AGJENCIA KOMBËTARE E BURIMEVE NATYRORE
NATIONAL AGENCY OF NATURAL RESOURCES

RENEWABLE ENERGY IN ALBANIA

Contents

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ALBANIA OVERVIEW

I. ALBANIA OVERVIEW

1.1 Geography and Climate

Albania is located in southwestern part of Balkan peninsula, Southeast Europe. The country is linked with the rest of the world via land, sea and air routes.

The total area of the Republic of Albania is 28,748 km^2 of which 4.7% are water (equal to 1,352km^2).

The border via land is 720km long, 287km out of which are shared with Montenegro and the Republic of Kosovo in north and northwest of the country, 151km east with the Republic of North Macedonia and 282km south and southeast with Greece. The coastline of the country is 362km long.

Characterized by a distinct mountainous landscape, the average altitude of Albania is 700m above sea level. Based on the structure, composition and shape of the landscape, four physical-geographic zones are distinguished: The Alps, Central Mountainous Region, Southern Mountainous Region and Western Lowlands. The highest peaks are those in the Alps and the Eastern Mount (Korabi at 2751m) and the lowest peaks are located in the western coast area.

Fig.1. Map of Albania

The landscape is intersected by the valleys of Vjosa, Devoll, Osum, Shkumbin, Erzen, Mat and Drin rivers, which enable the connection of Adriatic Sea with the internal part of the country and the Balkans. Albania lies in the Mediterranean climatic zone, characterized by a hot, dry summer, strong sunshine and generally mild winter with abundant rainfalls. Annual average rainfall is 1430mm.

Situated along the Adriatic and Ionian Sea coast, Albania constitutes one of the key points of intersection for the roads crossing the Western Mediterranean into the Balkans and Minor Asia. Albania ensures via sea routes the connection with other world countries and that of the central regions of the Balkans Peninsula with the Adriatic coast. The Adriatic Sea and Otranto Strait stand in between Albania and Italy.

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HYDROPOWER ENERGY

1. HYDROPOWER ENERGY

2.1 Hydropower Potential in Albania

Albania has one of the most developed hydrological networks in the Western Balkans. The country's hydrographic territory extends over 44,000km², which is 57% larger than its land area. The network consists of 152 rivers and streams, grouped into eight major river basins: Drin, Buna, Vjosa, Seman, Mat, Shkumbin, Erzen, and Ishmi. An average basin altitude of 700 meters above sea level, combined with an average perennial flow of 1,245m³/s, creates a strong natural basis for hydropower development.

Fig 2: Albanian hydrographical territory

Due to the morphological features, Albania is quite rich in rivers, with more than 152 rivers and streams forming eight big rivers. They have a southeast- northwest flow, mainly oriented towards the Adriatic coast.

The most important rivers are Drin with 340m³/sec, Vjosa with 210m³/sec, Seman with 101m³/sec, Mat with 74m³/sec, Shkumbin with 60m³/sec, etc. Although, with small flows, their considerable cascade makes these rivers substantially important for the hydropower potential offered to the country.

Consequently, Albania is considered as a country rich in water reserves and a hydropower potential that bears an important developmental role for the country.

Table 1. The main hydrologic characteristics of big rivers

River	Length (km)	Catchments area, (km^2)	Average flow (m^3/s)	Module of flow ($l/S/km^2$)	Ratio Max/Min flow
Buna	41	5.187	320	-	5,3
Drin	285	14.173	352	24,8	5,1
Mat	115	2.441	103	42,6	9,3
Ishmi	74	673	20,9	31,0	5,9
Erzen	109	760	18,1	24,0	11,2
Shkumbin	181	2.441	61,5	25,2	13,2
Seman	281	5.649	95,7	16,9	13,7
Vjosa	272	6.706	195	29,1	7,2

2.2 Hydropower Energy Development in Albania

Albania has a huge hydropower potential, of which about 61.42% has been used so far. Hydropower installed capacity up to 2024 is 2764MW. Average production is 8149.5GWh from hydro. It remains the dominant source of electricity generation in Albania. The total installed hydropower capacity in the country amounts to 2,764MW. A significant share of this capacity is operated by the public generation company KESH sh.a, whose installed capacity of 1,563MW accounts for approximately 56.6% of the national total. The remaining 1,201MW, or approximately 43.4%, is operated by other electricity producers, including both large and small hydropower plants developed through concession and PPP agreements. This diversified structure reflects the strong contribution of private and concessionary investments to Albania's renewable energy sector.

Albania also has a substantial number of concession contracts BOT and ROT type both in operation and under construction, further expanding the national hydropower portfolio and contributing to the geographical dispersion of electricity generation across the country.

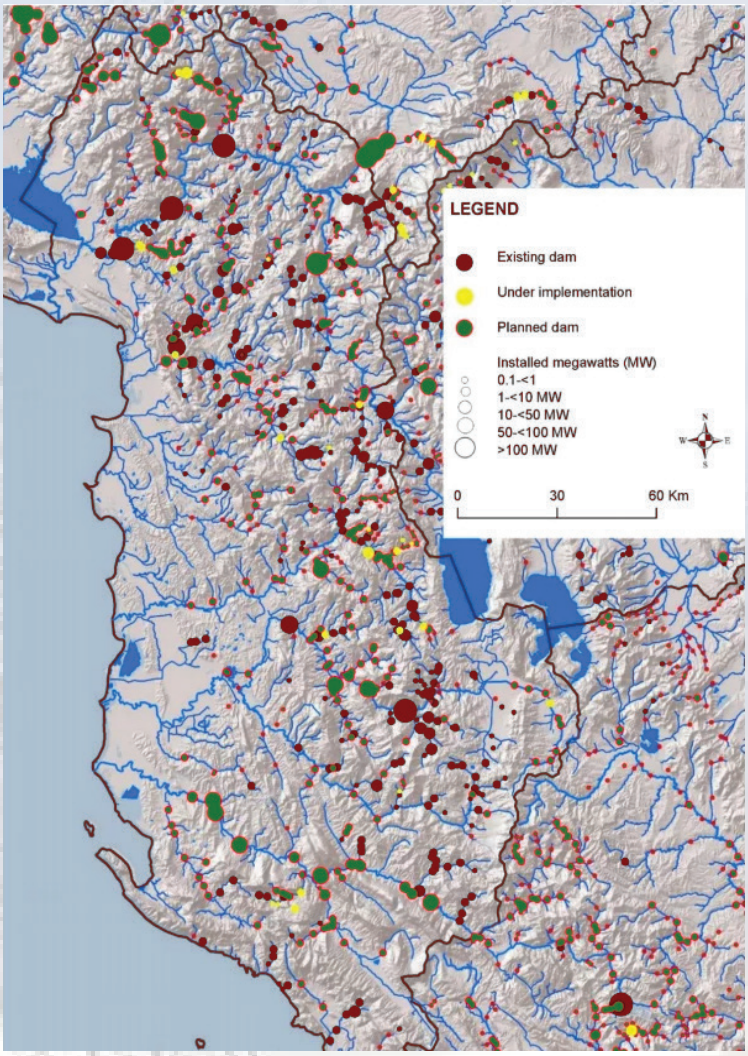

Fig. 3: Hydropower Projects on Balkan Rivers

The hydropower sector in Albania began to develop after 1952, when Selita Hydropower Plant started operating, with an installed capacity of 5,000kW. In 1958, the Ulza Hydropower Plant started operating with an installed capacity of 25,000kW.

