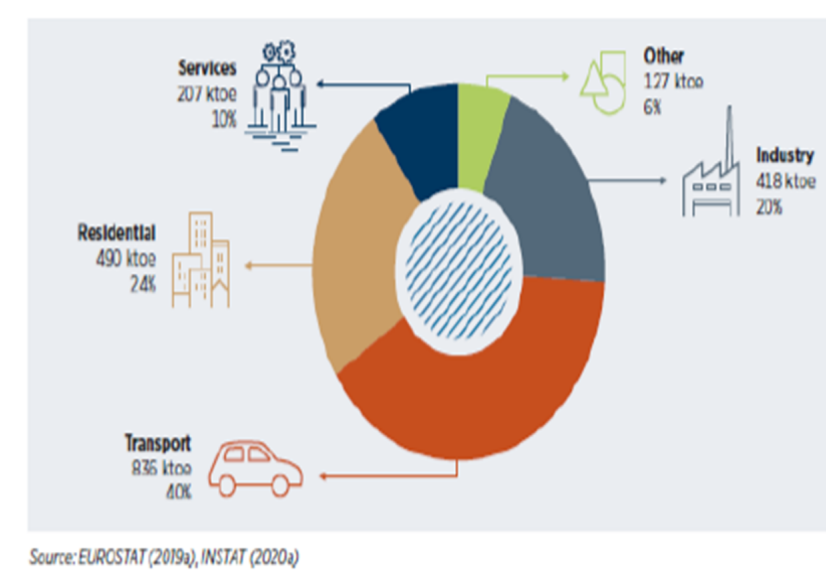
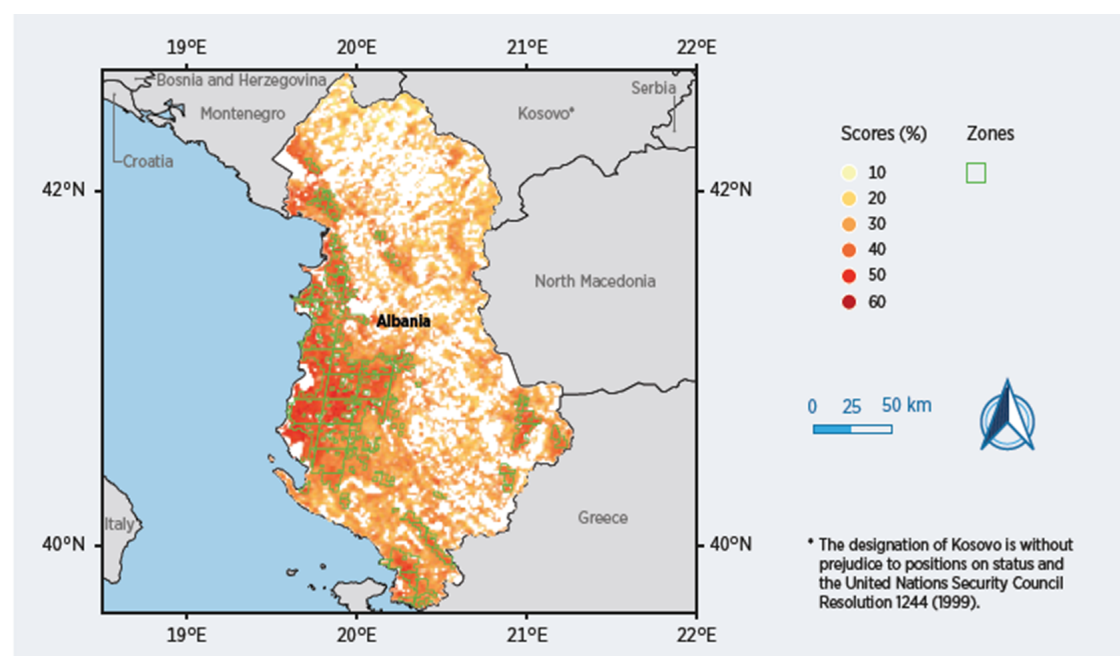


Figure 1, 2: Plot of mean monthly insolation in kW/m²/month, ground measurements and NASA estimates

Wind energy

Figure 15 shows suitable areas for wind development and highlights zones of the highest potential for development in Albania. These zones are assessed by combining resource potential with protected areas, land use, topography, population growth, and proximity to transmission lines and are ranked by scores between 0% and 100% – identifying the degree of the feasibility of an area to host a utility-scale wind plant project. According to IRENA's assessments, the highest potential zones for wind power development are in the south and north of the country. Albania currently has no installed wind power plants. However, 70 applications for the construction of wind plants up to 3 MW have been received. Of these, three have been authorized for construction with a total capacity of 9 MW. Furthermore, at the end of 2020, a 150 MW wind tender was launched, restricted to projects with a minimum capacity of 30 MW and a maximum capacity of 75 MW. (MIE, 2020). [11, 27, 28, 45, 46, 47]

