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Jan Bondy
Ambassador of the Czech Republic to Serbia

CZECH REPUBLIC'S AMBITIOUS CLIMATE GOALS: Stability Through Nuclear and Green Energy

Bihać – When Tourism Development Goes Hand in Hand with Care for Nature

Climate Change

ENERGY ADVISORY CENTERS: Knowledge as the Currency of Climate Policy

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Photographs: (1st row) MT-KOMEX, VTF studio; (2nd row) Mihajlo Pupin Institute, DANUBE4all; (3rd row) Blaž Perić, Green Team Association

WORD OF THE EDITOR

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Dear readers,

For the editorial team of Energy Portal, this summer has been both busy and inspiring. We have prepared for you a series of carefully chosen topics that, each in its own way, touch upon the central theme of our magazine – the climate challenges of the modern era.

Although we also found moments to rest, we did not allow ourselves to overlook the fact that climate change often reveals its most destructive face during the summer – through floods, fires, and other extreme events. That is why, in this issue, we present an analysis of the increasingly frequent fires at landfills and on agricultural land in Serbia, while also examining how climate change impacts migration flows.

We also present new insights into regenerative agriculture, as well as the concept of the "smart garden" – an innovative approach that combines greater productivity, cost-effectiveness, and sustainability in agricultural production.

In a conversation with the Ambassador of the Czech Republic to Serbia, Jan Bondy, we learned how the Czech Republic managed to reduce greenhouse gas emissions by an impressive 47 percent compared to 1990, as well as their plans in the fields of nuclear and renewable energy.

The Director of the Forest Administration, Saša Stamatović, spoke to us about the results of the Second National Forest Inventory, regional differences in forest coverage, the importance of climate-resilient management, and significant projects such as Forest Invest.

We also visited Bihać, a city with a rich history and pristine natural surroundings. In an interview with Mayor Elvedin Sedić, we discovered how tourism can grow hand in hand with the preservation of natural heritage, through projects such as the "Emerald Path" and many other initiatives.

We bring you a story of two solar power plants under construction in Aleksinac, both of which will deliver all the electricity they produce into the grid, helping to make our country's energy sector even greener.

We also reveal how young people from Mostar have launched an innovative project that changes the way agricultural land is protected, as well as how young biologists from Bosnia and Herzegovina are working to preserve a rare amphibian – a living witness of the Ice Age – whose survival is now endangered. And that is not all – many more interesting stories await you.

Enjoy your reading and remain true to yourselves, to nature, and to a green future.

Nevena Đukić,
editor-in-chief

Photograph: courtesy of Nevena Đukić

CZECH REPUBLIC'S AMBITIOUS CLIMATE GOALS: STABILITY THROUGH NUCLEAR AND GREEN ENERGY

Photograph: Pixabay/Duernsteiner

The Czech Republic is recording notable successes in the fight against climate change – from reducing greenhouse gas emissions by 47 percent compared to 1990, to ambitious plans for expanding the share of renewable sources and nuclear energy in its energy mix.

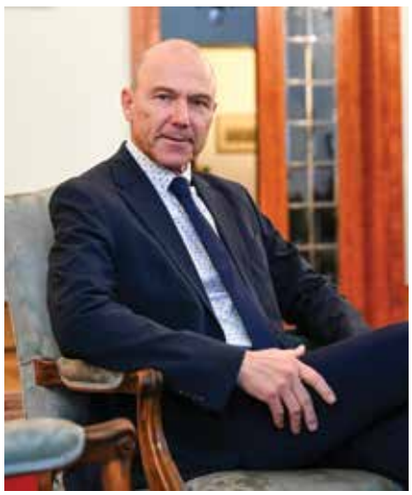
In an interview with our magazine, the Ambassador of the Czech Republic to Serbia, H.E. Jan Bondy, talks about the strategic directions of Czech climate and energy policy, the challenges and benefits of the energy transition, improvements in air quality, and the fight against flooding.

He also touches on concrete measures supporting the development of electromobility and green infrastructure, as well as prospects for deepening cooperation with Serbia in areas such as environmental protection, renewable energy sources, and waste management.

Q: What are the main measures the Czech Republic is implementing in the fight against climate change, and what specific climate targets has it set in line with European and international commitments?

A: At the national level, the Czech Republic has adopted strategic documents related to climate protection, covering the period from 2017 to 2030, with a long-term outlook to 2050. Broadly speaking, we can say that since 1990, harmful gas emissions in the Czech Republic have been reduced by 47 percent. Thanks to this, we expect to meet the EU's 2030 target, which aims for a 55 percent reduction in greenhouse gases. Now we must ensure a consistent trend of decarbonizing the energy sector and the entire economy. That's why we will continue to encourage the development of renewable energy sources and heat production systems, as well as energy efficiency measures, through successful subsidy schemes, primarily via the Modernization Fund.

In relation to the ongoing debate on a new target under the proposed revisions to the European Climate Law, which would apply up to 2040, we can briefly highlight several key points of importance for the Czech Republic. As one of the EU's highly industrialized countries, with a significant share of energy-intensive sectors, the Czech Republic will face relatively greater consequences and costs in transitioning to low-emission and zero-emission technologies. Therefore, we will insist on guarantees and the preservation of the principles of solidarity and fair burden-sharing, where the principle of technological neutrality is of key importance to us. It is also crucial that the Czech Republic continues and increases green transition funding from the EU budget, which is closely



H.E. JAN BONDY is an experienced Czech diplomat with a distinguished career in foreign policy and public diplomacy. He graduated from the University of Economics in Prague, specializing in production economics, and further enhanced his knowledge through training in marketing, management, public diplomacy, and cybersecurity. His diplomatic career began following a successful tenure in cultural institutions, including positions at PragoConcert and the Prague Symphony Orchestra. He was later appointed as the Ambassador of the Czech Republic to Cyprus (2007–2011) and to Greece (2015–2019). Notably, he has twice served as Director of the Public Diplomacy Department at the Ministry of Foreign Affairs of the Czech Republic.

Photographs: (bottom) Pixabay/Duernsteiner; (top right) CorD Magazin/Zoran Petrović

linked to the preparation of the new multiannual financial framework.

Q: How does the Czech Republic protect its natural resources, and which institutions play a key role in implementing environmental protection policy?
A: In recent years, the Czech Republic has undergone a fundamental economic transformation and achieved significant success in areas such as air protection, water quality improvement, waste management, the remediation of areas polluted by industrial activities, and the reclamation of regions damaged by raw material exploitation. This is the result of tremendous efforts by the Ministry of the Environment, together with other key players, including relevant ministries, the scientific community, businesses, industry, civil society organizations, and other stakeholders, with support from international partners at both European and global levels. In the area of bilateral cooperation, collaboration with neighboring countries is especially important to us.

Q: What concrete measures is the Czech Republic taking to reduce air pollution, particularly in the energy and transport sectors, and how aligned are these steps with European air quality standards?
A: A specific example of good practice, which has become a symbol of the connection between environmental, social, and economic contributions in many respects, is the New Green Savings (NZŠ) program. Thanks to this program, the energy demand of buildings is being reduced, renewable sources are being encouraged, housing quality is improving, and new job opportunities are being created. Today, the program also focuses on vulnerable households (subsidized support for the elderly and low-income families), thus supporting social sustainability and contributing to the fight against energy poverty. This program has already helped thousands of families and plays a significant role in our climate commitments. By the end of 2024, 480,000 applications will have been approved under the NZŠ, and 600,000 households will have received subsidies amounting to approximately 110 billion Czech crowns, of which two-thirds – 350,000 applications worth 75 billion crowns – have been approved in the current phase of the program since 2021.

Q: Given the increasingly frequent and severe floods in Central Europe, including the Czech Republic, what strategies and investments is the Czech government implementing in flood prevention and climate adaptation?
A: The implementation of technical flood protection measures is very problematic and time-consuming in the Czech Republic. The reasons lie in the complex permitting processes, unresolved property relations, conflicts within protected natural areas, and the long-standing negative societal and media attitudes towards the establishment of technical flood defenses. In some cases, local authorities are even pushing for development in flood-prone areas.

To improve this situation, the Ministry of the Environment has amended the Water Act, stipulating that flood protection structures are to be built in the public interest, which should, in practice, speed up expropriation procedures for such facilities.

State institutions must promote resilience at both individual and local levels. It is essential to educate the public about the importance of water management and flood protection.

International information exchange is also crucial, both bilaterally and within international river basins. In the Danube basin, which includes both the Czech Republic and Serbia, long-term functional early warning rules have been established within the International Commission for the Protection of the Danube River.

Photograph: Pixabay/Jaromír Čižinský

the context of energy security and decarbonization?

A: Yes, the Czech Republic aims to increase the share of nuclear energy in electricity generation to as much as 68 percent by 2040 (currently around 40 percent), through the completion of new units in Dukovany (2×APR-1000) and the introduction of up to 3 GW of capacity from small modular reactors (SMRs). The expected benefits of this strategy are stability, low-emission electricity, greater energy security, and reduced dependence on coal and natural gas (CO_2, pricing, geopolitical risks).

SMRs offer faster and more flexible commissioning, lower financial demands for projects, and the potential for factory production, which enhances scalability and deployment in various locations and local conditions. Priority is given to locations where there is already infrastructure for electricity production and distribution, i.e. sites of existing nuclear and coal-fired power plants.

Q: The Czech Republic plans to increase the share of nuclear energy in total electricity production to 68 percent by 2040, through the construction of new large reactors and the introduction of up to 3 GW of capacity from small modular reactors. What are the main challenges and expected benefits of this strategy in

In the field of SMRs, cooperation with British partners from Rolls-Royce is crucial for us, where the semi-state-owned Czech company ČEZ holds a 20 percent stake. The Czech Republic and the United Kingdom are both interested in success not only within their domestic markets.

Photographs: (top) Unsplash/Dmitry Romanoff; (right) Pixabay/Stanly8853

It's worth noting that in the Czech Republic, 71 percent of the population supports the development of nuclear energy, especially when combined with renewable sources.

Q: According to the updated National Energy and Climate Plan, the Czech Republic aims to increase the share of renewable energy sources from 16.5 percent to 28 percent by 2030, and to 46 percent by 2050. How does the Czech government plan to ensure stable growth in renewables, particularly in the solar and wind sectors, to meet these ambitious goals?

A: Specifically, the plan foresees a fivefold increase in the capacity of photovoltaic systems and wind farms by 2030 (e.g., solar capacity up to 10 GW, wind capacity around 1.5 GW). Government support includes the national recovery plan, with approximately five billion Czech crowns allocated for businesses and an additional seven billion for households to develop photovoltaic systems and energy storage – including programs targeting low-income households and community energy. Other measures include streamlining permitting procedures, digitalizing processes, and improving public acceptance, especially for wind projects. Support is also directed towards combining energy savings and storage, including integration with grid flexibility and backup capacity (e.g., gas or batteries).

Q: How committed is the Czech Republic to developing electromobility, and what incentive measures are being implemented to accelerate the shift to electric vehicles in transport?