Following the construction of three other hydropower plants Shkopet, Bistrica I and Bistrica II, as well as the Thermal Power Plant in Fier, the power production reached 500kWh per capita.

In 1971, 1978 and 1985, three of the biggest hydropower plants of the country: Vau i Dejes Hydropower Plant (with an installed capacity of 250MW), Fierza Hydropower Plant (with an installed capacity of 500MW) and Koman Hydropower Plant (with an installed capacity of 600MW) were respectively constructed.

Fierza Hydropower Plant

Currently, from the register of contracts that AKBN monitors, there are 177 active concession contracts and 96 contracts with capacity below 2 MW according to VKM 822/2015.

Table 2. Active Hydropower Plants as by Concession Contracts

Phase	Number of Contracts	Installed Capacity (kW)	Annual generation (kWh/year)
Operation phase	123	1,095,144	4,140,384,370
Under construction phase	10	70,411	241,785,216
Pre-construction phase	44	708,697	2,808,235,367
Total	**177**		

Table 3: Contracts acording DCM Nr. 822, date.07.11.2015, changed:

Phase	Number of Contracts	Installed Capacity (kW)	Annual generation (kWh/year)
Operation phase	45	60,314	214,455,498
Under construction phase	17	28,895	98,464,427
Pre-construction phase	34	50,954	186,314,147
Total	**96**		

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SOLAR ENERGY

3. SOLAR ENERGY

3.1 Solar Energy Potential in Albania

Albania enjoys one of the highest solar potentials in the Balkan region and across Southeast Europe. Across Albania's territory, there is a significant solar energy potential, with many areas exposed to annual solar irradiation ranging from 1,185kWh/m² to 1,700kWh/m² and an average of 240–280 sunny days per year.

It is worth highlighting that the western part of the country, particularly the southwest, benefits from exceptionally high solar energy levels, reaching up to 2,200kWh/m² per year.

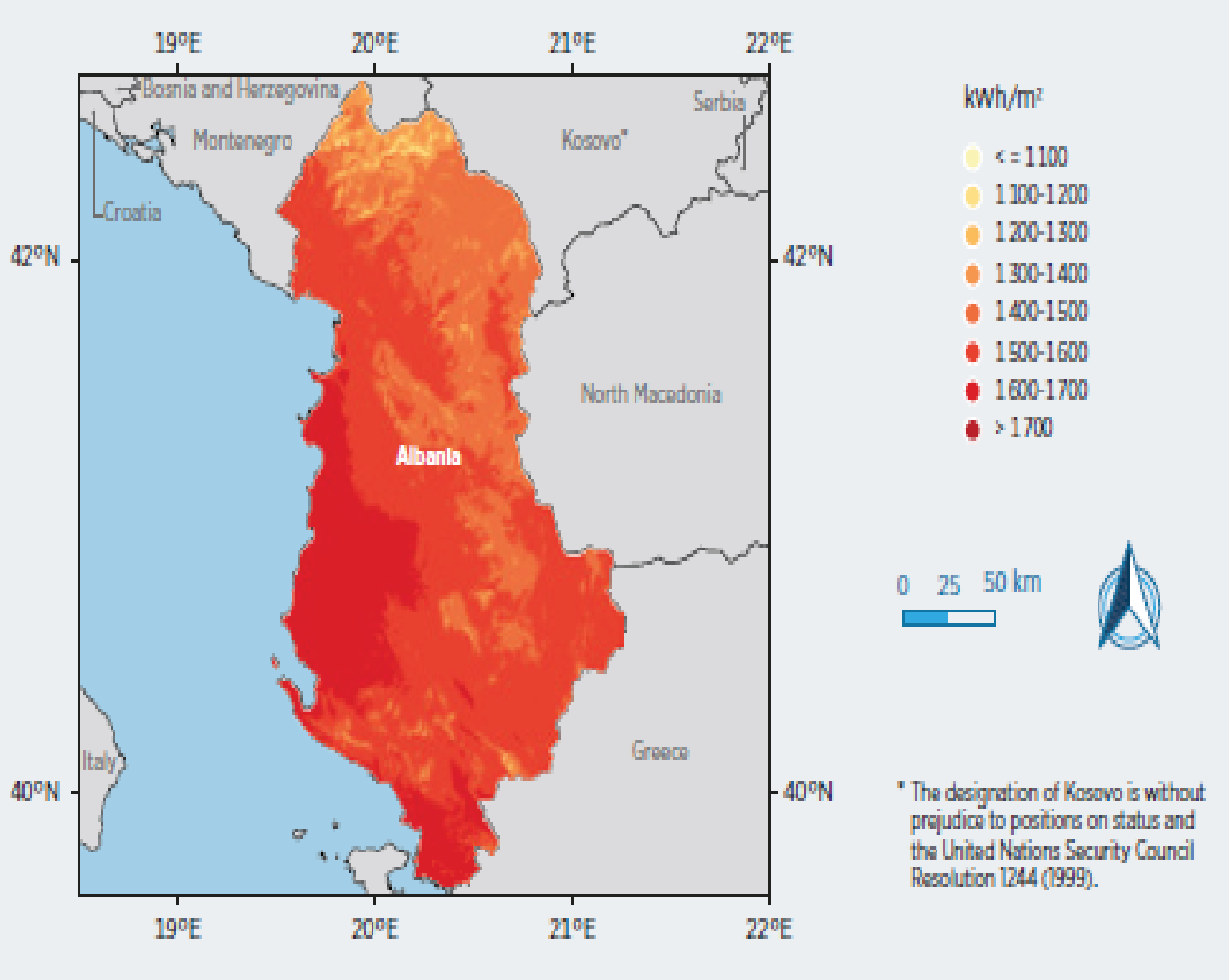


Fig.4: Albania's annual average Global Horizontal Irradiance

Albania's strong solar potential ensures abundant electricity production throughout the year, creating excellent opportunities for both large- and medium-scale photovoltaic investments. These favorable conditions also make solar installations highly suitable for self-consumption projects by households and businesses, while at the same time reducing the country's dependence on hydropower and its vulnerability to hydrological fluctuations.

3.2 Solar Energy Development in Albania

Albania has made rapid progress in the deployment of photovoltaic systems in recent years. The total installed solar capacity has reached 449 MW, reflecting the country's strong commitment to expanding renewable energy generation and reducing dependence on electricity imports during hydrological shortages.

