EUROPEAN INSTITUTE OF PEACE

The Green Agenda for the Western Balkans: Energy Security, Regional Cooperation, and Sustainable Development in Kosovo

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Table of Contents

1. Introduction

There is a need for a deeper and more comprehensive understanding between EU institutions and local stakeholders regarding the development and conflict resolution potential embedded in the Green Agenda for the Western Balkans. Its effective implementation could facilitate the resolution of conflicts in and around Kosovo, as well as address other regional disputes.

Kosovo presents a unique case within the Western Balkans due to its shortage of biomass and lack of significant economic geothermal resources. This situation requires flexibility and coordination between international institutions to enable a phased approach toward sustainable carbon neutrality, with all the accompanying benefits. The goal is not only decarbonization for energy security but also to reduce pollution and aid conflict resolution.

The development agenda presented here is ambitious but achievable within the proposed timeframe. It aims to address life-threatening risks for millions of people and to remove the barriers to better cooperation and co-existence in a shared environment. The agenda provides an opportunity for politics to find a lasting formula for peace and reconciliation. This investment plan promotes community-driven, distributed, and decentralized projects, providing local communities with autonomy and security in terms of water and energy supply while significantly improving air, water, and soil quality. Tangible improvements in the quality of life can be achieved swiftly—within a year or two.

Local communities are at risk of deep energy poverty, pollution and deterioration of health. Energy security is not guaranteed and there is little hope for employment and investment if this vicious circle is not resolved. Fear, insecurity and concerns breed conflict.

Kosovo's energy security cannot be viewed in isolation, and the country's future must be aligned with the modern EU approach to energy security. Regional cooperation and integration into broader European energy markets are key to reducing reliance on lignite and energy imports. The EU's emphasis on resilience, sustainability, and cross-border collaboration provides a framework for Kosovo to transition towards a more secure and sustainable energy system.

The successful implementation of the Green Agenda for the Western Balkans and the transition towards sustainable energy systems in Kosovo are intrinsically linked to broader regional cooperation. A key element of this cooperation lies in the ongoing process of normalizing relations between Kosovo and Serbia. The normalization of relations could significantly advance not only political stability but also enhance collaboration in critical sectors such as energy. By fostering a stable and cooperative environment, both Kosovo and Serbia, along with other regional actors, can benefit from shared resources, joint energy infrastructure, and improved market access. This approach could serve as a catalyst for broader economic and environmental sustainability, ultimately supporting regional integration and reconciliation efforts.

This paper is partially inspired by the logic that was introduced as a solution to the Trieste crisis (1945-1953-1959). The crisis was put on track toward a solution when predominantly political approaches were replaced with practical interventions[1] based on strategic and economic[2] considerations, which

[1] https://www.researchgate.net/publication/376561886_The_Trieste_Crisis_after_1948
[2] Dr. Vladimir Pertot: TRST. Međunarodni privredni problem. Beograd, publication: Instituta za medunarodnu politiku i privredu, 1954,

called for international investments into the Port of Koper and the surrounding railway infrastructure as well as broad adjustment to the international position of Yugoslavia at the time.

2. Problems and Concerns

For Kosovo to sustain economic activity, production, and services, a balanced combination of natural resources, human work, energy and infrastructure is essential.

Currently, Kosovo imports most of its resources, products, services and energy and its trade deficit is only managed by remittances that are diverted from productive capitalization and are unlikely to underpin economic growth.

This can be at least partially attributed to Kosovo facing unfavorable terms of trade in the region and beyond. Its import prices are elevated beyond the regional average and its access to international markets, seaborne trade, energy markets and appropriate transport services is obstructed by legal and political factors. The same factors also render many international conventions and norms not applicable.[3] This situation reinforces multidimensional regional disputes and entails the considerable strategic consequence of hindering Central Europe's access to Mediterranean energy markets and seaborne trade.[4] Despite these challenges, conflicts can and must be resolved.Kosovo's current use of natural resources exceeds its sustainable capacity in various ways. This overuse creates tensions both with neighboring countries and within Kosovo itself. These internal and external tensions fuel political and social disputes and contribute to poor management. In turn, inadequate management reinforces the unsustainable exploitation of resources.

Below are some key statistics that provide an overall picture:

Kosovo land use[5] is estimated as follows:

- agricultural land: 52.8% (2018 est.)
- arable land: 27.4% (2018 est.)
- permanent crops: 1.9% (2018 est.)
- permanent pasture: 23.5% (2018 est.)
- forest: 41.7% (2018 est.)
- other: 5.5% (2018 est.)

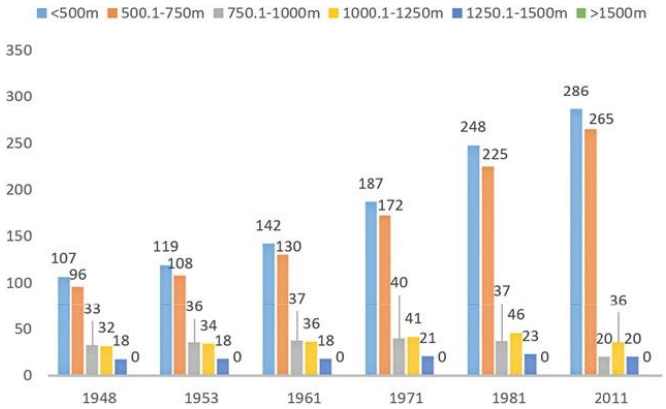
A key characteristic of Kosovo's territory is its high population density at lower altitudes, where there is greater exposure to risks of flood, air pollution, and poor wind ventilation. Population density in these areas rivals that of the most densely populated areas in Western Europe, but without the full infrastructure and territorial adjustments typically found in such areas.