A: The core national policy for the development of alternative transport fuels is the National Action Plan for Clean Mobility (NAP ČM), which was last updated in August 2024. The plan is primarily based on the EU regulation on the deployment of alternative fuels infrastructure, known as the AFIR regulation. Moreover, the action plan incorporates several other new EU legislative frameworks and modern trends. A key objective was to align NAP ČM with other national energy and climate strategies.

The adopted measures include, for example, support for modernizing public and freight transport, aid for vulnerable social groups, and the development of shared mobility and e-car sharing. A crucial component is encouraging the development of

Photograph: (top) Pixabay/Umkreisel App

both public and private infrastructure for electric, hydrogen, and biomethane-powered vehicles. In non-road transport, the focus is primarily on introducing alternative fuels into rail transport. These measures will be financed through the National Recovery Plan, the Operational Program Transport, the Modernization Fund, or the Social Climate Fund.

Q: How would you assess the cooperation so far between Serbia and the Czech Republic in the field of environmental protection, and in your opinion, what are the most promising directions for future collaboration?

A: From the perspective of the Czech Ministry of the Environment, cooperation is progressing well. This is evidenced by numerous environmental projects implemented in Serbia. The legal basis for this cooperation is the Memorandum of Understanding on Environmental Protection between the Ministry of the Environment of the Czech Republic and the Ministry of Science and Environmental Protection of the Republic of Serbia (October 2006). Our colleagues at the Serbian Ministry are particularly interested in cooperation on sharing experiences from the Czech Republic's pre-accession process, the use of EU funds, and climate protection. We have also observed growing Serbian interest in cooperation in the area of environmental control and see potential in various other areas, including waste management, environmental remediation, wastewater management, and water resource protection.

Q: Are Czech companies interested in investing in renewable energy projects in Serbia, and what specific measures or conditions could further encourage such investments?

A: We already have a few investors in hydro energy projects in Serbia. Czech companies see potential in further developing small hydropower plants. We have the technical expertise, financial capacity, and willingness to invest more in this field. However, challenges usually stem from slow administrative procedures at both local and national levels. Some processes take too long and could result in Czech companies losing interest in the Serbian market. We expect more flexibility, which would also benefit the Serbian side.

The field of waste sorting and disposal is another area where Czech companies show strong interest. We believe we have significant experience and good results to offer, which we would be glad to share with our Serbian partners.

Interview by Milena Maglovski

Photographs: (middle) Unsplash/Marcin Jozwiak; (bottom) Pixabay/Krystianwin

BIHAĆ – WHEN TOURISM DEVELOPMENT GOES HAND IN HAND WITH CARE FOR NATURE

The city of Bihać is located in the northwest of Bosnia and Herzegovina and is known for its exceptional natural beauty and rich cultural and historical heritage. Much of the city abounds with springs, streams, rivers, and underground waters, and the first thing that comes to mind when mentioning this area is undoubtedly the emerald-green Una River, with its famous waterfalls – Štrbački Buk and Martin Brod.

It is precisely these natural wonders that attract visitors from around the world, which is why Bihać pays special attention to the development of sustainable tourism while preserving the natural environment. However, the other side of the coin points to growing threats, such as illegal construction and the concreting of riverbanks, which could seriously damage the natural landscape and biological balance of the area.

What are the city authorities doing to protect natural resources and prevent pollution? What is the Emerald Road project, and what are the latest developments in the city? We learned more from Elvedin Sedić, Mayor of Bihać.

Q: Which natural resources would you single out as the most important for the City of Bihać, and how significant are they for local development?

Una is without doubt our greatest natural asset and development potential. It is the foundation of our identity and the lifeblood of this region

Photograph: City of Bihać

A: Bihać is no longer an industrial city, and I believe we must come to terms with that. The era of major industrial giants like Gorenje, Kombiteks, and Polietilenka is behind us. The time when the city relied solely on industry has passed, and today, in terms of local development, we must think differently. When we talk about resources, especially natural ones, Una is without doubt our greatest natural asset and development potential. It is the foundation of our identity and the lifeblood of this region.

Aside from Una, I would also highlight forest resources, especially timber, which have unfortunately remained underutilized in the post-war period. We have failed to develop a stronger timber industry, and there lies room for a serious strategic breakthrough. We have the resources and knowledge; what we now need is more coordination and vision to leverage these natural advantages for sustainable development.

Q: Given that Bihać is the largest city through which the Una River flows, how do you view its potential – environmentally, touristically, and economically?

A: Una is our mirror and, in every sense, our most valuable asset. From an environmental standpoint, our primary task is to protect it. Its cleanli-

Elvedin Sedić
Mayor of Bihać

Photographs: City of Bihać

ness, flow, banks, and natural surroundings are values we must defend and preserve for future generations. From a tourism perspective, Una and its entire environment offer enormous potential. It is a beauty that already attracts visitors from around the world, but one that we must use carefully and responsibly. Tourism development must not come at the expense of nature. I believe that preserving the natural environment and developing tourism are not opposing but complementary concepts. We need to plan wisely and in the long term, invest in infrastructure that respects ecological standards and uses natural resources sustainably.

Q: What are currently the greatest threats to the ecosystem of Una National Park, and how are the Park or local authorities addressing them?

A: The biggest challenge is illegal construction. This is a problem that concerns all of us – the local community, institutions, and every individual. When we concrete the riverbanks and disturb the natural configuration of the river, we are actually damaging its identity. We lose what makes it unique, and with that, we lose tourists, development, and the future. The problem doesn't stem only from illegal construction, but also from a lack of awareness about the importance of preserving natural spaces. That's why it's extremely important to urgently adopt and implement regulatory and zoning plans, which will enable planned, controlled construction within the National Park and along the Una's banks. Only in this way can we stop further devastation and create a sustainable framework for the coexistence of humans and nature.

Q: What concrete measures are being implemented to prevent pollution and preserve natural resources in Bihać and the wider region?

A: We are acting on several fronts simultaneously, through infrastructure, education, projects, and control mechanisms. The City of Bihać continuously invests efforts into preventing pollution and the degradation of natural resources. One of the key projects in this direction is RECIRCLE, through which we are strengthening waste management system capacities by applying circular economy principles. The focus is on increasing recycling rates, separate waste collection, and reuse.

Additionally, the SMART DeCARB project is aimed at developing innovative pilot solutions for decarbonizing public buildings. This directly contributes to reducing CO_2 emissions and improving energy efficiency, making Bihać part of the broader European energy transition. These projects are not just technical solutions but also essential tools for raising public awareness about the importance of environmental protection

Photograph: City of Bihać

and responsible behavior, as well as a strong path toward applying European standards.

Q: Are there any plans to develop new tourist infrastructure, particularly that which respects sustainability principles?

A: In recent years, we've worked intensively on developing tourist infrastructure, always with sustainability in mind. Unfortunately, for years, this sector was neglected, and many attractive locations were either abandoned or difficult to access.

Through the Emerald Road project, right in the city center, we've started connecting the islands on the Una and forming a circular promenade, which we hope will become one of the most visited spots in Bihać. Inspired by the Una River, the Emerald Road is a symbol of our commitment to preserving nature while also being a vision for developing the urban core neighborhood, completing one of the most scenic walking routes in Bosnia and Herzegovina.

Q: How do you maintain a balance between tourism growth and the need to protect natural resources?

A: That balance is precisely the core of our approach. Tourism development must go hand in hand with environmental preservation. We must not sacrifice nature for short-term profit. That's why we insist on sustainable solutions, respect for zoning and regulatory plans, and investment in infrastructure that protects the environment. Through projects like the Emerald Road, we are demonstrating that it's possible to develop a tourism product that benefits the local community while preserving the authenticity and natural values that define us. That's the direction we want to continue pursuing.

in harmony with the natural surroundings.

Furthermore, we've improved access to attractions like Štrbački Buk and the National Park, and we're doing the same in Martin Brod. Through revitalization of historic towns, our focus has also been on enhancing rest and recreation areas. Besides building a new pedestrian bridge, which is currently under construction, we also plan to develop a suspension footbridge that will connect the walkway behind Stens with the Midžić

Q: How is waste management organized in the City of Bihać, and are there any problems with disposal or recycling?

A: Waste management is organized through the public utility company Komrad. We are currently recycling around five percent of collected waste, which is the best result among local communities according to Ekopak. However, we still consider that percentage insufficient compared to actual needs and possibilities. That's why we are continuously working to improve processes, both in terms of collection and in sorting and processing waste. We are also taking advantage of opportunities provided by international and EU projects, such as RECIRCLE, to further strengthen the system and increase efficiency. We have excellent examples from European countries, and I believe it's simply a matter of replicating them in line with our capabilities.

In the long term, the goal is for Bihać to become a role model of sustainability regarding waste management.

Interview by Jasna Dragojević

The Heart of Krajina on the Banks of the Una

Bihać, a city located in the west of Bosnia and Herzegovina, in the heart of the Una-Sana Canton, is known for its rich history, natural beauty, and the Una River, one of the cleanest rivers in Europe. The city exudes a blend of Ottoman and Austro-Hungarian architecture, while the surrounding natural attractions, such as the Una National Park, attract lovers of rafting, hiking, and unspoiled nature.

The old town of Bihać, with its numerous monuments, towers, and remnants of a medieval fortress, preserves traces of the turbulent past of this region. Cultural and music festivals, held throughout the year, bring the city's streets and the riverbanks to life, offering a unique experience to both domestic and international visitors. Bihać is also a significant university center, and its young population contributes to the city's modern spirit. The traditional Krajina cuisine adds extra charm to the city on the Una, where nature and history coexist in perfect harmony.

Photograph: Pixabay

THE FORESTS OF SERBIA – GUARDIANS OF WATER, SOIL, LIFE, AND THE FUTURE

As the world increasingly recognises forests as key allies in the fight against climate change, Serbia is recording a positive trend – forest cover today stands at 39 percent, with total green cover reaching 43.1 percent of the country's territory. Behind these figures lie decades of planned afforestation, natural succession, and an increasingly robust institutional framework.

In an exclusive interview for Energy Portal Magazine, Saša Stamatović, Director of the Forest Directorate at the Ministry of Agriculture, Forestry and Water Management, discusses the results of the Second National Forest Inventory, the challenges of uneven forest distribution across regions, the importance of climate-resilient forest management, and major projects such as Forest Invest.

Q: What is Serbia's current forest coverage, what is the state of its forests, and what are the key factors influencing it?

A: First and foremost, I must underline that forest area, along with many other quantitative and qualitative data about forests, is determined through a complex, robust, scientifically, methodologically, and statistically sound procedure known as the National Forest Inventory. Serbia completed its Second National Forest Inventory and published the results at the end of 2023, using the most advanced methodological and geoinformation technologies and instruments. FAO experts, under whose supervision the inventory was carried out, rated it a "high-quality study".