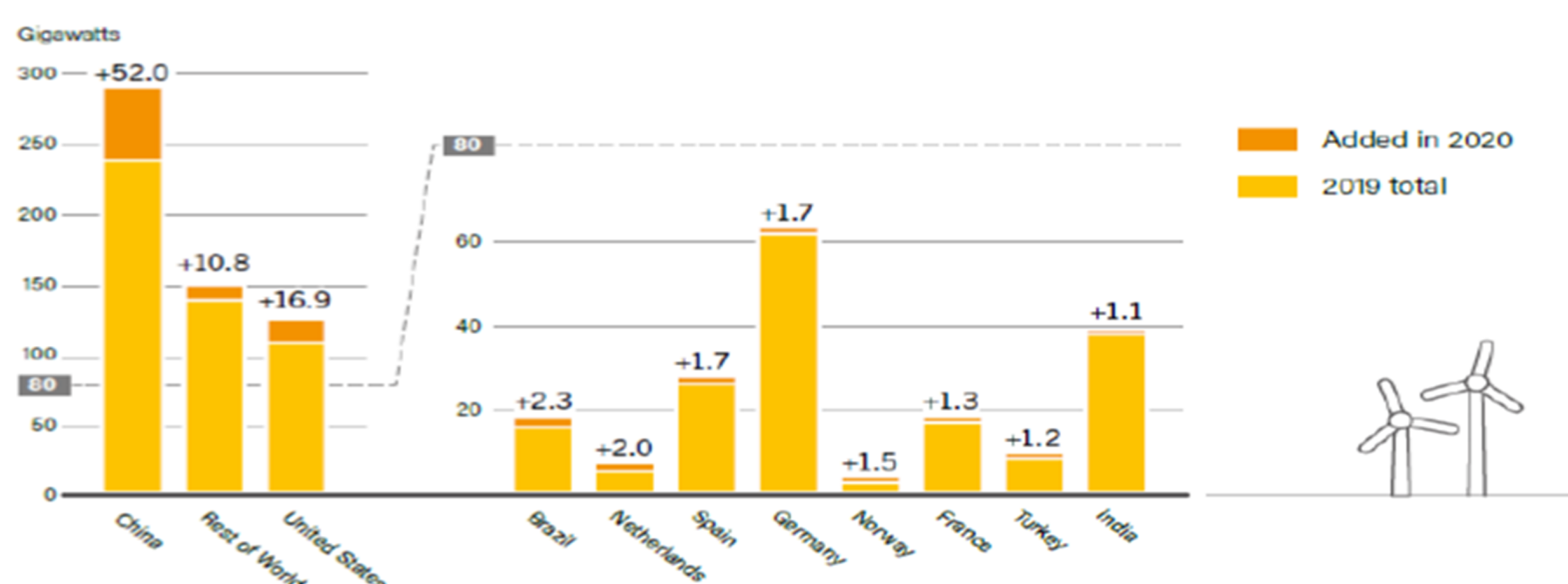
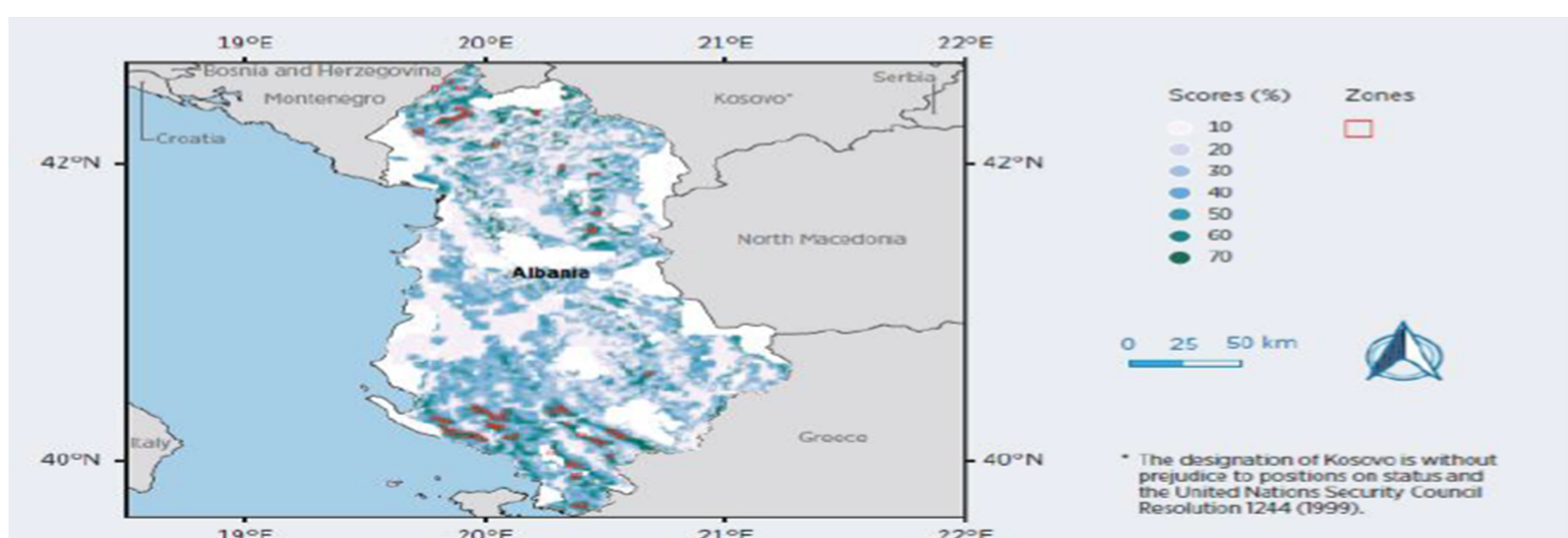