[3] https://connectingregion.com/featured/aleksandar-kovacevic-oxford-institute-for-energy-studies-pacta-sunt-servanda/

[4] https://www.academia.edu/101107854/Russian_Energy_to_Europe_Western_Balkans_as_the_Security_of_Demand_Device

[5] https://www.indexmundi.com/kosovo/land_use.html and to be compared with https://www.land-links.org/country-profile/kosovo/

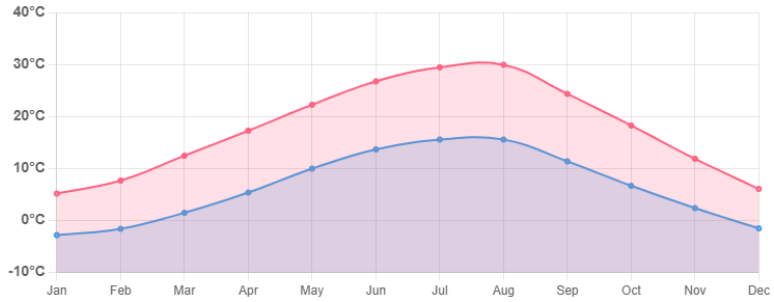
Graph: Hypsometric demography of Kosovo: the distribution of Kosovo population by altitude



Source: https://cityterritoryarchitecture.springeropen.com/articles/10.1186/s40410-016-0047-8/figures/9

Kosovo is exposed to highly variable weather conditions with significant variations between day and night temperatures and variable precipitation patterns. It stands at a high altitude between the moist Mediterranean climate and the Dinaric mountains.

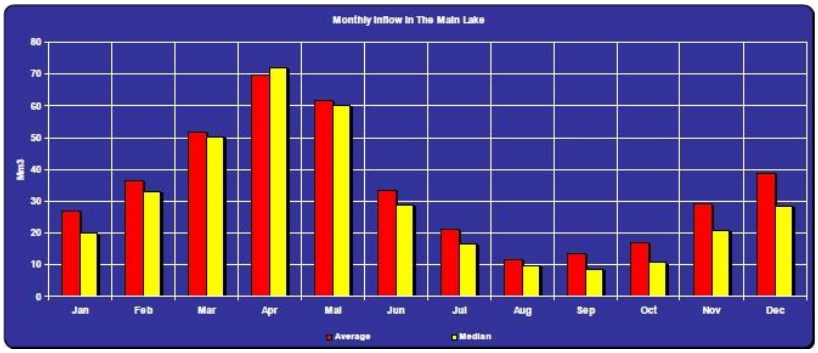
Graph: City of Pristina, Average day and night temperature: The mean minimum and maximum temperatures over the year.



Source: https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,pristina-pristina-county-xk,Kosovo

Water inflow variation ratio (1 to 7) to main lakes in the Ibar – Lepenac hydro system indicates dramatic variations in precipitations.

Graph: Monthly variation of the natural inflow to main lake – in million m3



Source: https://www.eeas.europa.eu/sites/default/files/final_report_-_english.pdf

Variations in water inflow (if not managed) dictate variations in the outflow and can cause flooding downstream both in Kosovo and surrounding countries. There is only one accumulation lake, the Gazivode/Ujmani Lake,[6] which was artificially created through the construction of a dam on the Ibar River.[7]

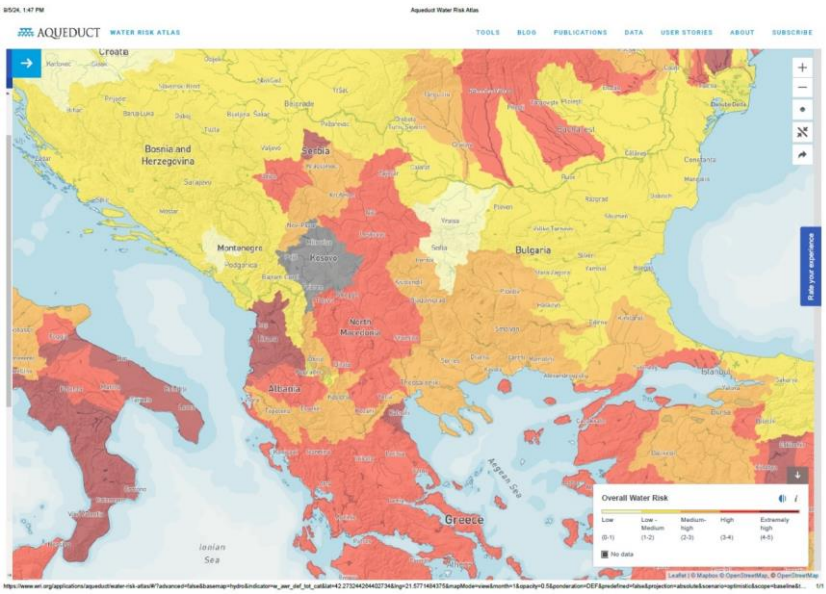
The most arable and populated land areas contain also the most mineral resources such as lignite coal (see below).

Average density of forests is estimated to only 84 m3/ha[8], that is much below the ideal 200-300m3/ha. Consequently, water conservation is more than 4 times less than appropriate, creating considerable variations in water inflow entirely dependent on exceptionally variable precipitation. Inadequate forest coverage also contributes to further temperature variations during the day-night cycle. During the summer period, inadequate forest coverage leads to further reduction in precipitation when it is most required. Wood harvesting is persistently beyond the sustainable optimum. The situation will worsens over time and in the foreseeable future.

Kosovo is surrounded by countries with high water stress both in terms of regular availability of water inflow and water pollution. In the map below, data about water resources within Kosovo have not been taken into consideration. Kosovo is at higher altitude than its surroundings. This indicates that the water inflow from Kosovo is one of the significant factors of water stress for others.