According to data from the Second National Forest Inventory, conducted by the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia in cooperation with the United Nations Food and Agriculture Organization (FAO), Serbia has 3,025,471 hectares of forest and forest land, which amounts to 39.01 percent of its territory. When we add

Photograph: Unsplash/David Bruyndonckx

Today, with increasingly frequent droughts, wildfires, and soil fertility loss, the role of forests is becoming strategic – for both the state and rural areas. At the same time, forests are threatened by extreme climate events, so appropriate management that boosts their vitality and resilience is more important than ever

Saša Stamatović

Director of the Forest Directorate at the Ministry of Agriculture, Forestry and Water Management

other land with tree cover (OLWT) – such as tree-lined avenues, smaller tree groups or individual trees, parks, and forest patches smaller than 0.5 hectares – which are not methodologically included in the official forest coverage figure, the total tree canopy cover reaches 43.1 percent. Although this latter category is not internationally defined as forest coverage, its importance and the need for preservation, especially in areas with low forest percentages and particularly in urban and peri-urban environments, are undeniable.

To properly understand the significance of this figure, we must look to the past and examine how forest coverage has changed over previous centuries. Historical estimates suggest that, at the beginning of the 19th century, over 50 percent of Serbia was covered by forest. This reflected the natural landscape before the widespread expansion of agriculture, livestock farming, and industrial development. However, by the second half of that century, following the country's autonomy and the expansion of rural settlements into hilly and mountainous areas, there was significant population movement accompanied by growing demand for arable land and pastures. Forests were cleared to make way for agricultural production, especially livestock farming, and later for the development of infrastructure, mining, and industry, leading to a drastic reduction in forested areas.

By the end of the 19th century, forest coverage had decreased to around 35 percent, and just before the Second World War, it was estimated to have fallen to a mere 17 percent. This was the lowest recorded level and reflected the deep socio-economic and political processes of the time. Nevertheless, negative trends were already being recognised then. As early as 1839, Prince Miloš issued a decree legally prohibiting the felling and clearing of forests without supervision. The Forest Law of 1922, enacted during the Kingdom of Serbs, Croats and Slovenes, was the first to mandate reforestation of cleared land, signalling a move towards more active state management of forest resources.

The post-WWII period brought gradual change. As early as 1947, the state began allocating budget funds for afforestation, which, along with the cultivation of fast-growing species, gained momentum in the decades that followed. Alongside this, demographic trends – particularly rural depopulation and the decline of extensive livestock farming – led to the abandonment of pastures and meadows in mountainous areas. These unused areas underwent natural succession, meaning they gradually became reforested on their own. This process of natural succession has been one of the most significant factors behind the increase in forest coverage in recent decades. Alongside it, systematic afforestation, especially in barren and erosion-prone areas, has played an immeasurable role.

In the last ten years alone, through state and provincial programmes, more than 1.1 billion dinars of budget funds have been invested annually in afforestation and forest improvement, along with significant international funding through various projects.

The third key element is the strengthening of the legal and institutional framework.

Today, deforestation is strictly prohibited by law and can only be carried out if there is a determined public interest. Illegal logging is treated as a criminal offence. There is also a strong inspection system in place, and all forest managers are required to implement protection and improvement measures for forest resources in accordance with current forest management plans.

The fourth factor contributing to the recorded increase in forest coverage is the modernisation of monitoring.

As part of the Second National Forest Inventory, a two-phase sampling

Photograph: courtesy of Saša Stamatović

system was used, combining field measurements with satellite imagery analysis (FAO Collect Earth). This method made it possible to record even small forest areas that previously remained outside statistical coverage. This means today's data is not only better, but also more accurate.

A significant factor in this positive trend is also the growing public awareness of forests' ecosystem functions, which has seen exponential growth in recent decades, particularly with the recognition of forests' role in mitigating climate change.

To summarise, the current state of Serbia's forests is a mirror image of its economic, historical, and cultural circumstances. It represents the result of a decades-long process of reversing degradation. This includes natural succession, organised afforestation, the retreat of agriculture from marginal lands, and a significant role played by regulatory mechanisms.

Q: What activities is the Forest Directorate undertaking to increase forest coverage further, and is it involved in CO_2 emissions reduction projects?

A: Since the 1980s, the optimal forest coverage for Serbia has been estimated at 41.4 percent, and this figure is officially included in the national Spatial Plan.

What's the difference between an average percentage and an optimum? According to the Second National Forest Inventory (NFI2), forests in Serbia are not evenly distributed: over 94 percent of all forests are located in Central Serbia, while Vojvodina, due to its predominantly agricultural land use, has only 8.63 percent forest coverage. The most forested districts are Raška, Jablanica, Bor, Toplica, and Zlatibor. In contrast, the least forested are North Banat, Central Banat, and North Bačka – with Raška at over 67 percent and North Banat at just 0.2 percent.

The optimum for the republic, as a functional indicator, can only be determined bottom-up - that is, by calculating optimum levels for smaller spatial units and then aggregating them at the national level. An average value does not reflect spatial distribution - for instance, increasing forest cover in already heavily forested districts won't improve the situation in Banat. This doesn't mean afforestation shouldn't continue where there is potential, even in areas with high forest coverage, but priority must be given to those with low coverage.

In any case, the optimum is a dynamic and primarily spatial-planning category that must combine natural potential with aligned ecological, economic, and social needs.

From a forestry perspective, a strategic stance can fully embrace the statement attributed to Jovan Jovanović Zmaj: "Wherever you find a good place, plant a tree there." This means continuing to secure land for establishing new forests, financing new afforestation efforts, and preserving and improving existing forests.

In this sense, the seven-year Forest Invest project has just begun implementation, co-financed by the Green Climate Fund. The project is jointly implemented by the FAO and the Government of Serbia (via the Ministry of Agriculture, Forestry and Water Management, Serbia Forests and Vojvodina Šume public enterprise), with the aim of increasing forest resilience, ensuring energy security for the most vulnerable, and improving carbon storage. In brief, the project covers afforestation, conversion of degraded forests, nursery improvements, and the inclusion of the private sector in climate-resilient forestry and decarbonisation. It is planned that during the project's implementation, 7,000 hectares will be afforested, 51,000 hectares of degraded coppice forests will be converted into high forests, climate-resilient forest management will be enabled on 500,000 hectares, firewood consumption among the most

Photographs: Unsplash/Syahrin Seth; (middle) Unsplash./Geranimo

vulnerable households will be reduced, and emissions will be cut by 8.4 million tonnes of CO_2 equivalent over the next 27 years.

Q: Can you tell us something about the ecological, economic, and social importance of forests and their role in combating climate change?

A: Forests are, by their nature, multifunctional ecosystems and much more than just sources of timber – they are the foundation of land preservation, climate regulation, and rural life. Their role in preventing

erosion, retaining soil moisture, and mitigating extreme weather conditions is irreplaceable, especially in areas already affected by drought and land degradation. A well-managed forest protects roads, watercourses, and the agricultural land beneath it. It is a carbon sink, a refuge for plant and animal life, but also a source of fuel and income for rural households. Today, with increasingly frequent droughts, wildfires, and soil fertility loss, the role of forests is becoming strategic – for both the state and rural areas. At the same time, forests are threatened by extreme climate events, so appropriate management that boosts their vitality and resilience is more important than ever.

In Serbian forestry, for over half a century, wood has not been the goal of forest management but rather a consequence of implementing measures to preserve and enhance forest vitality and resilience.

In today's conditions of increasing climate extremity, recognising the need to strengthen forest resistance and conserve biodiversity, Serbia has, in recent years, adopted close-to-nature forest management as its guiding principle. In short, this means that forest management is based on professionally induced imitation of natural processes. Simply put, it involves earlier and more intensive implementation of selection measures to secure more space for the trees of the future. We have established this system through numerous regulatory and technological innovations.

This would not be functional without the introduction of continuous staff training. For this purpose, we implemented systematic education and the principles of lifelong learning, which are essential in the context of today's rapid technological changes. The result of implementing the new management system, with the use of state-of-the-art modelling of climate impact, is significantly lower tree mortality and higher, better-quality forest growth. These positive differences are increasingly evident under more extreme climate scenarios.

In conclusion, intensive management based on the concept of close-to-nature forestry has no alternative. The system provides more resilient forests, which are at the same time ecologically more stable and economically more efficient.

In this context, it is important to mention the significant efforts made to assess forest fire risk levels and ensure early detection.

In the upcoming period, implementing modern technological solutions is necessary to install devices that facilitate quicker intervention and minimize damage. Additionally, increasing public awareness is crucial to reduce the occurrence of fires.

Q: Are Serbia's forests managed sustainably?

A: The term sustainability is often used lightly, as if it were a vague or abstract concept, when in fact it is a precise outcome of set criteria and their indicators.

In addition to forest area, the National Inventory collected over 100 structural, dendrological, and biodiversity attributes of forests. These data form the basis for further improvement and the development of sectoral objectives and measures to achieve them. They also serve as a valuable source for other sectors linked to forests and timber.

According to the results of the Second National Forest Inventory (NFI2), the total timber volume in Serbia is about 557 million m^3, with an average volume of 194.5 m^3/ha. The annual increment is around 14.33 million m^3, with an average annual increment of 5.05 m^3 per hectare. Total biomass exceeds 511 million tonnes, and carbon stocks surpass 257 million tonnes, making Serbian forests a significant carbon sink within climate policy.

The inventory data point to an increase in forest area, timber volume (and consequently carbon), and both average and total increment – all of which indicate improved sustainability. Sustainability can also be measured by the ratio between annual increment and harvesting, which currently stands at around 0.65 in favour of increment. That is, the annual harvesting rate is less than two-thirds of the increment.

The criteria and indicators show that forests in Serbia are continuously increasing both quantitatively and qualitatively.

Interview by Milena Maglovski

ENERGY ADVISORY CENTERS: KNOWLEDGE AS THE CURRENCY OF CLIMATE POLICY

Opportunities for change sometimes arise only in times of crisis. Climate change is a crisis that has forced us to finally alter our poor energy habits and raise the level of energy literacy. Energy transition, as a pillar of climate policy, has become important not only for large organizations and systems but also for households and entrepreneurs.

Flash floods and heat waves are now increasingly associated by the public with the direct costs of energy wastefulness, dependence on fossil fuels, and energy poverty—such as the health costs of air pollution, rising bills for electricity and other energy sources. Understandably, citizens are becoming more interested in replacing windows and joinery in residential buildings, acquiring modern, cleaner, and more efficient heating and cooling devices, and producing their own energy from renewable sources for personal use.

However, unlike large companies that have the resources to acquire the necessary knowledge about new technologies and the profitability of investments, many citizens and small entrepreneurs lack the knowledge and resources to make informed decisions. Public subsidy programs, jointly implemented for several years by the Government of the Republic of Serbia and local self-governments, often assume that recipients already possess the technological and other necessary knowledge, which many still need to acquire.

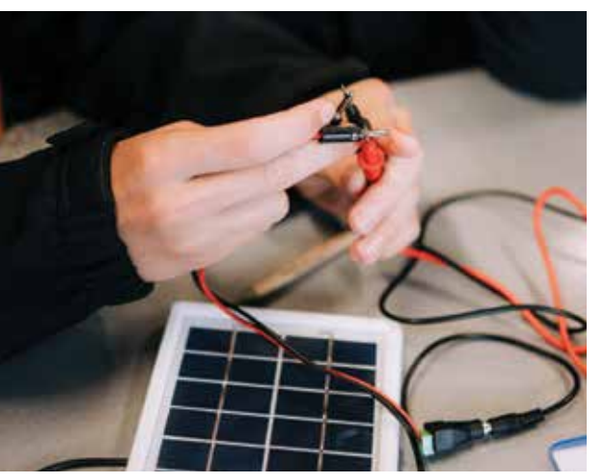
News of open public calls for subsidies often reaches rural households too slowly. Frequently, citizens who need the most assistance do not have the financial means required for their contribution toward the costs of replacing devices or joinery. Many live in buildings that do not meet the required eligibility criteria of these programs.