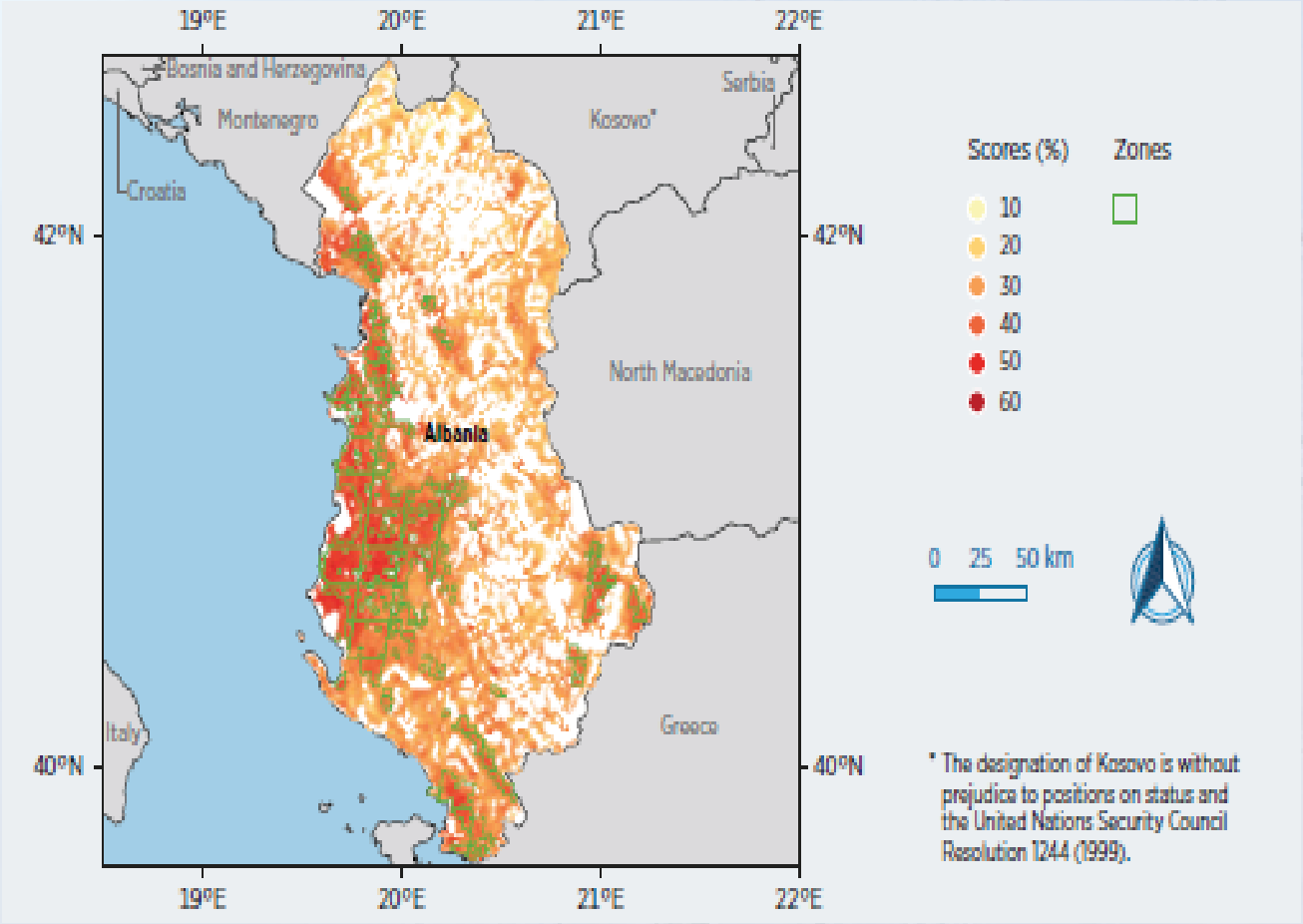


Fig. 5: Suitable areas for solar PV development and zones with highest potential

In addition to utility-scale PV plants, the number of autoproducers has grown significantly nationwide, contributing an additional 271 MW of installed capacity. Approximately 110 MW of these installations belong to households, highlighting a significant shift toward decentralized, consumer-driven renewable energy production.

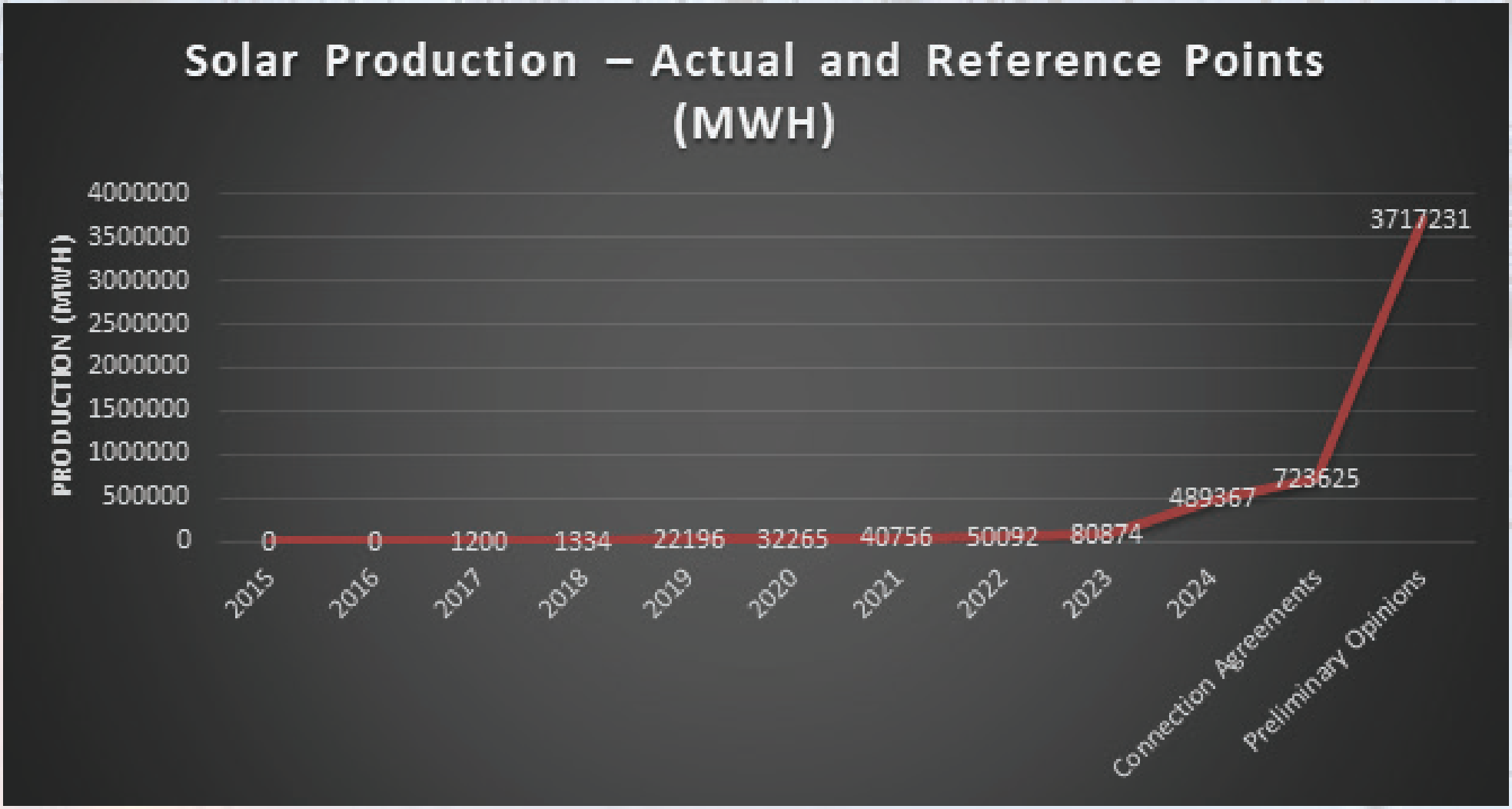


Fig. 6: Solar Production

As shown in the graph below, solar energy production in Albania has followed a strong and upward trajectory. From negligible levels prior to 2017, generation reached over 80 GWh in 2023, and surged to nearly 490 GWh in 2024, reflecting the accelerated expansion of photovoltaic capacity nationwide.