[6] https://dialogue-info.com/water-resource-opportunities-at-lake-gazivode-ujman/
[7] https://www.osti.gov/servlets/purl/1783167
[8] https://www.researchgate.net/publication/282759391_Wood_Biomass_Sector_in_Kosovo_Woodfuel_Integrated_SupplyDemand_Overview_Mapping_WISDOM

Map: Excerpt from the Aqueduct Water Risk Atlas



Source:https://www.wri.org/applications/aqueduct/water-risk atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=42.273244264402734&lng=21.5771484375&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&threshold&timeScale=annual&year=baseline&zoom=7

According to the World Resource Institute, both Albania and North Macedonia are categorized as experiencing "High water stress (40-80% of water)" while the entire territory of Serbia is categorized as "Low-Medium (10-20%)".[9]

2.1 Mineral Wealth

Kosovo has significant mineral wealth,[10] including the fifth largest reserve of lignite[11] in the world. However, turning mineral wealth into actual economic benefit requires sustainable and secure power generation at massive scale, appropriate water resources, as well as transportation capabilities to bring end products to international markets. It is also important to sustain price volatility and resist negative impacts of resource rents on the quality of governance.

[9] https://www.wri.org/insights/highest-water-stressed-countries
[10] https://www.kosovo-mining.org/mineral-resources/mineral-deposits/?lang=en
[11] Even though some countries do not consider lignite resources within their mineral inventories (assuming lignite as uneconomical form of low rank coal) this is very strong statement. Despite its small territory. Kosovo possesses lignite resources of about 12-14 billion tons. This is comparable to Germany, with. much larger territory.

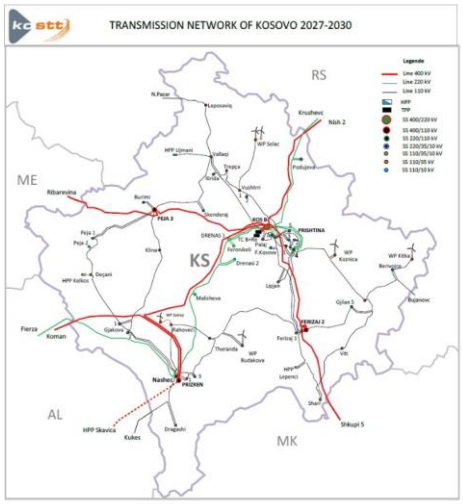
2.2 Energy Security

Kosovo's power system consists of electricity production, transmission, distribution, and supply, with a strong reliance on lignite-fueled thermal power plants. Despite their aging infrastructure, the power stations Kosova A and Kosova B have consistently contributed 90/98%[12] of the total electricity production between 2011 and 2022. This underscores Kosovo's dependence on lignite. Thermal power plants account for 960 MW, or 77.7%, of the country's total 1,236 MW generation capacity. While the usage of renewable energy sources, particularly wind energy, has grown in recent years, their contribution remains modest, ranging from 2% to 9% of the total electricity production.[13]

Kosovo has also been a net importer of electricity, with imports fluctuating between 8% and 18% of the total available electricity to meet domestic demand. This data highlights Kosovo's reliance on both traditional power plants and imported electricity, despite the growing, yet still limited, presence of renewable energy. In response, the Kosovo Government in 2023 approved a long-term energy strategy, setting a target for 35%[14] of electricity consumption to be covered by renewable energy sources (RES) by 2031.

Economic development comparable to EU countries may require twice as much electricity production per person, reduction of distribution network losses by one third and reduction in residential electricity demand to about 10% of the actual demand. That may create a demand profile with over 60% of electricity consumed by commercial and industrial customers versus less than 40% consumed by residential customers.

Map: Transmission network development vision[15] to 2030



[12] Annual Reports of the Energy Regulatory Office
[13] https://indep.info/en/energy-transition-index-in-kosovo/
[14] https://me.rks-gov.net/wp-content/uploads/2023/04/Energy-Strategy-of-the-Republic-of-Kosovo-2022-2031-1-1.pdf
[15] The map shows how the transmission system operator is looking to internalize the effects of a 400kV transmission system (by connecting a potential Zhur hydro power plant and providing more interconnection points between 400/110kV systems) as well as by empowering a 110kV system with distributed power generation and batteries (https://www.mcc.gov/news-and-events/release/release-070122-mcc-board-approves-kosovo-compact/).

Any energy imports or dependency on energy imports inevitably exposes consumers to price volatility beyond what they can afford taking into consideration the small export potential of the economy. In this sense, import dependency diverts the positive impact remittances could have on investments and economic development towards import of electricity, liquid fuels and fuel-wood.

Commented [SG1]: Moved it out of the foot note. Seems an important point to make.

Kosovo is not isolated in the energy sector; its energy security cannot be addressed solely within its own borders. As the European Union redefines energy security, focusing on resilience, sustainability, and cross-border collaboration, Kosovo must align its strategy with these evolving standards. The EU emphasizes the importance of diversifying energy sources, improving energy efficiency, and integrating renewable energy into national grids. Kosovo's reliance on lignite and energy imports leaves it vulnerable not only to domestic challenges but also to regional and global energy price fluctuations and supply disruptions.

The international organization Energy Community plays a crucial role in facilitating Kosovo's integration into the broader regional energy market. As a member of the Energy Community, Kosovo is committed to aligning its energy policies with EU standards, focusing on decarbonization, market integration, and energy security. The Energy Community provides the necessary regulatory framework and support mechanisms for Kosovo to harmonize its energy sector with regional and European energy markets. This alignment will be instrumental in attracting investments, ensuring compliance with environmental and emission standards, and fostering cooperation with neighboring countries. The Energy Community's involvement also supports regional cooperation, creating opportunities for joint energy projects and cross-border infrastructure development that will benefit the entire Western Balkans.