Citizens and entrepreneurs with the financial capacity and desire to invest in solar energy often make

Photographs: GIZ

mistakes by oversizing their solar power plants, which results in profitability being lower than expected.

Some municipalities and cities in Serbia have recognized that their citizens and entrepreneurs need a place for learning and obtaining information—a place of understanding and support—so they can make correct and informed decisions on their own. At the end of last year, Užice, Knjaževac, and Bačka Palanka opened their Energy Advisory Centers, offering answers to citizens' questions all in one place. These advisory centers do not sell devices or issue bills; instead, they help people understand what and when it is worth investing in, and how to get involved.



Energy Advisory Centers serve as a mechanism for connecting public policy with the everyday lives of citizens. Their role includes providing information, interpreting relevant regulations and guidelines, directing users toward available solutions, and offering professional support. Given the complexity of their goals, these centers operate in cooperation with state administration institutions, the private sector, and civil society organizations. Particularly important is the involvement of local actors who possess relevant knowledge and experience in energy efficiency and sustainable development.

For example, the recent opening of the Knjaževac Energy Advisory Center was an opportunity to invite companies that market products and services for improving energy efficiency to present their technical solutions, products, and services to interested citizens and entrepreneurs in the center's premises—located in the Directorate for Development, Urban Planning, and Construction of the Municipality of Knjaževac.

Given the growing importance of rural tourism in the Knjaževac municipality, outreach to local entrepreneurs included publishing the Guide to Energy Efficiency and Renewable Energy Sources for owners of rural tourist households. The guide provides practical advice for improving energy efficiency, reducing costs, and introducing sustainable solutions into business operations.

In Bačka, alongside direct contact with citizens, emphasis has been placed on strengthening the capacity of local and regional media to monitor, report on, and convey information to citizens regarding energy efficiency, habits, public calls, and technologies.

In Užice, in addition to the regular working hours of the municipal Energy Advisory Center—housed within the premises of the Regional Development Agency Zlatibor—energy literacy has also been promoted through the publication Culture into the Sun!, dedicated to energy efficiency and the construction of solar power plants on 10 cultural institutions, such as museums, libraries, and cultural centers. In addition to financial savings for local governments and comfort for users of these facilities, these projects will, as signposts to a new energy culture, have a strong influence in the future as demonstration examples for all members of the local community.

A common feature of all three regions is their commitment to working with young people through training in secondary and higher education institutions, as well as cooperation with teachers to help integrate these crucial topics into school curricula and activities.

The importance of raising awareness, knowledge, and rational energy use among all citizens and entrepreneurs is even greater when considering that the state, through various subsidy programs, is investing an increasing amount of taxpayers' money into replacing joinery, switching to more efficient heating systems, insulating buildings, and other measures. For these purposes, international loans exceeding 100 million euros have been secured, which are currently used to provide households and small businesses solely with financial support, and solely in the form of direct subsidies.

At a time when significant resources are being invested in equipment and infrastructure, it is equally essential to invest in people and their knowledge. Access to information, understanding the possibilities, and support throughout the process are necessary to ensure that subsidies are not limited only to technically qualified users or only to those able to secure their financial contribution toward the total investment costs.

By engaging citizens, Energy Advisory Centers reduce the risk of misguided investments and build trust in the transition. In a time when climate challenges demand local responses, these centers represent a trust infrastructure—a place where knowledge turns into savings, and transition into opportunity—for everyone!

The Energy Advisory Centers were opened with the support of the project Promotion of Renewable Energy Sources and Energy Efficiency in Serbia, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in cooperation with the Ministry of Mining and Energy. The project is financed by the German Federal Ministry for Economic Cooperation and Development (BMZ).

GIZ

ProCredit Bank

Net Zero Calculator

A GAME-CHANGER:

PROCREDIT BANK'S NET ZERO CALCULATOR FOR MEASURING CO_2 EMISSIONS

ProCredit Bank has developed the first Net Zero Calculator for small and medium-sized enterprises (SMEs) in the Serbian market. This tool enables businesses to easily measure their carbon footprint, understand the source of their emissions, and plan their next steps in the energy transition. We spoke with Marina Mijić, Head of the Sustainable Department, about the development of the Net Zero Calculator, while Miloš Stepandić, Head of Business Department, shared his perspective on the importance of supporting businesses at the start of their ESG journey.

Q: How did the idea of creating a Net Zero Calculator for SMEs come about?
Marina Mijić: The idea arose from a real market need. Through daily interactions with our clients, we noticed that many small and medium-sized companies want to operate more responsibly but lack the tools and knowledge to understand their environmental impact. As a bank committed to sustainable development, we wanted to offer them a simple yet precise tool that helps them take the first step—measuring greenhouse gas emissions from their activities. At the ProCredit Group level, and in cooperation with external experts, we developed the Net Zero Calculator tailored to the business needs of SMEs in the region.

Q: What exactly does the Net Zero Calculator offer, and how does it work?
Marina Mijić: The Calculator was designed to enable companies to independently calculate their direct and indirect CO_2 emissions by entering

Illustration: ProCredit Bank

data on electricity and fuel consumption, transportation, and even raw materials. The results provide a clear breakdown of emissions by sector, enabling companies to identify the key areas where they can reduce emissions and optimize costs. In the future, the Calculator will also offer guidance on where the biggest savings can be achieved—whether through switching to renewable energy sources, improving energy efficiency, or planning investments. Importantly, the Calculator is free of charge and represents the first step towards sustainable operations that also generate savings.

Q: When will the Net Zero Calculator be available, and how can SMEs prepare to use it?

Marina Mijić: The Calculator will officially be available on the ProCredit Bank website in September this year. Before calculating their emissions, we recommend that companies download our Net Zero Guide, which explains in simple terms which data they need to collect. This way, they'll be ready to immediately obtain relevant results and identify areas for reducing emissions. The Calculator was designed so that no prior expertise in sustainable business practices is required—we want every company, regardless of size or sector, to be able to take the first step towards sustainability.

Q: What role does the bank play in supporting companies that want to reduce emissions?

Miloš Stepandić: Our role is not just to provide a tool, but to be a partner throughout the transformation process. Many SMEs are only just beginning their ESG transition and often lack the internal resources or expertise to address complex requirements, such as the EU's Carbon Border Adjustment Mechanism (CBAM). That's why, in addition to the Calculator, ProCredit Bank offers tailored advice and financial products designed for investments in energy efficiency and renewable energy. Our goal is to help businesses enhance their operations and achieve savings, rather than viewing ESG as an additional cost or burden.

Marina Mijić
Head of the Sustainable Department

Miloš Stepandić
Head of Business Department

The Calculator was designed to enable companies to independently calculate their direct and indirect CO_2 emissions by entering data on electricity and fuel consumption, transportation, and even raw materials

Q: How important is this for companies that export or work with EU partners?

Miloš Stepandić: Extremely important. The CBAM requires companies exporting goods to the EU to report the emissions embedded in their products. Those who fail to do so will face additional costs and barriers. While the Omnibus package has introduced some temporary relief, it won't last long. Companies that already measure their footprint and take steps to reduce it will be at a significant advantage—both from a regulatory and a market perspective. That's why we say the Calculator is not only a tool for environmental protection but also for competitiveness.

Q: What are ProCredit Bank's next steps in ESG support?

Miloš Stepandić: We are continuing to develop tools, educate clients, and finance sustainable projects. At the same time, we are strengthening our internal capacities; our vision is for every advisor also to become an ESG advisor. Ultimately, our goal is to make sustainable business the new standard, not the exception.

Interview by Milena Maglovski

Photographs: Goran Đukanović, Studio Photogenic

SCC BELGRADE – SAFETY AND STABILITY OF THE NETWORK AS A PRIORITY

As energy systems develop rapidly and their interdependence becomes increasingly complex, network stability takes on strategic importance. In this game of precise coordination and technical reliability, regional coordination centers play a key role. One of them, SCC – Security Coordination Centre SCC Belgrade, has been connecting transmission system operators from several South-East European countries for ten years, contributing to the safe and efficient operation of the network.

We spoke with Luka Okuka, Director of SCC, about how this centre

Photograph: courtesy of Luka Okuka

SCC is the result of a shared commitment by regional transmission system operators to pool their knowledge, tools, and resources to ensure reliability and interoperability of systems in an increasingly complex energy environment

Luka Okuka
Director of SCC

operates, its daily responsibilities, and why coordination between countries is crucial for a stable electricity supply.

Q: Mr Okuka, to begin with, could you briefly introduce SCC Belgrade? Who are your founders, and where precisely do you position yourselves in the power sector?

A: SCC – Security Coordination Centre Belgrade is a regional centre for security coordination in power systems, founded in 2015. It was established as an initiative by transmission system operators from the region, following the practice of developed European countries, to set up a joint centre that would contribute to greater security and efficiency in the operation of the transmission network. Our primary role is to ensure, through daily work and analyses, the stable and coordinated operation of transmission systems in the region, in line with the standards of the European Network of Transmission System Operators for Electricity (ENTSO-E).

SCC is the result of a shared commitment by regional transmission system operators to pool their knowledge, tools, and resources to ensure reliability and interoperability of systems in an increasingly complex energy environment.

The founders of the company are EMS from Serbia, CGES from Montenegro, and NOSBiH from Bosnia and Herzegovina – operators who recognized the need for a regional approach and coordinated security. Over the years, SCC has expanded its range of services, with OST from Albania, MEPSO from North Macedonia, and TEIAS from Turkey joining as service users, further strengthening the centre's regional significance as well as its technical capacity.

Today, with ten years of successful operation behind it, SCC is recognized as one of six European Regional Coordination Centers (RCCs), in line with the European Union's legislative framework and ENTSO-E standards. Our role is to provide technical and operational support to transmission system operators through security analyses, risk assessments, coordination of planned works, and other key activities that contribute to the stable and safe operation of the power system – both at the regional level and within the European framework.

Q: What are the specific responsibilities and daily activities of SCC?

A: SCC has clearly defined responsibilities arising from the European regulatory framework, and our main role is to provide operational and technical support to transmission system operators to maintain the safety, stability, and efficiency of the power system.

Specifically, SCC's responsibilities cover the following areas:

- **Creation of a unified network model of Continental Europe** Every day, based on input data (network models) provided by the transmission system operators of Continental Europe at the two-day-ahead, day-ahead, and intraday timeframes, we create a unified network model of the entire synchronous interconnection. This model serves as the basis for all subsequent analyses and calculations, both by RCCs and TSOs.
- **Security analyses** We conduct daily n-1 (n-x) security analyses at both the day-ahead and intraday timeframes to identify potential overloads and risks to system security. Based on the analyses, if potential problems are identified, we propose corrective measures.
- **Coordination of planned works** We coordinate annual, monthly, and weekly planned outages of network elements of regional importance, owned by our service users, such as transmission lines or transformers, to minimize the impact on the region's transmission system and maintain supply security.
- **System adequacy assessment** We monitor whether the regional

Photograph: courtesy of Luka Okuka

system has sufficient capacity to cover demand over different time horizons – from day-ahead to seven-day-ahead.