In addition to the installed and operational capacity, the pipeline of new solar projects further underscores the sector's rapid development.

Photovoltaic plants that have already signed connection agreements represent a potential annual output of approximately 723 GWh, while projects that have received preliminary opinions from the transmission system operator are estimated to add an additional 3.7 TWh of annual generation once completed.

If this growth rate continues, solar energy is expected to play an increasingly significant role in the national electricity mix, reduce reliance on hydropower variability, and contribute substantially to the overall share of renewables in Albania's energy balance.

Looking ahead, if these trends materialize and the identified pipeline becomes operational, Albania could experience a structural shift in its electricity sector, transitioning from a predominantly hydropower-dominated system to a more diversified and resilient renewable energy mix. This would strengthen supply security, reduce exposure to hydrological fluctuations, open space for competitive wholesale markets, and support long-term alignment with EU decarbonization and renewable energy targets.

Fig. 7. Floating Photovoltaic Plant on Banja Lake

4

WIND ENERGY

4. WIND ENERGY

4.1 Wind Energy Potential in Albania

The main directions of wind in our country are northwest-southeast and southwest-northeast, with a dominant flow directed inland. Our country's coastline extends 345 km along a north–south orientation, where a part is the coastal lowlands while in the south the coastline lies close to seaside mountains. Inside the territory, the direction and intensity of wind from area to area varies in time.

Thus, in this division are areas where can be determined periods of time for which wind speed can be used as energy source. There have been recorded very high wind speeds in Kryevidhit stations, Gllaves, Xarrës, Sheqerasit and Durrës.

According to the estimates, Albania shows an excellent wind potential, with wind speed values exceeding 8-9 m/s in many areas. A number of interesting areas, especially along the coast and on the ridges of the mountains, with particularly strong winds in the southern part of the country, have been identified. Their overall exploitable wind potential has been estimated taking into account the main constraints preventing the development of wind power plants (i.e. distance from roads, power lines, protected areas, etc.).

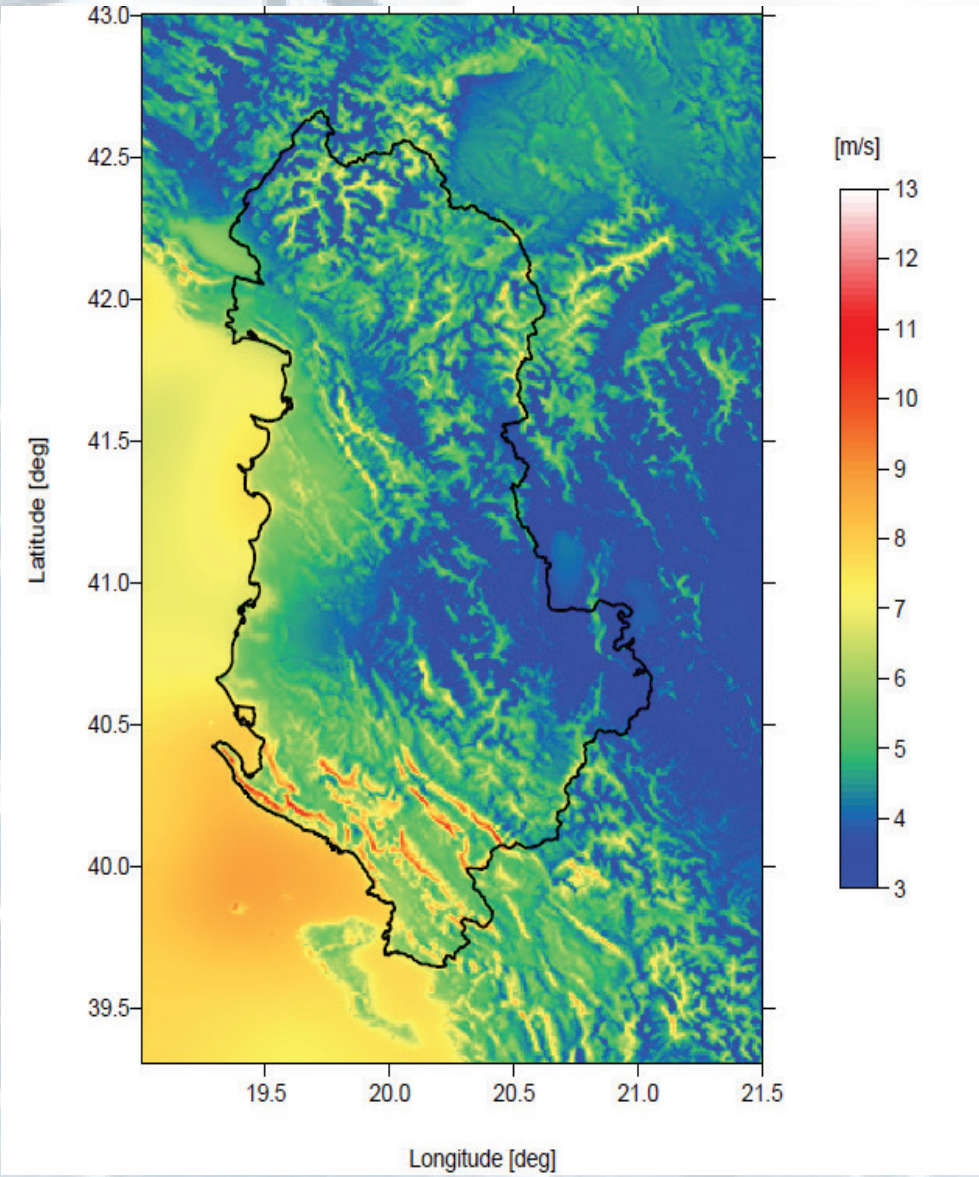


Fig. 7: Average Wind Speed at 50 m Above Ground Level over the Albanian Territory

Several attractive areas have been identified in Albania, including Shkodra (Velipoja, Has), Kukës, Lezha (Ishull Shëngjin, Tale, Balldre), Durrës (Ishem, Porto Romano), Kavaja (Kryevidh), Fier (Seman), Karavasta (Hoxhara , Hoxhara 2), Vlorë (Akerni), Saranda, Korça and Tepelena.

4.2 Wind Energy Development in Albania

Albania currently has no installed wind power plants. However, according to the MIE, since the introduction of the wind FiT support scheme, there have been 70 applications for the construction of wind plants. As shown in Figure 8, annual average wind speeds across Albania 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 5.8m/s and 7m/s.

According to IRENA's estimates, Albania has a cost-competitive wind potential of up to 7,400 MW under the low-cost capital scenario. IRENA's CESEC study proposes in its REmap scenario a wind installed capacity of 616MW by 2030, with an annual generation potential of up to 1 794GWh (IRENA, 2020a).