Energy security today is not just about ensuring a steady supply of electricity; it is about securing this supply in a sustainable and interconnected manner. For Kosovo, this means enhancing regional cooperation, particularly with its neighbors in the Western Balkans, to ensure stable energy imports, exports, and grid balancing. The establishment of a joint electricity exchange with Albania is a positive step, but more needs to be done to strengthen its ties with the wider European energy market. The EU's approach to energy security, which promotes market integration and cross-border energy flows, provides a model for Kosovo to reduce its dependency on volatile energy imports and improve overall energy resilience.

To achieve long-term energy security, Kosovo must move away from traditional definitions that focus on national self-sufficiency. Instead, it should embrace the EU's broader, modern concept of energy security. By doing so, Kosovo can better manage its energy needs, mitigate risks associated with aging infrastructure, and position itself as a key player in the regional energy landscape.

Fuel-wood accounts for about 14-15% of the overall energy demand. The conversion of fuel-wood into space heating services is inefficient and reduces the living space (around 10 square meters per person) during the winter period[16]. In addition, the small incremental growth of wood of only 3.2m3 per hectare per year should also be taken into consideration.

Demand characteristics including weather sensitivity cause exceptional load variability over power generation and distribution system. Considering the non-linear increase of distribution losses during

16 https://www.researchgate.net/publication/282759391_Wood_Biomass_Sector_in_Kosovo_Woodfuel_Integrated_SupplyDemand_Overview_Mapping_WISDOM

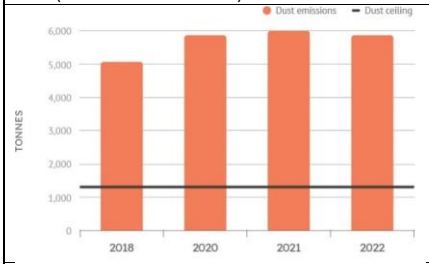
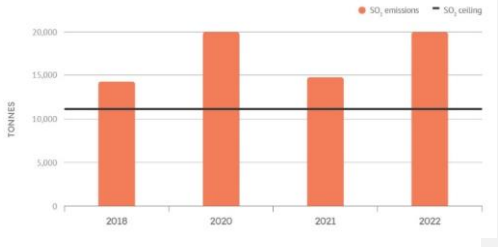
periods of load increase, spikes of demand are challenging for the power supply system in Kosovo[17] that centers on (fairly inflexible) lignite fired power plants built with old conventional power generation technology and just one small hydro power plant that is limited to water supply duty. That further directs the Kosovo power system toward expensive electricity imports with high price volatility.

This situation forces available power plants to operate in suboptimal mode which further decreases efficiency while increasing emissions. Both coal-fired power plants are approaching the end of service life. The limited utilization rate of less than 4600 hours[18] indicates significant problems with maintenance and technical failures as well as a predominance of partial load operation. The aging of these plants, combined with rising peak electricity demand, demand volatility, and the diminishing availability (or rising costs) of fuel-wood, poses a critical challenge to Kosovo's energy security.

2.3 Emissions

Importantly, the environment is negatively impacted by emissions[19] to air[20], water and soil from individual combustion devices (fuel-wood, coal, household waste), large scale lignite combustion with transboundary effects, sewage systems without waste water treatment, dust from various landfills (ash disposal at lignite plants, industrial waste landfills, municipal waste), methane emissions from landfills and open pit lignite mines, and leaching of heavy metals and other substances from landfills.

Table: Comparative analyses of emissions from lignite-fired power plants in Kosovo

Dust emissions[21] from Kosovo's NERP coal plants, compared to the allowed emissions ceilings, 2018 to 2022 (2019 data is unavailable)	Sulphur dioxide emissions from Kosovo's NERP coal plants, compared to the allowed emissions ceilings, 2018 to 2022 (2019 data is unavailable)
	
Nitrogen oxides emissions from Kosovo's NERP coal plants, compared to the allowed emissions ceilings, 2018 to 2022 (2019 data is unavailable)	Emissions from Kosovo power plants in 2022 according to the Energy Community annual implementation report

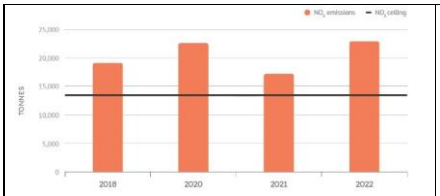
[17] In 2022 peak demand reached 1439MWe with less than 1400MWe of installed dispatchable capacity. (see https://www.ero-ks.org/zrre/sites/default/files/Publikimet/Bilancet/Electricity%20and%20Thermal%20Energy%20Annual%20Balance%202022_1.pdf)

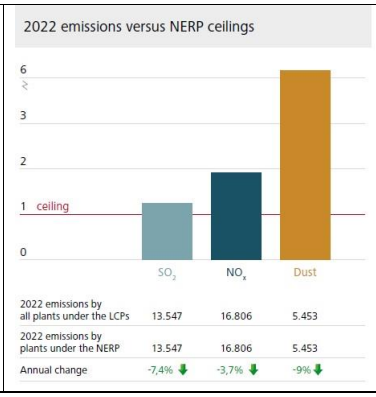
[18] Calculated according to 2022 Energy balances (https://www.ero-ks.org/zrre/sites/default/files/Publikimet/Bilancet/Electricity%20and%20Thermal%20Energy%20Annual%20Balance%202022_1.pdf). Taking into account 8760 hours per calendar year, it provides for a utilization rate of about 50% only.