- **Calculation of cross-border transmission capacities** SCC takes part in calculating available capacities for cross-border electricity transmission, which is crucial for the functioning of the regional electricity market.
- **Operational coordination and data exchange** SCC collaborates daily with TSOs and other RCCs in Europe through data exchange, joint operational meetings, and urgent coordination as needed.

Our activities are highly technical and require expert teams, sophisticated software, and constant real-time communication with TSOs and RCCs. It is precisely SCC's position, situated between operational planning and real-time decision-making, that makes us a key element in the security of the South-East European power system.

Q: How would you explain the difference between the role of SCC, the transmission system operators (TSO), and the power exchanges? Where exactly does your role fit within this network of actors?

A: In the power system, each institution has a clearly defined role: the transmission system operators (TSOs), the power exchanges, and the regional coordination centers, such as SCC. Our role lies precisely at the intersection of technical coordination and support for the safe operation of the system, both in the regional and European contexts.

Here is how these roles differ:

- The TSO (transmission system operator) is responsible for managing the transmission network in its own country – ensuring the physical delivery of electricity, balancing the system, operating in real time, and maintaining network stability at the national level.
- Power exchanges are market institutions that enable the organized buying and selling of electricity, mainly in the day-ahead and intraday timeframes. They deal with the price and volume of trading but do not operate the transmission system.
- SCC, as a Regional Coordination Centre, does not operate the network directly, nor does it participate in the market. Our role is to coordinate operational processes between multiple TSOs, analyze technical risks, assist in planning outages, and assess transmission capacities at the cross-border level.

In short, the TSO runs the network, the exchange manages the trading, and SCC ensures that all of this can function safely and in harmony within regional and cross-border frameworks.

Our position is neutral, technical, and coordinative, and it is precisely in this role that we enable the safe operation of the entire system, support the energy market, and facilitate cooperation between different actors.

Q: How do your analysis and coordination influence the reliability and stability of the power system in South-East Europe?

A: The analysis and coordination carried out by SCC have a direct impact on the reliability and security of the power system – not only in South-East Europe but also at the level of the whole of Europe.

Our primary role is to conduct timely security analyses, assess transmission capacity, and coordinate planned works to identify potential risks in the network and propose measures that ensure the system remains safe, even in complex or critical operating conditions. This means that every day we analyze how local changes – for example, work on the network, weather conditions, or increased production from renewable sources – can affect energy flows and the security of the entire system.

The TSO runs the network, the exchange manages the trading, and SCC ensures that all of this can function safely and in harmony within regional and cross-border frameworks

It is important to underline that SCC does not operate in isolation. As part of the network of European Regional Coordination Centers (RCCs), SCC also participates in activities of wider significance, such as assessing generation adequacy at the European level and providing support in crises, including extreme weather events or major system failures.

In this way, our work contributes to:

- preventing system disturbances,
- more efficient network operation planning,
- and strengthening operational cooperation between TSOs in the region and beyond.

Therefore, SCC is an essential factor in both technical and energy security in South-East Europe and the entire European power system.

Q: How important is the role of expert staff in SCC's operations, and how do you develop your team in line with the requirements of the energy sector?

A: Expert staff are the foundation of SCC – without a high-quality and de-

dicated team, it would not be possible to meet the high technical, regulatory, and operational demands placed on us by both the region and Europe. Our employees are highly educated engineers, power sector experts, IT specialists, and analysts who work daily on complex analyses, data exchange, and the development of internal tools.

We place particular emphasis on:

- continuous professional development – through internal training, cooperation with European institutions, participation in ENTSO-E working groups and international conferences,
- developing new skills in the areas of digitalization, artificial intelligence, and complex systems management, and
- creating a working environment that fosters teamwork, responsibility, and professional growth.

As an organization, SCC grows and develops alongside its people. That is why it is important for us that every employee sees a clear career path, has access to knowledge, and is part of a shared vision – to build a safer and more efficient power system for the entire region.

Q: Given that you work with multiple operators from different countries, how challenging is it to manage regional coordination, and what tools do you use for this?

A: Managing regional coordination in the power sector is indeed a complex task, precisely because it involves multiple transmission system operators from different countries, each with its own regulatory framework, technical approach, and operational practices. However, it is precisely within this complexity that SCC's strength lies. Our task is to overcome these differences through the standardization of procedures, constant communication, joint planning, and the use of modern technical tools that enable the complete synchronization of information and activities across the region.

For effective regional coordination management, we use:

- advanced software platforms for security analyses and network power flow simulations,
- tools for coordinated planning of works and capacity assessment,
- platforms for real-time exchange of operational and market data,
- our own internal IT systems developed for the needs of regional coordination.

In addition to technology, the key to success lies in interpersonal and institutional cooperation. SCC communicates daily with TSOs, organizes operational meetings, expert working groups, training sessions, and courses. This constant coordination ensures that all actors understand the shared goal – stable and secure operation of the entire system.

Therefore, although regional coordination is demanding, with the right tools, a clear framework, and a professional team, it becomes a strong foundation for the safe and reliable functioning of the power grid.

Q: What is the future of SCC, and how do you see SCC in the next five to ten years? Do you plan to expand your services? If so, how will you do it?

A: In the next five to ten years, we see SCC as an even stronger and more technically sophisticated regional centre, whose role in the European power system will be further reinforced.

Our strategy is clearly focused on strengthening capacities, expanding services, and implementing the most advanced technological solutions in the areas of security analysis, transmission capacity calculation, and coordination among operators.

We expect the following key directions of development:

- Expanding the scope of services provided by SCC, including new requirements from European regulations that further extend the role of Regional Coordination Centers (RCCs),
- Improving internal software tools and transitioning to advanced digital platforms, including elements of artificial intelligence for risk prediction and coordination optimization,
- Developing human resources through the continuous strengthening of expert teams and cooperation with the academic community and research institutions,
- Deeper integration with the European system through increasingly intensive cooperation with ENTSO-E, other RCCs, and European bodies.

Furthermore, as the power system faces growing challenges – such as the large-scale integration of renewable energy sources, decentralized generation, and the need for flexibility – SCC will play a key role in ensuring technical security and regional harmonization.

Our goal is not only to follow changes but to lead them – to be a regional leader in operational coordination and a model of efficiency and expertise at the European level.

Interview by Milena Maglovski

Photograph: Pixabay/Artur Pawlak

DEMOGRAPHIC DYNAMICS OF SERBIA UNDER THE INFLUENCE OF CLIMATE CHANGE

Climate change has become an increasingly significant factor in shaping demographic trends over the past few decades. Its impact on birth rates, mortality, and migration is difficult to quantify precisely, but it is becoming more prevalent and pronounced. These processes, particularly evident since the late 20th century, have intensified with the beginning of the 21st century, shaping the destinies of communities worldwide.

To discuss how climate change affects demographic movements and how this relationship is studied in Serbia, we spoke with Natalija Mirić, head of the POPENVIROS project – the first research in our country to link environmental challenges with population dynamics.

As she explains, climate change directly affects population dynamics through extreme weather events and indirectly via various socio-economic channels, including agricultural production and yields, land use, health, quality of life, and overall well-being. For example, agriculture is particularly threatened by droughts, high temperatures, and storms. The reduction of arable land and yields can lead to the working-age population migrating from rural to urban areas. Villages are then left predominantly inhabited by older people, which leads to a decline in birth rates and an increase in mortality, thereby deepening depopulation processes. Furthermore, growing health risks due to environmental changes can potentially force people to leave their homes or, for instance, alter family arrangements.

Speaking about the most vulnerable parts of the world, our interviewee pointed out that climate change has the greatest impact on regions that are both environmentally sensitive and socio-economically vulnerable. Sub-Saharan Africa, for example, faces droughts, land degradation, and chronic water shortages

Photograph: Unsplash/Jay Alexander

Agriculture is the most vulnerable sector, primarily due to droughts and extreme weather conditions. Loss of agricultural income leads to the migration of the working-age population, leaving villages inhabited mainly by older people, thus threatening the sustainability of rural communities

that significantly reduce agricultural productivity, encourage migration to urban centres, and affect the overall health of the population.

These observations are confirmed by a 2023 study conducted by Wolde, D'Odorico, and Rulli, published in the journal Global Sustainability. The research, covering 32 countries in Sub-Saharan Africa from 1990 to 2021, showed that most migrations are internal and regional. They are often driven by direct factors such as drought, flooding, storms, and land degradation, while indirect factors include water shortages, food insecurity, conflict, and health risks. Political, economic, and social processes that deplete and degrade natural resources further amplify the effects of environmental changes. The key environmental push factors identified are extreme rainfall events (such as cyclones, storms, and floods) and chronic water shortages. At the same time, migration in this context is seen as a coping mechanism and an adaptation strategy to climate change.

The POPENVIROS Project

The POPENVIROS project (Population Dynamics Under Environmental Challenges in Serbia) is being carried out within a consortium comprising three faculties of the University of Belgrade: the Faculty of Geography, the Faculty of Organizational Sciences, and the Faculty of Economics, as well as the Institute of Social Sciences. The project is implemented by the Science Fund of the Republic of Serbia through the PRIZMA program, a subprogram of scientific research in the field of social sciences and humanities (project number 7358). Launched in December 2023, the project will last for three years, until December 2026. The multidisciplinary team comprises 10 researchers with complementary scientific backgrounds, including demographers, environmental analysts, and statisticians.

This is a pioneering project in Serbia, whose primary goal is to examine how and to what extent environmental challenges impact three key components of population dynamics—fertility, mortality, and migration—and to identify the channels through which these effects occur.

NATALIJA MIRIĆ is an assistant professor at the Department of Demography, Faculty of Geography, University of Belgrade, holding a PhD in demography, obtained in 2019. She teaches at undergraduate, master's, and doctoral levels, as well as on the interdisciplinary master's programme "Computing in the Social Sciences". Her research focuses on the demographic aspects of climate change, fertility, family, and human well-being. She has published more than 20 scientific papers, two university textbooks, and a chapter in a monograph. She is a member of the international scientific organisations EAPS and SAA, and has undertaken professional development at the University of Geneva and the Swiss Summer School for Longitudinal Research.

Photograph: Unsplash/Md. Hasanuzzaman Himel; (Mirić) courtesy of Natalija Mirić

The innovative methodological approach lies in combining demographic, socio-economic, and environmental data collected at different levels – from individual, through regional, to national. To investigate cause-and-effect relationships, structural equation modeling (SEM) will be employed. The research relies on data from official institutions, including the Statistical Office of the Republic of Serbia, the Hydrometeorological Service, and the Serbian Environmental Protection Agency.