Figure 3, 4 Suitable areas for wind power development and zones with higher potential in Albania

Economics of renewables. Albanian situation

Location	Levelised cost of Energy, LCOE			
	€/kWh			
Modules	c-Si	a-Si	CIS	CdTe
Vlora	0.282	0.271	0.286	0.254
Fier	0.275	0.269	0.280	0.250
Korça	0.288	0.286	0.293	0.263
Kuçova	0.281	0.274	0.285	0.255
Kukes	0.315	0.314	0.320	0.288
Himare	0.286	0.278	0.290	0.259
Borsh	0.287	0.279	0.291	0.260
Dhermi	0.286	0.278	0.291	0.259
Gjirokastrë	0.294	0.288	0.290	0.268
Durrës	0.277	0.272	0.282	0.253
Tirana	0.287	0.281	0.292	0.261
Shkodra	0.296	0.280	0.299	0.266
Elbasan	0.288	0.282	0.293	0.262
Saranda	0.285	0.265	0.287	0.254
Median	0.288	0.280	0.291	0.261
Standart Deviation	0.0097	0.0118	0.0096	0.0093

Types of Turbine	CF %	LCOE eur/kWh
Bonus33.4Mk 300kW	33.00	0.06640
Bonus 44 Mk 600 kW	31.17	0.07034
Bonus 1000/54 1000kW	31.60	0.06938
Bonus 1300/62	32.23	0.06803
NEG Micon 900/52	31.14	0.07041
NEG Micon 750/52	30.15	0.07271
NEG Micon 500/43	31.65	0.06927
Nordex N27/150	37.78	0.05803
Nordex N29/250kW	30.11	0.07281
Nordex N43/ 600kW	30.73	0.07134
Nordex N60 1300kW	30.88	0.07099
Vestas V47 660kW	33.12	0.06619
Vestas V29 225kW	30.82	00.7113
Wind World 170/27	29.97	0.07315
Wind World 600/42	29.09	0.07536

Conclusions

Albania has made significant economic progress during the past three decades, moving from a low-income economy to a middle-income EU member state, with a gross domestic product (GDP) per capita from USD 200 in 1991 to USD 5 353 in 2019.

Albania's energy mix is dominated by fossil fuels, mainly crude oil, which account for more than half of TPES. However, domestic production cannot meet demand; therefore, on average, Albania is a net energy importer. Between 2014 and 2018, the amount of net energy imported ranged from a low of 12% of the TPES in 2015 to a high of 46% in 2017. Net energy imports are directly correlated to annual rainfall, given that the electricity sector is almost entirely reliant on hydropower production.

Opportunities for the deployment of solar energy are extensive. Albania's solar insolation is very high throughout most of its territory at more than 1 500 kWh/m² annually, with peaks of 1753 kWh/m² annually, presenting significant potential for the development of solar PV for power generation and solar thermal for heating purposes.

Under a low-cost capital scenario, Albania has a cost competitive wind potential of up to 7400 MW, and the Agency proposes a wind installed capacity of 616 MW by 2030 in its RE map scenario with an annual generation potential of 1794 GWh.

Reference

In the material of study