By December 2025,seven contracts had been signed have been signed across the national territory, all currently in the study phase. In parallel, AKBN has successfully completed the technical peer review of five (5) wind power projects. These projects are now advancing through the regulatory procedures required to obtain construction permits, marking an important step toward the expansion of renewable energy capacity and sustainable development.

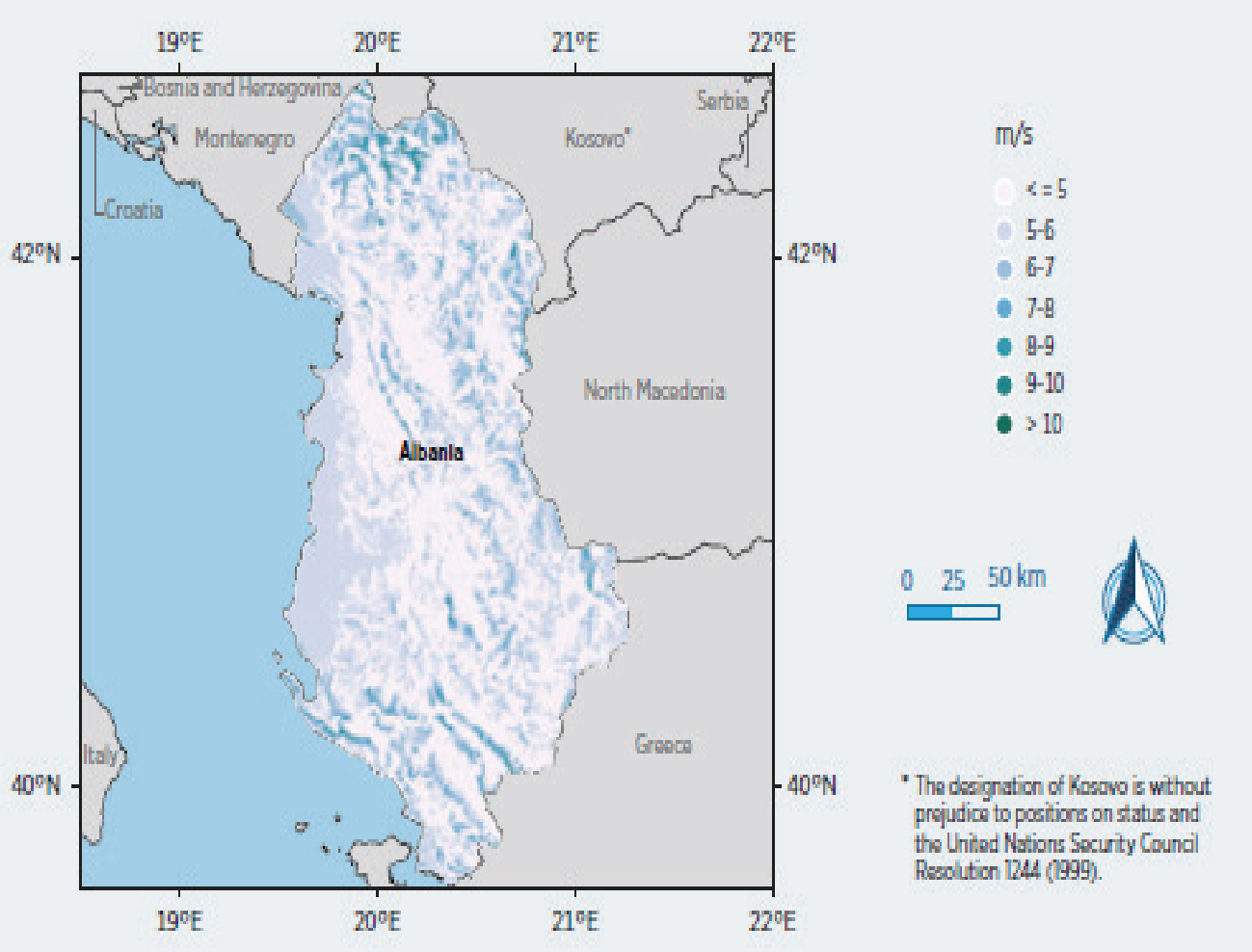


Fig. 8: Albania's annual average wind speeds at 100-metre hub-height

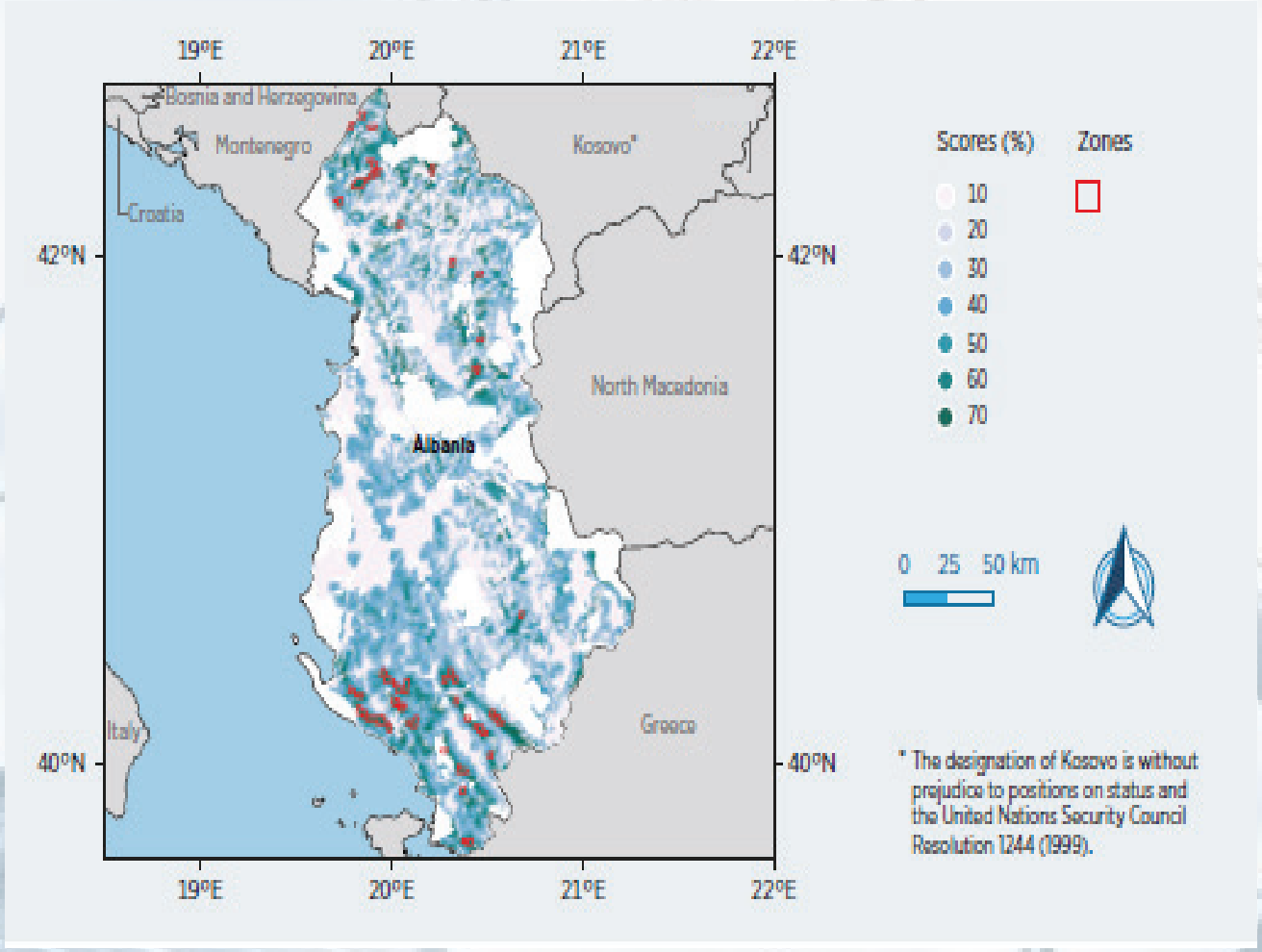


Fig.9: Suitable areas for wind power development and zones with highest potential

Wind energy is still far from practical implementation, aside from a few auctions that have been carried out, but no projects have yet been brought into operation.