Climate Change in Serbia

Climate change in Serbia is already showing a marked impact, particularly through the rise in average temperatures compared to the mid-20th century. Since the 1960s, a trend of an increase of 0.36°C per decade has been recorded, with forecasts suggesting a possible rise of between 2°C and 4.3°C by the end of the 21st century. In addition to average changes, extreme events such as heatwaves, droughts, heavy rainfall, landslides, and wildfires are becoming more frequent. Around 57 per cent of Serbia's territory is particularly vulnerable to these risks, with the highest temperature increases expected in the southern parts of the country. In the future, a further rise in the number of tropical days and an intensification of climate extremes are forecast, our interviewee explains.

Poor and rural areas of Serbia are particularly affected by climate change, especially in Southern and Eastern Serbia, which further accelerates depopulation and hampers regional development. Agriculture is the most vulnerable sector, primarily due to droughts and extreme weather conditions. Loss of agricultural income leads to the migration of the working-age population, leaving villages inhabited mainly by older people, thus threatening the sustainability of rural communities.

Poor and rural areas of Serbia are particularly affected by climate change, especially in Southern and Eastern Serbia, which further accelerates depopulation and hampers regional development

On the other hand, urban areas are particularly exposed to extreme temperatures. As Natalija notes, Belgrade stands out as a true heat island in Serbia. Research conducted as part of the POPENVIROS project indicated a significant negative impact of hot days on the birth rate, observed nine months after exposure to high temperatures in Belgrade.

"Estimates show that each additional hot day with a temperature above 26.6°C causes a drop in the birth rate of approximately 0.008, or 0.85 per cent, nine months later. The fact that the most significant effect is observed nine months after a warm temperature shock is in line with previous research, which confirms that hot days can have an immediate impact on reproductive health at the time of conception. It can also be assumed that sexual activity may be reduced during heatwaves. One of the logical

Photographs: (top) Unsplash/Artem Balashevsky; (middle) Unsplash/Tom De Decker

Serbia-North Region," published in the Bulletin of the Serbian Geographical Society, show that temperature extremes reduce the likelihood of a positive reproductive outcome. In addition, Ivan Marinković from the same team is investigating the impact of low temperatures and cold waves on mortality in Vojvodina between 2000 and 2020 in his paper The Impact of Low Temperatures on Mortality in Vojvodina (2000–2020), published in the International Journal of Biometeorology. The results show a significant increase in mortality during cold days and cold waves, with two thresholds: -3.5°C (beginning of the

conclusions is that climate change will increasingly shift the conception period to the winter months, given that exposure to high temperatures in the third quarter of the year will grow ever greater (the results of this research will be published soon)", our interviewee explains.

Members of the POPENVIROS team, Petar Vasić and Natalija Mirić, in their paper "Birth Seasonality, Fetal Loss, and Air Temperature in the

increase) and -7°C (sharp increase), while the highest mortality was recorded below -13°C. The effects of cold on mortality last from two to nine days, with the most pronounced impact during cold waves.

Speaking about the coming years and decades, our interviewee emphasized that Serbia will face increasingly pronounced consequences of climate change, which will have multiple effects on population dynamics, as well as on health and overall quality of life. However, to propose specific measures to mitigate the demographic consequences of climate change, it is necessary to study the complex relationship between population and the environment in detail. As she notes, it will be required to wait for the results over the next year and a half, after which, as the final outcome of the project, it will be possible to offer concrete recommendations for action.

It is expected that the results of the POPENVIROS project will have significant scientific and applied (policy) impact. By providing scientific insights into the impact of climate change on fertility, mortality, and migration, the POPENVIROS project will make a significant contribution to understanding current and future population processes, as well as to developing more realistic population scenarios in Serbia. Understanding present and future population dynamics in the context of environmental challenges is crucial for effective long-term policy planning. If environmental challenges affect fertility, mortality, and migration, decision-makers at all levels must take this factor into account when formulating population policy measures, Natalija says.

By identifying the socio-economic mechanisms through which environmental challenges affect population dynamics, policymakers will be able to modify intermediary factors to minimise the risks associated with these challenges. Establishing an open data environment through the Query tool on the POPENVIROS web platform will facilitate and encourage interdisciplinary and multi-domain use of the project's results and data during and after its implementation. This is the most important channel that will ensure the sustainability and long-term impact of the POPENVIROS project.

Prepared by Katarina Vuinac

BOSNIA AND HERZEGOVINA LEADS THE REGION IN ISSUES WITH OVERVOLTAGE

The Independent System Operator in Bosnia and Herzegovina (NOSBiH) oversees and manages the country's power transmission system. Its competencies and responsibilities are defined by the overarching Law on Transmission, Regulator, and System Operator of Electricity in Bosnia and Herzegovina, as well as by the Law on Establishing the Independent System Operator for the Transmission System.

Bojan Rebić, Head of the Real-Time Power System Operation Department, highlights the challenges the system faces due to the increasing integration of renewable energy sources. He explains how these challenges affect the electricity market, from which countries balancing energy is imported, and what the future holds for the power system.

Q: How does NOSBiH technically and operationally manage major transmission lines and high-voltage substations?

A: The management of the power system in Bosnia and Herzegovina is carried out from the Main Dispat-

Photograph: Unsplash/Andrey Metelev

ch center of NOSBiH through 24/7 operational activities. In addition to the Main Dispatch center, and in line with obligations defined by the ENTSO-E network codes, NOSBiH operates a Backup Dispatch center, fully equipped with the tools and systems necessary for managing the power system in the event of a loss of the Main Dispatch center.

The management of the power system in Bosnia and Herzegovina is carried out from the Main Dispatch center of NOSBiH through 24/7 operational activities

Operation of the transmission network at 400 kV and 220 kV levels, as well as all interconnected 110 kV transmission lines, is conducted by issuing direct instructions to operational staff at transformer substations and switchyards.

The operation of 110 kV lines that connect generation facilities to the transmission network is conducted indirectly, via the Generation Control Centers (CUP) of power utilities in BiH and the relevant Operational Areas (OP) of Elektroprenos BiH. Meanwhile, the operation of 110 kV line bays owned by users (new generating facilities) is performed remotely via the SCADA/EMS system from the NOSBiH Dispatch center (DC).

Through coordinated operation between the dispatch centers of NOSBiH, Elektroprenos BiH, the power utilities in BiH, and neighboring system operators, reliable and stable functioning of the BiH power system is ensured. In coordination with the Regional Security Coordination Center (SCC) in Belgrade, regular and additional security analyses of the power system are performed on a day-ahead and intra-day basis. These analyses are carried out for every hour using the interconnected model of the Continental European power system. If the N-1 security criterion is not met, available preventive and corrective measures are applied.

Supervision and management of the BiH transmission system are conducted through the SCADA/EMS system installed at the NOSBiH Dispatch center. Every two seconds, the SCADA/EMS system collects and archives data from all substations in BiH as well as from the observability zones of neighboring system operators.

In addition to the SCADA/EMS system, various software applications are used for day-ahead scheduling, balancing services, work approvals, dispatch logs, and information exchange at the ENTSO-E level.

Bojan Rebić

Head of the Real-Time Power System Operation Department at NOSBiH

Q: How challenging is it to balance the electricity market in Bosnia and Herzegovina, and how is it done?

A: Balancing the electricity market is becoming increasingly demanding and complex, making it an equally important task for the operational staff of the NOSBiH Dispatch center. A decade ago, balancing was almost negligible compared to transmission system operation.

With the integration of a large number of variable renewable energy sources, we are facing growing deviations and rapid changes in generation, which result in imbalances within the BiH control area. Often, within a short period of time, balancing services must be activated in opposite directions, leading to higher balancing costs. Deviations are also influenced by electricity prices on regional and European exchanges.

In cases of imbalances, NOSBiH procures and activates balancing energy daily to cover electricity deficits or surpluses. This is done by using automatic and manual frequency restoration reserves (aFRR and mFRR), procured from registered providers.

Photographs: (bottom) Unsplash/Diego Ph; (top) courtesy of Bojan Rebić

NOSBiH has signed agreements for the procurement of balancing energy from neighboring systems, including the SHB block (Slovenia, Croatia, BiH), as well as cross-border tertiary reserve exchanges with Serbia and Montenegro.

The quality of regulation had been satisfactory in previous years; however, in 2024 and the first quarters of 2025, it has significantly deteriorated, indicating the need to identify new balancing resources. Given the expected increase in renewable integration and current difficulties in the BiH power system, NOSBiH has sought modalities to expand the balancing reserve within the system.

According to the European Commission Regulation (SOGL), transmission system operators are entitled to exchange imbalances across different areas. At present, NOSBiH only has access to the GCC (INOM) platform, used by EMS (Serbia) and CGES (Montenegro). Together with EMS and CGES, NOSBiH has analyzed the possibilities of joining this platform, which would bring both technical and financial benefits. The agreement has been finalized and is pending approval from the relevant institutions. This would serve as a temporary solution until Bosnia and Herzegovina potentially joins the pan-European platform for automatic imbalance netting (IGCC).

The greatest challenge for any transmission system operator in the upcoming period is ensuring secure and stable operation of the transmission grid during the ongoing and future energy transition

Q: What are the biggest challenges for the BiH transmission network in the coming years?

A: The greatest challenge for any transmission system operator in the upcoming period is ensuring secure and stable operation of the transmission grid during the ongoing and future energy transition.

One of the major issues in operating the BiH power system is overvoltage – a problem for which the NOSBiH Dispatch center currently has no mechanism of control. Unfortunately, BiH leads the region in overvoltage problems, partly due to the structure of consumption in the country, and partly because neighboring transmission systems have already implemented voltage regulation measures, such as installing compensation devices. Overvoltages can result in partial or total collapse of the BiH power system, as well as the regional grid. Elektroprenos BiH has included the installation of four compensation devices in its investment plans, which have been approved, and procurement and installation activities are expected to commence.

Another major challenge is posed by large fluctuations in cross-border transit flows, which create

Photograph: courtesy of Bojan Rebić

significant operational difficulties. The BiH power system is integrated into the Continental European transmission system, which generally contributes to its secure and stable operation. However, during certain periods, due to significant transit flows from east to west and vice versa – directly driven by electricity markets and the integration of large volumes of renewables in Southeast Europe – severe overloads occur on both cross-border transmission lines and internal lines and transformers. These issues were the cause of the last two major disturbances: on January 8, 2021, when the Continental European transmission system split into two parts, and on June 21, 2024, when a major disturbance affected the power systems of BiH, Montenegro, Albania, and parts of Croatia.

One of the major issues in operating the BiH power system is overvoltage

In both cases, the BiH power system was neither the cause of the disturbance nor in a position to prevent its occurrence and propagation. Fortunately, all disturbances were resolved in record time. The dispatchers of the NOSBiH Dispatch center and neighboring TSOs successfully restored system stability: on January 8, 2021, Europe was re-synchronized within around 40 minutes, and during the blackout on June 21, 2024, system restoration was completed within approximately two hours.

Q: How is NOSBiH preparing for the integration of renewable energy sources into the transmission system?

A: One of the major challenges ahead for NOSBiH is identifying the most flexible and cost-efficient resources for balancing the power system. Current resources in BiH, particularly in terms of available capacity for automatic frequency restoration reserves (aFRR), remain insufficient. If we analyze the annual availability of aFRR that NOSBiH secures, the contracted capacity in 2024 amounted to only 35 percent during off-peak hours and 51 percent during peak hours.