[19] https://kfos.org/storage/app/uploads/public/626/a83/5a5/626a835a5d7a8227014052.pdf

[20] https://publications.jrc.ec.europa.eu/repository/handle/JRC118679

[21] https://ember-climate.org/insights/research/coal-power-air-pollution/





Bankwatch, "Comply or Close" report for 2023 indicates following emissions from Kosovo thermal power plants based on verified emission figures the European Environmental Agency

Kosovo (2022)	SO_2 ceiling	SO_2 emissions	Dust ceiling	Dust emissions	NO_x ceiling	NO_x emissions
Main NERP ceiling	10,077	19,987	883	5,867	8,829	22,846
Annex 2	10,894		1,362		13,617	

Actual air emissions from lignite-fired power plants in Kosovo[22] have been repeatedly analyzed over decades. It is widely understood that these emissions are substantial and have a significant impact on health, soil, and the broader biosphere. However, the available data on emissions are inconsistent. Discrepancies exist between various data sources and published analyses, even when they reference the same datasets. However, the relative size of emissions in Kosovo power plants[23] in comparisons with other power plant agglomerations in Europe is considerable: PM10 emissions from Kosovo power plants are larger than from all power plants in Germany[24] or over half emissions from lignite fired plants around the City of Belgrade that are nearly four times larger in capacity and utilization rate. The Western Balkans are exposed to air pollution way beyond the European average[25] and there is considerable cross border impact.

[22] A comprehensive analysis is available here: https://bankwatch.org/story/between-the-hammer-and-the-anvil. It is taking stock of real-life emissions observed during a given period. It also indicates the variable nature of emissions. However, it does not go into a more detailed understanding of operational aspects of power plants: variable lignite quality, variable load and differences in combustion efficiency as well as weather circumstances. When these parameters are taken into consideration, dramatic variations in emission outcomes (as observed) are logical outcomes. The lignite fired power plants in Kosovo are built for base load operation with lignite quality management within much larger energy system where demand side volatilities have been managed by other plants outside of Kosovo.

[23] https://www.iqair.com/us/newsroom/tiny-kosovo-is-one-of-europe-s-big-polluters

[24] https://ember-climate.org/insights/research/coal-power-air-pollution/

[25] https://www.eea.europa.eu//publications/europes-air-quality-status-2024

Particulate emissions[26] both from power plants and ash landfills[27] are the most challenging to tackle. Sulfur dioxide emissions, for example, have a significant impact on soil, erosion, landsliding, floods[28] and the land cover of Kosovo. Loss of density of forestry and land cover is a major contributor to flooding risks in Kosovo and along rivers that originate from Kosovo. Insufficient water conservation over territory creates problem with water scarcity during periods of droughts and extensive leaching[29] or flooding during periods of significant precipitation. The loss of forest density and quality should be viewed as a critical factor in water-related risks. Key drivers of this decline include fuel-wood harvesting, air pollution impacting forest health, soil degradation from erosion, and fluctuating precipitation patterns.

Most of the water pollution occurs within the Sitnica River[30] drainage area[31], which is augmented by the Ibar – Lepenac[32] hydropower system[33] as well as pollution inflow into the Ibar River downstream from the Sitnica River[34]. The dynamics of water releases from the Gazivode/Ujmani accumulation lake into the Ibar River effectively dilute pollution downstream.

[26] Notable research about radioactive properties of fly ash (particulates) from combustion of Kosovo lignite can be found here: https://www.sciencedirect.com/science/article/abs/pii/S0265931X14002483?via%3Dihub . It is to be noted that Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) have not been properly analyzed in the context of Western Balkan lignite combustion and its emissions. That also explains the controversy related to the claims of the use of depleted uranium ammunition during the 1999 NATO intervention: possible direct health effects have been considered by the International Atomic Energy Agency specialists (https://www.iaea.org/sites/default/files/properties.pdf) while numerous political/public claims continue to attribute health problems (that are more likely to be attributed to lignite combustion) to the depleted uranium argument.

[27] Effects on drinking water can be found here: https://www.sciencedirect.com/science/article/abs/pii/S0045653513010758

[28] CO2 impacts to soil and flood risks are cumulative over years (decades) therefore, actual events may go well beyond historical records and what people experience: https://kosovotwopointzero.com/en/floods-are-taking-kosovo-by-surprise/ . Further investigation: https://www.wbif.eu/technicalassistancegrants//WB25-KOS-ENV-02#:~:text=The%20studies%20have%20identified%20398,195%20are%20at%20high%20risk.

[29] Water leaching also applies to lignite deposits that are not extracted. See for example: https://www.sciencedirect.com/science/article/abs/pii/0166516295000313

[30] For example: Hyrije Koraqi, Ibush Luzha, Fatlinda Tërmkolli; "An Assessment of the Water Quality and Ecological Status of Sitnica River, Kosovo"; STUDIA UBB CHEMIA, LXI, 4, 2016 (p. 267 - 276) and several other sources

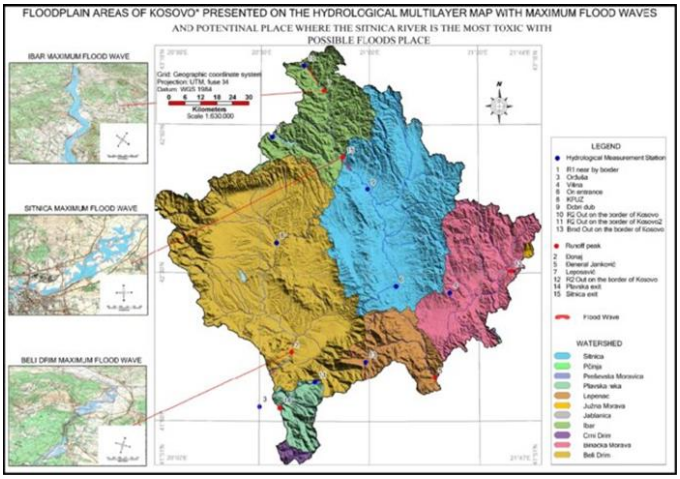
[31] Besime Sh. Kajtazi and Tania Floqi; "Thermo Power Plant "Kosovo B"– A Pollution Source for Sitnica River"; EJERS, European Journal of Engineering and Technology Research Vol. 6, No. 3, March 2021

[32] Report (https://www.osti.gov/servlets/purl/1783167) indicates that about 45% of water use (or 1.48 cubic meters per second) from the canal is water loss.