5

BIOMASS ENERGY

5. BIOMASS ENERGY

5.1 Biomass Potential in Albania

Biomass remains one of the most widely used energy sources in Albania, mainly from firewood and agricultural residues. However, current use of woody biomass exceeds the annual forest growth by 46%, raising concerns about sustainability. Albania relies primarily on high-value stem wood, while the use of forest residues remains limited. For long-term and sustainable use, selective thinning, improved forest management, and shifting consumption toward residues need to be promoted.

The consumption of biomass/firewood in the domestic sector is 21.4%. This consumption is mainly associated with rural areas, which are closer to forests and wood sources, for domestic use, heating and hot sanitary water. The use of firewood is not excluded in urban areas for heating purposes.

In the services sector, the consumption of biomass/firewood is related to hospitality activities, restaurants, etc.. The contribution of services to biomass consumption is 3.1% based on the 2024 Energy Balance of AKBN.

5.2 Biomass Energy

The forests constitute about 36% of the total land area, pastures 16%, agricultural land 24% and other land categories (urban areas, barren land, wetlands, etc.) 24%. The main forest species are oaks, beech, black pine, etc.

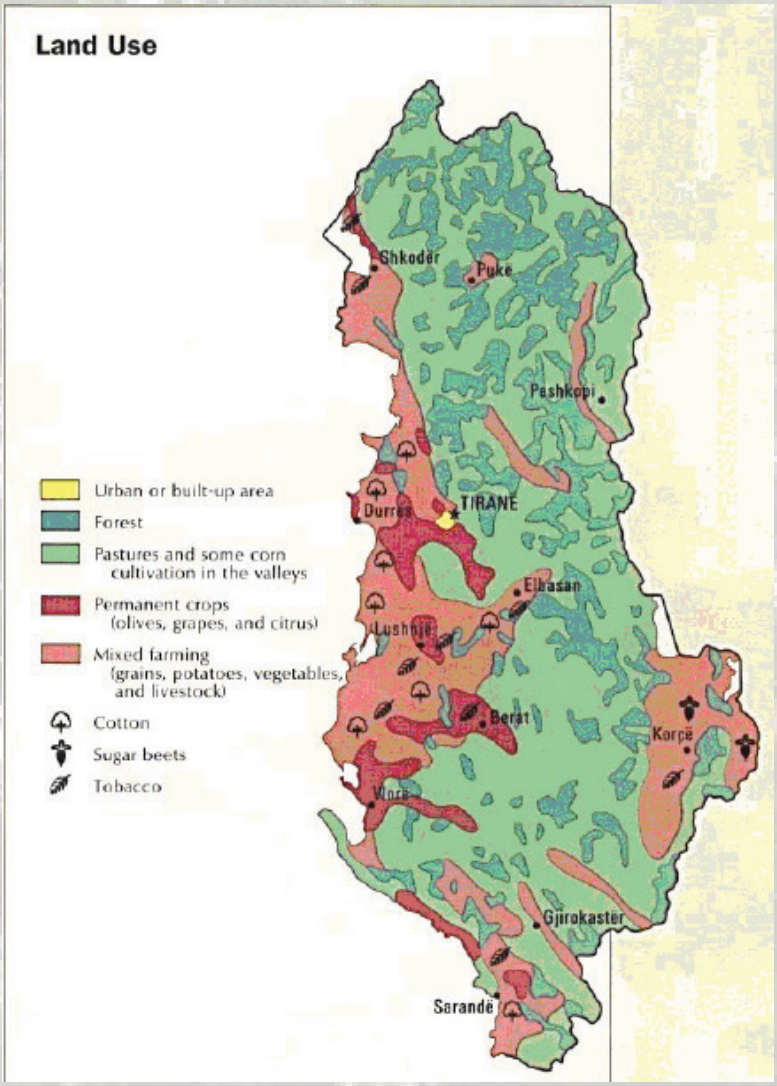
The country has five forest types: Mediterranean shrub, oak woodland beech forests, Mediterranean fir and alpine zone.

The table below shows the results of last National Forest Inventory in Albania

Description	Area (ha)	%	Volume (m^3)	%
High forests	295.000	31	59.910.000	82.7
Coppice forests	405.000	43	12.130.000	17
Shrubs forests	242.000	26	200.000	0.3
Total	**942.000**	**100**	**72.240.000**	**100**

There are different sources to provide forest biomass for production of energy:

- Complementary felling can be applied to increase the supply of bioenergy from forest biomass. This includes stem-wood biomass from thinning and final harvest (annual harvesting potential).
- Residues from harvesting operations in the forest. This includes stem tops, branches, foliage,stumps and roots that are left during stem-wood removal.
- Various industrial wood residues such as saw-dust. This is very important in the present utilization of woody bio-energy.
- Artificial plantations for energy production with short-rotation. That includes chips from plantations of willow, poplar, eucalyptus planted on land area that was formerly used for agriculture or in bare lands.
- Woody biomass from trees grown outside forests, e.g. horticulture and roadside maintenance. Recycled wood, e.g. demolition wood from old buildings.



Map of land use in Albania:

The last National Forest Inventory, conducted during 2002–2004, provided the basis for assessing the current state of forest resources within the Albanian Forest Fund.

5

GEOTHERMAL ENERGY

IV. GEOTHERMAL ENERGY

6.1 Geothermal Energy Potential in Albania

Albania is in the very early stages of geothermal assessment. However, similar to other South East European countries, low-enthalpy geothermal energy resources are available in Albania. Maximum temperatures of up to 80°C (degrees Celsius) can be found in the south of the country bordering Greece and in the northeast. The majority of Albania's geothermal resources are located in the Kruja Geothermal Area, which extends from the Adriatic Sea in the north of Albania and runs in a southeastern direction through the country towards the Konitza area in Greece. Within this zone in carbonate reservoirs lies an estimated geothermal energy potential of 5.9x108-5.1x109 gigajoules (Frasheri, 2015). Given the low-enthalpy nature of these resources, geothermal potential for electricity generation is limited and would be more suitable for heating applications.

Fig.10: Geothermal Energy in Albania

Nowadays, increasing attention has been given in most countries of EU countries to the development of geothermal resources for use in district heating and by direct end users in the services and agriculture sectors. Early institutional support of joint research and development efforts in collaboration with international laboratories and research groups which are well advanced in this field.