All this highlights the urgent need to join platforms for imbalance netting between control areas. As already emphasized, NOSBiH has initiated activities to join the IGCC cooperation as well as the INOM platform for imbalance netting.

In addition, NOSBiH has updated the Grid Code and Market Rules, which have been adopted by the State Electricity Regulatory Commission (DERK). These documents define the technical parameters for energy storage systems (ESS), outline the connection requirements to the transmission grid, and specify the technical parameters for providing automatic frequency restoration services. They serve as the foundation for drafting additional technical rulebooks, methodologies, and procedures that will enable the connection and testing of ESS, as well as their registration in the registry of balancing service providers.

Q: How do citizens of BiH benefit from the work of NOSBiH?

A: The main advantage and benefit for citizens, i.e., end electricity consumers, lies in the efforts of NOSBiH to reduce the costs of the balancing mechanism. In addition to the system operator tariff, there is also a tariff for system and ancillary services. Funds collected through this tariff are used exclusively for the market-based procurement of frequency containment reserves, automatic frequency restoration reserves, manual frequency restoration reserves, replacement reserves, as well as for both regulated and market-based procurement of electricity to cover transmission losses. These funds are secured through tariff elements applied to end electricity consumers. By reducing the financial requirements for system and ancillary services, the share of these costs in end-user tariffs (network charges) is automatically reduced.

The mission of system operators, both transmission and distribution, is to provide the highest possible quality of electricity supply to end consumers. This is achieved by ensuring uninterrupted supply, maintaining network parameters within permitted limits, and keeping both frequency and voltage stable within acceptable ranges, with minimal fluctuations in the system.

Interview by Jasna Dragojević

Photograph: Unsplash/Anthony Indraus

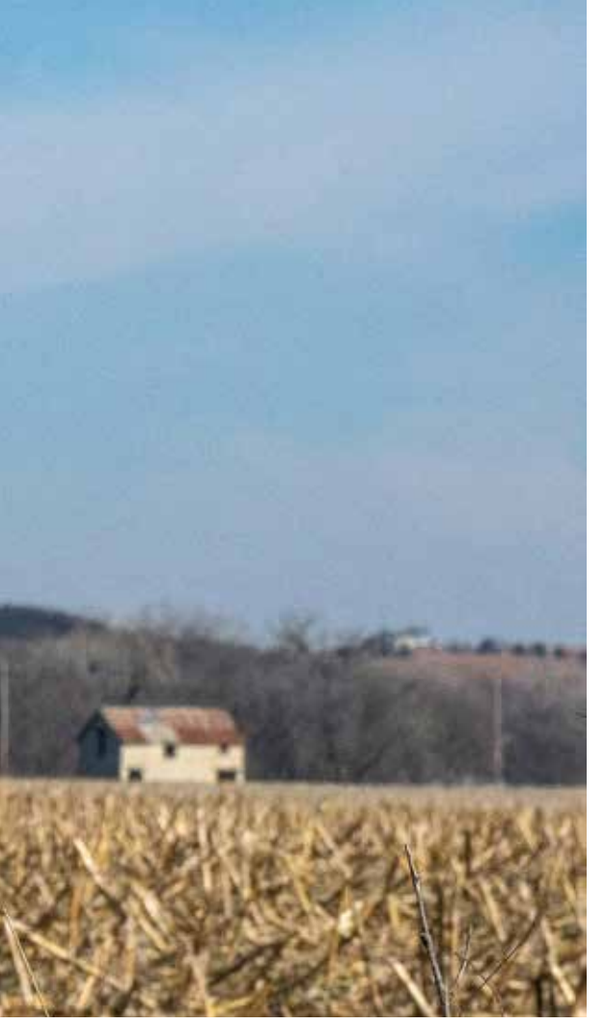
THE JULY WILDFIRE WAVE IN SERBIA – AN ALARM WE MUST NOT IGNORE

In July 2025, Serbia faced one of the most severe wildfire waves in its recent history. Although forest and field fires are not usually expected every summer to the extent, they are common in certain parts of the Mediterranean; this year's statistics show a serious increase in our country. Extreme heat, with days above 40 degrees Celsius, combined with prolonged drought and windy weather, created highly favorable conditions for the rapid spread of fires across the country.

The culmination occurred on July 7, when, between 7 a.m. and 7 p.m. alone, more than 620 open-space fires were recorded. Fires appeared in landfills, forests, agricultural fields, orchards, and around houses and auxiliary buildings. Under such conditions, firefighting units were under enormous pressure and at the edge of their capacity, while the situation also highlighted deeper issues within the fire protection system. According to available data, Serbia has approximately 3,600 professional firefighters, with an additional 1,500 engaged through volunteer firefighting associations.

The most critical situation was in the Toplica District, where fires affected the entire area – Prokuplje, Kuršumlija, Žitorađa, and Blace. Severe consequences were also suffered in parts of the Jablanica District in the southeast, the Rasina and Šumadija districts in central Serbia, particularly around Kragujevac, as well as the Bor District in the east. In many areas, due to dry vegetation and low

Photograph: Unsplash/Mary Hammel



soil moisture, fires spread rapidly. Thick smoke, stretching for tens of kilometers, further hindered efforts to extinguish them. In some places, visibility was reduced to only about fifty meters.

On July 9, the Government of Serbia announced that it had secured 350 million dinars of aid for those affected. It also announced the formation of a Commission for Fire Damage Recovery, tasked with directing activities in this regard and working on prevention.

Relief, however, came only in mid-July, when the first heavier rainfall, combined with the joint intervention of all engaged services, enabled the localization and extinguishing of most fires. Nevertheless, the damage remained enormous – both materially and psychologically – as the experience in the fire zones left a lasting sense of insecurity.

This catastrophe, however, did not affect only Serbia. Similar situations were recorded at the same time in Greece, Italy, France, and other parts of Europe, struck by an intense heatwave. In Serbia, however, additional problems arose from underdeveloped infrastructure, insufficiently equipped local services, and the absence of detailed emergency plans at the municipal level. In many places, it was precisely the citizens – alone, without adequate support – who were the first to react.

Stubble Burning – A Dangerous and Persistent Practice

One of the dangerous human causes of fires is stubble burning. Although prohibited by law, this method of clearing agricultural land is still widely practiced, especially in rural areas, where it is passed down as part of traditional practice. Under conditions of drought and high winds, fires can easily get out of control and spread to surrounding fields, forests, or even residential buildings. A single flame is enough to cause chaos.

Penalties for this practice are prescribed by the Law on Fire Protection and the Law on Agricultural Land – 10,000 dinars for individuals and several hundred thousand dinars for legal entities. In more severe cases, when major material damage or injuries occur, criminal liability also follows. However, in practice, such cases are rarely prosecuted. The problem is that burning is often done at night, in remote fields, and the perpetrators remain unknown.

In addition to causing fires, stubble burning has long-term negative consequences on the soil itself. The combustion of plant residues destroys beneficial microorganisms, dries out the surface layer of soil, and reduces its fertility. Instead, as a sustainable and safe alternative, plowing plant residues back into the soil, composting, or shredding and evenly spreading plant material across fields is recommended. These methods preserve soil, restore nutrients, eliminate fire risk, and do not pollute the air.

Landfills – A Recurring Summer Risk

Another serious problem that comes with the summer months is the increased number of landfill fires. Although this is not a new phenomenon, data show that the number of incidents is not decreasing; on the contrary, the problems are growing. Since the beginning of the year, hundreds of incidents have been recorded at landfills across Serbia, most often at unsanitary sites that lack basic fire protection systems. Causes include high temperatures, the presence of flammable waste, and usually poor management.

For this reason, representatives of the Sector for Emergency Situations of the Ministry of Interior and the Ministry of Environmental Protection held a joint meeting. They agreed on a series of urgent measures. The key among them is the introduction of 24-hour shifts of public utility employees at landfills, as well as a ban on access by unauthorized persons, including informal waste collectors.

The need was emphasized for checking hydrant networks and firefighting equipment, securing water tanks, nozzles, hoses, and distributors, as well as arranging fire access roads for unobstructed vehicle entry. It was also recommended to surround landfills with fire belts free of combustible materials to prevent the spread of fire to the surrounding areas. Additional protection is envisaged through so-called tamping – covering critical points with layers of soil, as well as regularly layering waste with inert material. For these measures to be effective, it was proposed to provide permanent locations for soil delivery and a sufficient number of machines for emergency interventions.

Prepared by Milica Vučković

CLIMATE VULNERABILITY IN BOSNIA AND HERZEGOVINA – WHAT AWAITS URBAN AREAS

The Institute for Protection and Ecology of Republika Srpska, with nearly half a century of experience, recognizes climate change and environmental pollution as some of the most serious challenges of our time. Through years of research and active participation in international projects, the Institute significantly contributes to improving environmental standards and protecting natural resources. The Institute's director, Predrag Ilić, shared insights into their current projects, support for local communities, and educational initiatives aimed at children and youth, highlighting the broader societal importance of their work.

Q: What are the most significant climate challenges for Bosnia and Herzegovina according to the Institute's research?

A: Our country is facing a rapid increase in average temperatures and extreme events, increasingly frequent heatwaves, prolonged droughts, and sudden floods. Snow cover is decreasing, while cities are experiencing a rise in the urban heat island effect. Uneven distribution of rainfall further complicates water resource management, causing hydrological stress, water shortages in summer, and flash floods during winter and spring.

We are actively involved in the revitalisation of water bodies through projects such as WATER-GUIDE and BRIDGEWAT, while projects like RES2FIRE and FireSafe Jezero focus on prevention and education about the increasing risk of forest fires caused by climate change. There has also been a rise in airborne allergens, particularly ragweed pollen, which is monitored and analysed through the AllerShield project aimed at protecting public health. An additional challenge is the insufficient institutional and local preparedness for adapting to climate threats.

Q: Which parts of Bosnia and Herzegovina are currently the most vulnerable to the effects of climate change?

A: According to the NAP – National Adaptation Plan to Climate Change, which provides the most detailed and up-to-date analysis of climate vulnerability in Bosnia and Herzegovina, the most vulnerable areas are those exposed to multiple climate risks, including floods, droughts, landslides, heatwaves, and land degradation. Vulnerability is particularly pronounced in the northeastern, central, and southern parts of the country.

Photograph: Pixabay/Petar Ubiparip

Our country is facing a rapid increase in average temperatures and extreme events, increasingly frequent heatwaves, prolonged droughts, and sudden floods. Snow cover is decreasing, while cities are experiencing a rise in the urban heat island effect

Predrag Ilić
Director of the Institute for Protection and Ecology of Republika Srpska

Northeastern Bosnia (including regions around Tuzla and Bijeljina) is prone to frequent flooding and is at high risk of landslides due to soil degradation and inadequate infrastructure. Central Bosnia and parts of the Sarajevo Canton face increased risks from torrential rains and urban flooding, especially in the context of more frequent extreme weather events. Southern Herzegovina, including the areas around Mostar and Trebinje, is confronted with extended periods of drought and a heightened risk of forest fires due to higher temperatures and reduced summer rainfall.