[33] https://www.eeas.europa.eu/sites/default/files/final_report_-_english.pdf

[34] https://kossev.info/trepca-tailings-near-leposavic-endangering-lives-and-the-environment-for-decades/ https://www.researchgate.net/publication/281003462_Heavy_Metals_in_Landfill_Waste_of_Trepca_after_Flotation_Process_as_Pollutants_of_Water_and_Soil ; https://www.undp.org/sites/g/files/zskgke326/files/migration/ks/TREPCA-Conf-Report_Engl.pdf

Map: Sitnica River network system and its polluted tributaries with potential flood waves on main rivers

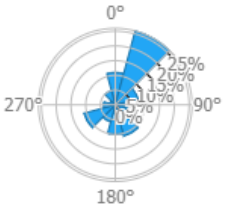
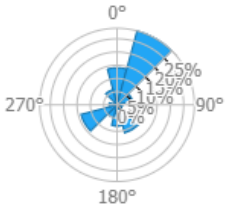
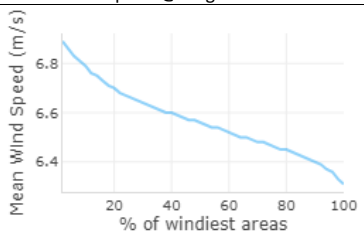


Source:
https://www.researchgate.net/publication/279750379_GENERALIZATION_OF_THE_SITNICA_RIVER_DRAINAGE_SYSTEM_WITH_POTENTIAL_POLLUTION_OF_TRIBUTARIES

Why does this matter?

Air emissions from lignite power plants with elevated stacks and located at high altitude may affect air quality in areas as far as 250km away[35] or even more under certain weather conditions. Long range pollution is significant across the region[36]. For example, lignite fired power plants located in Kosovo (at 533m altitude) may affect air quality in the City of Niš[37] that is about 150km away (at 188m altitude) in the main wind direction.

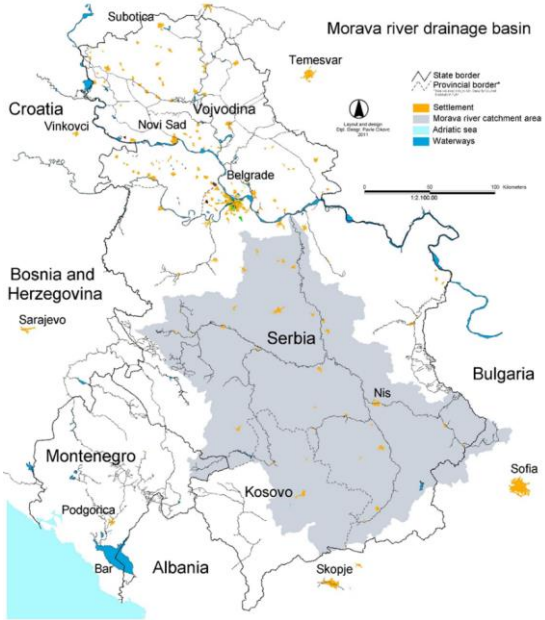
Table: Wind characteristics[38] at the Kosovo lignite power plant area

Wind Frequency Rose	Wind Speed Rose	Mean Wind Speed @Height 150m
		

[35] https://www.sciencedirect.com/science/article/abs/pii/S0048969720319203
[36] https://www.blue-europe.eu/analysis-en/full-reports/pollution-in-the-western-balkans-part-1-an-overview/
[37] https://en.wikipedia.org/wiki/Ni%C5%A1
[38] Calculated by the author using Web based tool: https://globalwindatlas.info/en

Kosovo water discharge directly affects the Morava River catchment area in Serbia that covers a considerable territory and several densely populated cities causing concerns about both pollution and flooding (or droughts).

Map: Morava river drainage basin, Serbia



Source: https://commons.wikimedia.org/wiki/File:Morava_river_drainage_basin_serbia_cikovac.jpg

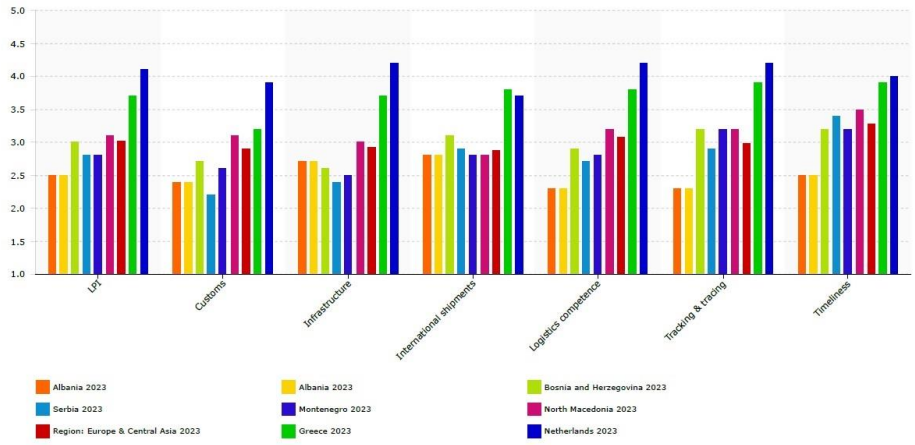
To the South, the Drin River catchment area in Kosovo affects the most valuable hydro power assets[39] in Albania[40] down the river.