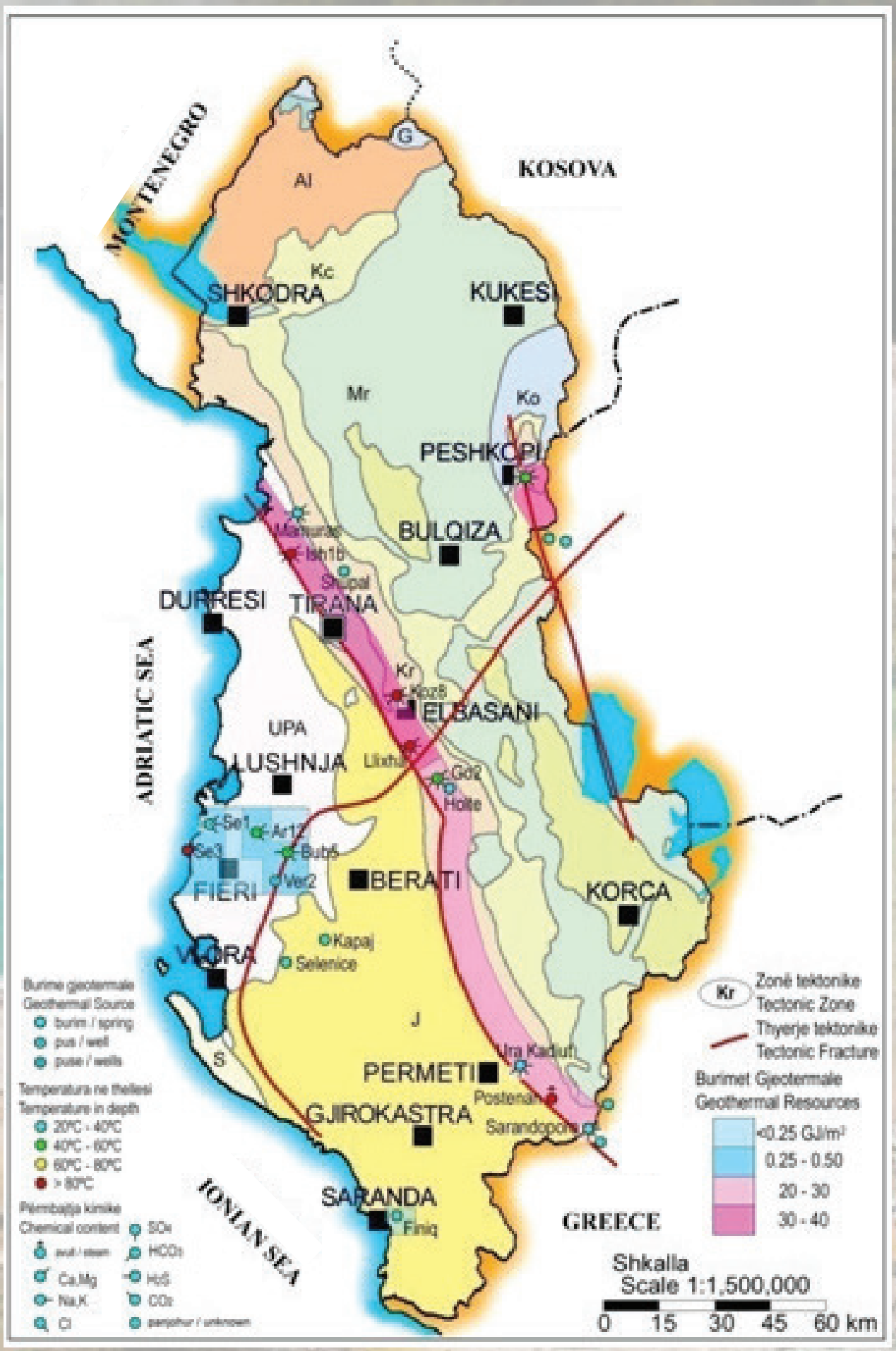


Fig.11: Geothermal Energy in Albania

Geothermal energy resources in Albania are mainly estimated as warm underground water sources, with sufficient temperature to be used as an energy source. The geothermal potential of Albania offers two main ways to use geothermal energy, which can be classified as follows:

Table 4: Geothermal resources in Albania

No	Thermal Springs	Temperature (oC)
1	Karme-Sarande	34
2	Langarice-Permet	26-31
3	Sarandapori-Leskovik	26-27
4	Tervoll-Gramsh	24
5	Llixha-Elbasan	58
6	Kozan-Elbasan	57
7	Supal-Elbasan	29-30
8	Mamurras-Kruje	21
9	Peshkopi	35-43

Table 5: Geothermal resources in Albania (Deep Wells)

No	Deep Wells	Temperature (°C)
1	Ishmi -1/b	60
2	Kozan-8	54
3	Galigati-2	45
4	Bubullima-5	48-50
5	Seman-1	35
6	Ardenica-12	32

Another significant form of geothermal energy utilization is the heat stored in deep underground layers, reaching depths of several thousand meters, similar to the deep exploratory wells drilled in Albania. Heat from the rock formations at these depths can be extracted through vertical heat exchangers installed inside deep boreholes.

Temperature measurements by depth indicate that at 100 m, temperatures range from above 5 °C up to approximately 19 °C. In the Western Lowland and Southwestern regions of Albania, temperatures at this depth typically range between 16 °C and 18.8 °C. In these same regions, temperatures reach up to 32.9 °C at 1,000 m, increase to approximately 54 °C at 2,000 m, and reach around 71.8 °C at 3,000 m. At greater depths, temperatures increase progressively, reaching up to 105.8 °C at 6,000 m, as measured in the Ardenica structure.