2.4 Economic Geography

Kosovo is located equidistance to waterborne transport facilities. Distance between the City of Pristina to the Port of Bar (Montenegro), Port of Durrës (Albania), Port of Thessaloniki (Greece), Port of Prahovo (Serbia) or Port of Smederevo (Serbia) is roughly 300km. Export from Kosovo to these ports is mostly downhill while import is mostly uphill. These transport routes across territories are scoring poorly in the Logistical Performance Index (LPI), which assesses performance in customs and the local infrastructure.

[39] These could be among the most valuable hydro power assets in Europe if allowed to trade in the European market. Now, these assets are confined to serve domestic demand in Albania while entirely exposed to variable water inflow and precipitation regime.
[40] https://www.kesh.al/en/asset/drini-cascade/

Graph: Components of the Logistical Performance Index (LPI) selected countries



Source: The World bank LPI database

Kosovo is entirely landlocked and faces the development challenges that accompany such a situation. The most substantial demand for products and services from Kosovo comes from neighboring countries. This is particularly true for tourism along the Adriatic coast, which is limited by the availability of energy to support year-round operations.

2.5 Climate Change

Climate change is going to complicate incidence and intensity of both droughts and precipitation/floods in the entire Western Balkans. Climate change is likely to worsen the problems indicated in this paper, causing further impact to the lives of the people and their living environment. A World Bank paper[41] and the Regional Cooperation Council study[42] provide insight into the growing risks and indicate that agriculture, forestry, water and human health are likely to be most affected. In wider terms, the Western Balkans have a considerable stake in the global action to control climate change and every reason to champion reduction in greenhouse gases emissions.

3. How to make it right

First and foremost, an intervention with well-coordinated actions that tackle various aspects of the problems indicated here and above is needed. The goal is to improve Kosovo's sustainability and reduce its negative environmental impact as a positive contribution for itself and the region. That translates into the following goals:

[41] https://documents1.worldbank.org/curated/en/494741468189532505/pdf/98220-WP-P148173-PUBLIC-Box393168B-pdf.pdf
[42] https://www.rcc.int/download/docs/2018-05-Study-on-Climate-Change-in-WB-2a-lowres.pdf/06af8f7432484a6ce384ebcb8c05e8d7.pdf

3.1 Water

Water drainage downstream from Kosovo toward all three drainage areas must be less exposed to variations in precipitation, with more predictable flow and without harmful pollutants. This requires significant reforestation efforts, the construction of additional water retention facilities, the cleanup of critical landfills, and the establishment of wastewater treatment plants. Water consumption in the country's main thermal power plants must also be drastically reduced.

This approach involves cutting fuel-wood use by more than half, bringing it below the natural growth rate of forest resources. It also includes the restoration of degraded forests and the reforestation of regular forests, alongside the development of short-rotation plantations where appropriate. All efforts must consider biodiversity and broader environmental impacts.

3.2 Energy

A critical issue is reliable and affordable heat supply to provide space heating to something between 45-50 million square meters of (residential, public and commercial) buildings. Currently, over one third of space in residential premises is not heated during winter periods. Over the next 4-6 years, a major transition must take place, moving away from fuel-wood and direct grid electricity heating toward more sustainable, reliable, and affordable heating solutions. This transition should aim to halve fuel-wood consumption and eliminate the direct use of grid electricity for space heating. Experience over the past 32 years shows that this is a significant challenge.

However, this transformation is essential for creating a sustainable energy future and contributing to conflict resolution. If successful, it could reduce technical losses in electricity distribution from 14% to less than 9% and reduce residential electricity demand by 1300GWh per year. A further reduction of more than 500GWh can be achieved if domestic hot water is not produced through the electricity supplied by the grid. Both are feasible through electrification of heat combined with simple distributed heat storage and implementation of the (distributed) wind and (off grid) solar power well within limits estimated by the IRENA[43].

Another layer foresees the replacement[44] of the lignite-fired power plants with modern units with carbon capture and without any significant emissions into the air as well as with water recycling and minimal cooling water requirements. Although modern coal-fired plants are equipped with 95% carbon capture, these units need to be convertible into a biomass-to-power configuration with similar performance once biomass production is made sustainable and sufficient. Kosovo authorities need to commit to convert to biomass soon. This means changing to appropriate forestation in the near future.

A small biomass cogeneration plant is proposed for the Leposavic–Mitrovica area to provide affordable district heating services and to reduce the reliance on fuel-wood and electricity for space heating in the region. The operation of this plant would free up capacity from the Gazivode/Ujmani hydropower plant for more commercial use, helping to address energy security challenges in the area.

Although these combustion plants are capable of firing a small proportion of (combustible) municipal

[43] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/IRENA_Cost-competitive_power_potential_SEE_2017.pdf, page 54. A combination of distributed heat storage, off grid configurations and heat pumps effectively eliminates grid balancing challenges.

[44] Using existing infrastructure at the existingKosovo A power plant could provide, 4x160MWe plus 4x240MWt in a similar configuration as envisaged for much larger conventional units: https://documents1.worldbank.org/curated/en/543491468047410529/pdf/E13670VOL1020Box327408B.pdf, page34.

waste, a central waste-to-energy cogeneration plant should be located in Prizren area[45] to provide affordable heating services in the area and resolve waste disposal problems. It should have an appropriate economy of scale, the ability to recycle about 50-60% of municipal solid waste stream and to burn combustible waste[46] with carbon capture.

Captured carbon dioxide is going to be required for the carbonation of mineral waste (lignite ash, waste from mineral processing) from landfills, turning it into solid aggregate that is going to prevent further leaching of heavy metals into downstream water bodies. At the same time, material is going to be available for infrastructure construction, control of erosion and hydro power or water accumulation constructions. That includes the formation of a large water reservoir by cultivating depleted lignite open pits and the construction of the Zhur hydro power system.

These interventions would transform Kosovo's power system into a net-zero carbon energy producer. Intensive reforestation efforts could even result in a net carbon-negative situation, which would have significant international implications. More importantly, these developments would eliminate harmful emissions into the air, soil, and water, while also reducing downstream pollution. Additionally, they would help stabilize water flow to the Drin hydropower cascade and mitigate flooding risks in other areas.

Further economic growth, beyond what these investments support, can be achieved through improvements in building energy efficiency and industrial energy efficiency.

3.3 Transport and trade

Kosovo may obtain a stake in the tourist industry in the Mediterranean by offering food products and various services. That requires considerable improvement in the transport infrastructure toward Port of Bar in Montenegro. This would likely include the construction of a railway link to the Montenegrin town of Bijelo Polje as well as the reconstruction of the railway system to Skopje in North Macedonia; if the expected transport volumes justify such an investment.

These developments could also facilitate irrigation and the construction of greenhouses for over 10’000 hectares of agricultural land as well as aquaculture production. Increasing agricultural productivity may provide both food security for the local market as well as potential for export and employment.

3.4 Employment

The proposed development would unfold in layers over time, creating significant employment opportunities. Intensive training will be required for a new generation of professionals in energy, infrastructure, biodiversity, agriculture, forestry, food processing, sales, and marketing. This will lead to an overall increase in labor productivity, giving Kosovo a competitive edge in exports.

3.5 Implementation

The envisaged investments require a solid financial framework. Investments could be arranged within the Action Program for Coal Phase-out (APCP) that is envisaged by the Implementation plan for the Green Agenda[47] for the Western Balkans. Financing would be based on access to the EU Emissions Trading System (EUETS) and its financial mechanisms that support rapid decarbonization investments.

[45] Prizren area is the lowest altitude point in Kosovo and offers high quality road infrastructure.
[46] Including dry affluent from wastewater treatment plants.
[47] https://www.rcc.int/campaigns/15/green-agenda-for-the-western-balkans

Considering Kosovo's annual CO2 emissions and the rules of the EUETS Modernization Fund and Just Transition Fund, a Western Balkans Coal Phase-out Fund with similar rules could provide Kosovo with the equivalent of 6-7 million tons of CO2 allowances per year over a period of eight years. At the current prices, this could equate to over €4.5 billion in financial resources available between 2028 and 2035, provided that the legislative and administrative prerequisites under the Energy Community Treaty and the Green Agenda for the Western Balkans are met by 2028.

This framework could be supplemented by access to voluntary carbon markets and traditional funding from donors and international financial institutions. Kosovo may also need to allocate a portion of its allowances to Albania to offset the loss of hydropower production during the construction of the Zhur hydropower system. This could enable Albania to invest in thermal power and enhance the security and value of its power generation system.

4. Recommendations

1. Local professionals, with their knowledge and expertise, should be entrusted with a significant portion of the planning and execution of the proposed energy and infrastructure development projects. International and national stakeholders should allocate resources and opportunities to local experts to harness their capacity. This will enhance project ownership and ensure that the plans are well-aligned with local needs and realities.
2. The Kosovo government, in collaboration with regional and international partners, should prioritize initiatives that tackle energy poverty, pollution, and health risks in local communities. A coordinated effort to improve energy security and sustainable employment prospects can break the cycle of poverty and environmental degradation. This includes adopting practical, community-driven solutions through the Kosovo Decarbonization Platform.
3. The Kosovo government, supported by regional governments and international donors, should establish a Kosovo Decarbonization Platform to facilitate stakeholder engagement and implement the regional Action Program for Coal Phase-out. The platform should include participation from Albania, North Macedonia, Montenegro, and Serbia, involving energy companies, water management firms, and spatial planning authorities. This will foster collaboration across borders, improving energy transition efforts and enhancing regional cooperation.
4. Kosovo's energy regulatory authorities should continue strengthening ties with ENTSO-E in conjunction with the EU-facilitated normalization dialogue between Kosovo and Serbia. The integration of KOSTT of Kosovo into ENTSO-E, as part of the EU-facilitated dialogue aimed at normalizing relations between Kosovo and Serbia, marks a significant step toward implementing the key points outlined by the Energy Community Secretariat. This milestone creates an opportunity to enhance regional energy security through strengthened cooperation between Kosovo and Serbia, benefiting the entire region.
5. Regional stakeholders, led by the Regional Cooperation Council (RCC), should provide leadership and project management for the Green Agenda for the Western Balkans. This includes coordination with various national governments, energy stakeholders, and local authorities to ensure effective implementation of the energy transition. The RCC, given its track record, is well-positioned to manage these complex, multi-stakeholder initiatives.

6. The international donor community should be engaged to provide financial support for administrative, technical, and spatial planning activities. A coordinated donor strategy, potentially through public-private partnerships, would ensure sufficient funding for the proposed initiatives. Local, municipal, and government ownership models should also be explored to manage the diverse asset portfolios. This approach would ensure that investments are efficiently utilized, with tangible improvements in energy security, environmental health, and economic opportunities.
7. The governments of Kosovo and Serbia, supported by the European Union and international partners, should use the normalization of relations as a platform to enhance regional cooperation in the energy sector. This could include joint energy projects, improved cross-border energy infrastructure, and the development of a unified energy market. Efforts should be made to expand the Albania Power Exchange (ALPEX) to include additional countries, potentially including Serbia. Expanding ALPEX would enhance cross-border electricity trading, improve energy security, and promote a more integrated and efficient regional energy market. The Energy Community should play a key role in facilitating this process by ensuring compliance with regional energy regulations and supporting the alignment of energy policies across participating countries.