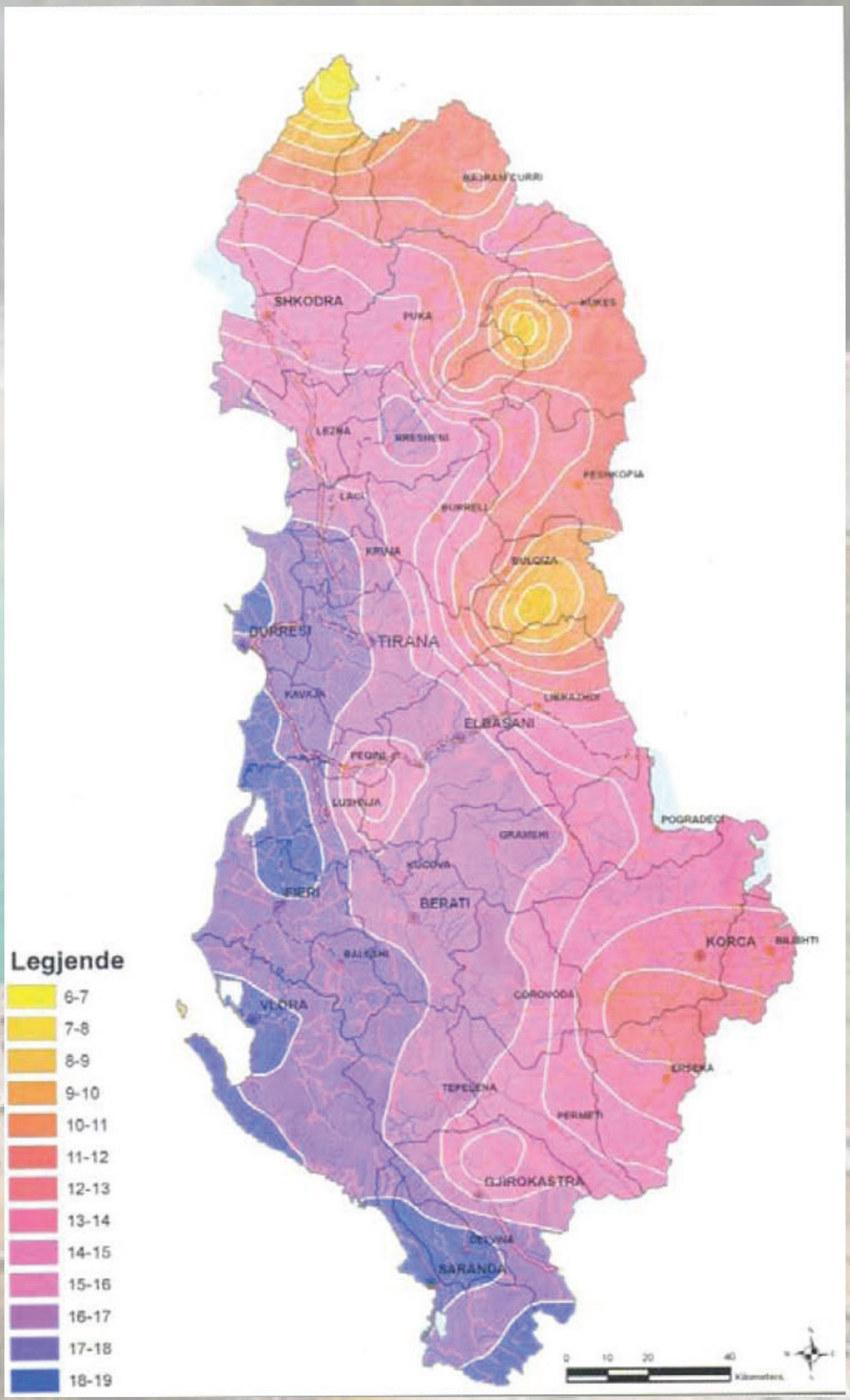


Fig. 12: Ground Temperatures at a Depth of 100 m

6.2 Geothermal Energy Development in Albania

It should be noted that in Albania, thermal waters used in spa facilities currently exploit geothermal resources primarily for therapeutic purposes. The utilization of the energy potential of these thermal waters has not yet been implemented, despite the significant opportunities they offer for energy production.

Experimental energy assessments conducted for the four major geothermal sources—Elbasan Thermal Springs, Peshkopi Thermal Springs, the Kozani-8 well, and Ishmi-1/b—indicate a total thermal water flow rate of 44.8 l/s, a geothermal energy capacity of 6.64 MW thermal, and a potential installed power of approximately 7,084 kW. These figures are highly promising and support the initiation of energy projects aimed at harnessing this renewable energy resource.

Geothermic space of Kruja where are located the biggest geothermic sources in Albania evaluated $5.9 \times 10^8 – 5.1 \times 10^9$ GJ" and the geothermic space of Peshkopi in the northeast of Albania, where some sources of thermal loc near each other have a water temperature of 43.5 °C and inflows of 47 l/s. Actually, evaluation of this energy is under study process.

7

LEGAL FRAMEWORK ON RENEWABLE ENERGY

7. LEGAL FRAMEWORK ON RENEWABLE ENERGY

7.1 Relevant applicable legislation in the energy sector

- The New Law No. 24/2023 aims to facilitate the use of Albania's important renewable energy sources, especially in the field of hydropower plants, biomass and biofuels. Through the Energy Community, Albania has set a National Objective of energy from renewable sources which according to the National Plan for Energy and Climate will be 54.4% in 2030, which is an ambitious objective compared to 38% in 2020. Specifically, the new law for RES will introduce a renewable energy support scheme for electricity based on Contracts for Difference ("CfDs"), which takes into account the creation of a competitive day-ahead electricity market.

- Law no. 43/2015, dated 30.04.2015 "On power sector" sets out the main principles for the energy sector development, including RES power plants and the transmission and distribution networks. Law transposes the EU Directive 2009/72 on electricity and repealing the previous law on electricity (Law no. 40/2015, dated 22.05.2003). This law also includes the requirements and criteria for granting a license to carry out an activity in energy sector. The law also includes a number of specific provisions regulating the construction of a direct line or of a commercial interconnection line.

- HPP concessions are granted in accordance with Law No.13/2013 "On Concessions and Public – Private;

- Partnership"(this law was aligned with the EU directive 2004/18/EC) as amended by the Law No. 88/2014 and Law No.77/2015. According to the Law on "Concessions and PPP"; the Private – Public

- Law no. 9876, dated 14.02.2008 amended "On production, transport and trade of bio-fuels and other renewable fuels for transport", as amended, sets out the legal framework for granting permits for the production, wholesale and retail of bio-fuels and other renewable fuels, for the purpose of transport.

- Law No. 8602, dated 10.09.1998, "On the control and discipline of construction works", amended.

7.2 Specific applicable legislation in the sector of RES

The Albanian Government with the aim of meeting the requirements of the RES law adopted by-laws provided below:

- DCM No. 822, dated 7.10.2015, "On approving the rules and procedures for the construction of new capacities of electricity generation, that aren't subject to concession", amended;
- DCM No. 369, dated 26.4.2017, "On approving the methodology for determining the purchase price of electricity produced from small renewable sources of sun and wind";
- DCM No. 27, dated 17.1.2018, "On the approval of the methodology for determining the purchase price of electricity produced by small generators with renewable sources of biodegradable solid waste using industrial, urban and rural waste"
- DCM No. 349, dated 12.6.2018, "On adopting of support measures to promote the use of electricity from renewable sources of sun and wind".
- DCM No. 480 dated 31.7.2018 "On the National Strategy of Energy 2018-2030".
- DCM No. 580 dated 31.7. 2019 "On approval the National Consolidated Renewable Energy Action Plan (NCREAP 2019 – 2020)".
- DCM No. 858, dated 4.11.2020, amended legal basis for the development of hybrid auctions "Some changes and additions on Decision no. 349, dated 12.06.2018".
- DCM No.198, dated 3.3.2021 on the establishment of the Renewable Energy Operator, which will act as another body to the Contract for Difference (KpD) for all priority producers of electricity from renewable sources and producers benefiting from feed in support tariff (FIT).
- DCM No. 872, dated 29.12.2021 "On approval the National Energy and Climate Plans (NECP 2020-2030)".
- DCM No. 547, dated 09.08.2006, "On the establishment of the National Agency for Natural Resources", amended by DCM No. 506, dated 01.08.2024;

GLOSSARY

MIE	Ministry of Infrastructure and Energy
AKBN	National Agency on Natural Resources (NANR English acronym)
BOO	Build-Operate- Own
BOT	Build-Operate-Transfer
DCM	Decision of Council of Ministers
ERE	Regulating Entity of Energy
INSTAT	Institute of Statistics
PPA	Power Purchase Agreement
PPP	Public Private Partnership
ROT	Reconstruct-Operate-Transfer
PPP	Public Private Partnership

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