Additionally, lowland areas along the River Sava and its tributaries are among the most exposed to flood risks. In contrast, hilly and mountainous areas, although often rich in precipitation, have high geological vulnerability, especially to landslides triggered by heavy rainfall. Urbanised areas such as Sarajevo, Banja Luka, Zenica, and Tuzla are increasingly experiencing heatwaves and air pollution, further exacerbating the health and infrastructure vulnerability of the population. The NAP document also highlights that institutional and technical vulnerabilities, such as poor spatial planning and limited water and waste management capacity, further worsen the situation in many municipalities.

Q: How does the Institute support municipalities and public institutions in building capacity to adapt to climate threats?

A: The Institute provides significant support to municipalities and public institutions in Bosnia and Herzegovina by helping build capacity for climate adaptation, relying on a multidisciplinary approach, expertise in analytical testing, and experience in implementing international projects. Through active participation in projects such as WATER-GUIDE and BRIDGEWAT (Horizon Europe), we organise educational workshops and training sessions that enable local governments and other stakeholders to understand climate risks related to water management and to develop adaptation plans aligned with EU directives and national strategies.

As part of its activities, the Institute has also contributed to the development of strategic documents such as BIH ESAP 2030+ (Environmental Strategy for Bosnia and Herzegovina), through the creation of the Strategic Environmental Impact Assessment, directly assisting public bodies in integrating climate aspects into policy planning and spatial development. Within the RES2FIRE project (Interreg Adrion) and the FireSafe Jezero programme (SDC), we

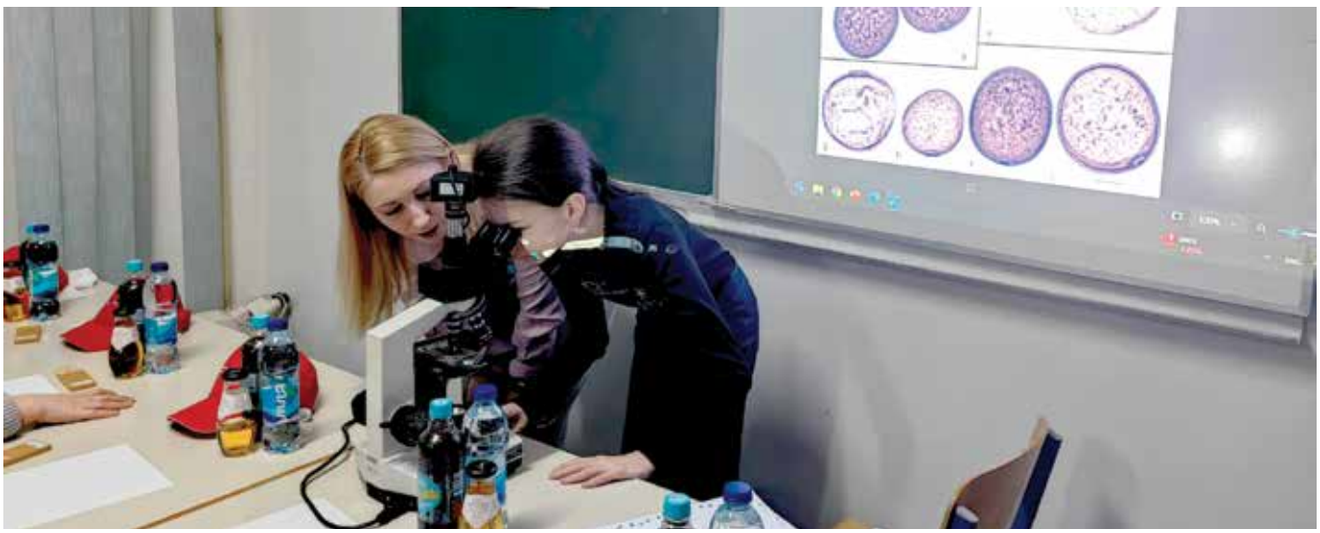
Photographs: (Ilić) courtesy of Predrag Ilić; (all others) Institute for Protection and Ecology of Republika Srpska

conduct specialised training for managing forest fire risks, especially in highly vulnerable areas, and develop guidelines for interventions and preventive measures. In addition, through the CircleAware project, we provide technical and educational support for introducing circular waste management in local communities, thereby contributing to climate resilience through more sustainable use of resources.

Q: What specific activities are you currently working on?

A: We are currently implementing a range of concrete activities focused on protecting air, water, and soil, all aligned with modern European practices and climate policy priorities. In the area of air quality, we are actively involved in the AllerShield project (Interreg VI-A IPA HR–BA–ME), through which we are developing a monitoring network for airborne allergens and air pollutants, aimed at protecting public health and raising awareness among citizens, especially children and vulnerable groups. Soon, pollen monitoring will be conducted at three locations in Banja Luka. In addition, we carry out continuous measurements using both stationary and mobile stations for monitoring air quality in urban environments. In the field of water protection, the Institute conducts chemical, physical, and microbiological testing of surface water, groundwater, wastewater, and sediment. Through European projects such as WATER-GUIDE and BRIDGEWAT, we contribute to sustainable river ecosystem management and the strengthening of local capacities for water resource governance.

In terms of soil protection and waste management, we play an important role in identifying contaminated sites, analysing soil samples, classifying waste, and proposing remediation measures. A notable achievement is the establishment of the first specialised waste testing laboratory in Bosnia and Herzegovina, enabling the timely and precise identification of waste properties. We offer a wide range of expert and laboratory services to legal entities, including professional opinions, technical studies, risk assessments, and protection measures, as well as advisory services related to compliance with legislation, preparation of documentation for environmental permits, and conducting impact assessments (EIA, SEA).



Q: How do you contribute to the prevention and management of forest fires in increasingly hot and dry summers?

A: We actively contribute to forest fire prevention and management through a combination of scientific research, field activities, education, and strategic planning, with particular emphasis on international projects such as RES2FIRE (Interreg IPA ADRION). As part of this project, the Institute and its partners are developing models and tools to increase the resilience of protected natural areas to fires, through mapping vulnerable zones, creating technical recommendations for spatial planning, and identifying preventive measures that local communities can apply.

One of RES2FIRE's key contributions is the exchange of knowledge and experience in integrated fire

Photographs: Institute for Protection and Ecology of Republika Srpska

risk management, including the use of geographic information systems (GIS) for monitoring and risk assessment, and recommendations for integrating fire management into spatial and development plans. We also participate in the FireSafe Jezero project, which focuses on wildfire protection, including the introduction of local response protocols, public education, and the development of communication tools to raise awareness.

Q: How do you raise environmental awareness among young people?

A: We place special emphasis on education and raising environmental awareness among young people, recognising this target group as a key driver of future change in environmental protection and sustainable development. Through several projects, particularly within the Interreg programme, we've delivered hands-on education. In the AllerShield project (Interreg VI-A IPA HR-BA-ME), which focuses on improving allergen and air quality monitoring, the Institute organised workshops and educational events in primary schools, directly involving over 80 children in activities such as measurement demonstrations, practical tasks, and creative workshops.

A similar approach was used in the CircleAware project, which promotes circular waste management principles. Over 250 children participated in workshops and practical exercises to learn about waste reduction, recycling, and sustainable resource use. In parallel, as part of the BRIDGEWAT project (Horizon Europe), we are currently implementing a dedicated educational programme for more than 100 university students in environmental protection, biology, ecology, chemistry, and related sciences.

Q: The Institute has been named a champion of nature protection and received the prestigious Golden Tisa Award under the auspices of the Champions of Nature Protection, BH Green Awards 2025 campaign. How does this recognition further motivate your work?

A: Receiving this award is a great honour, but also a significant responsibility. It is not only a recognition of our past efforts, but also a strong call to continue our mission of environmental protection, promoting sustainable development, and strengthening ecological awareness with even greater commitment. Being named a champion in the business sector category among more than 50 candidates from across Bosnia and Herzegovina, and selected as one of 29 finalists supported by over 200,000 citizens via online platforms, reflects public trust and recognition of the quality of our work.

This acknowledgement further obliges us to be a role model and leader in the region, to expand our educational, research, and technical support activities for local communities, and to continue innovating in the areas of water, air, and soil protection, as well as climate risk management.

Interview by Jasna Dragojević

Photograph: Institute for Protection and Ecology of Republika Srpska

HOW ABB TECHNOLOGY REDEFINES INDUSTRIAL ENERGY EFFICIENCY

In today's business landscape, energy efficiency is no longer viewed as an optional initiative or a matter of corporate social responsibility. It has become a pillar of strategic positioning, a prerequisite for market survival, and a driver of technological modernization. With industry consuming more than 30 percent of the world's total energy—45 percent of which is used solely by electric motor systems—it is clear that the real answer to energy, regulatory, and climate challenges lies in the way we manage existing resources.

The greatest potential often goes unnoticed—in the electric motors that power everyday processes in factories, pumping stations, transport lines, irrigation systems, and industrial plants of every kind. Statistics show that more than half of these motors are over 20 years old, often oversized for actual operational needs, lacking control capabilities, and incurring inefficiencies that quietly but steadily translate into higher costs and increased CO_2 emissions.

This is precisely where ABB, a global leader in electrification and automation, sees opportunities for both technological and economic advancement. Replacing conventional motors with new high-efficiency models in the IE4, IE5, and even IE6 classes—achieving efficiencies of up to 99.13 percent—combined with the integration of variable speed drives (VSDs) and digital monitoring, forms the backbone of a modern energy strategy. The essence lies not simply in replacing equipment, but in creating an intelligent system—one where motors operate neither more nor less than needed, where speed and load adjust in real time, and where every kilowatt is used purposefully.

When high-efficiency motors are paired with VSD technologies such as ABB variable speed drives, systems gain a new level of controllability. Instead of running at full capacity regardless of demand, motors become "smart": responding to processes, conserving energy, and reducing wear. Although these technologies have been available for decades, only

Photographs: ABB

about 25 percent of industrial motors worldwide are currently connected to VSD systems—highlighting the vast potential still to be unlocked.

Industry case studies confirm the effectiveness of such solutions. At the Aurubis copper plant in Bulgaria, 460 motors were replaced, and ABB variable-speed drives were installed. The result: annual energy savings of 25 GWh and a return on investment within three and a half years. In Brazil, the utility company Saneago leveraged ABB Ability™ digital tools to cut energy costs by USD 700,000 annually, while simultaneously improving system availability and maintenance control.

In the agricultural sector—where balancing efficiency with resource sustainability is becoming increasingly critical due to climate change and mounting pressure on water supplies—smart solutions based on high-efficiency motors and variable speed drives (VSDs) deliver tangible benefits. In the United States, irrigation systems for large corn farms were upgraded with ABB VSD technologies, enabling precise pump operation tailored to actual crop needs and available water levels. The results were significant: electricity consumption decreased by 35 percent, while water usage was optimized and reduced by around 25 percent within a single season. The system achieved full payback in under two years, while simultaneously delivering higher yields and improved irrigation control.

Digitalization adds further value to these technological solutions. By connecting motors and drives to IIoT sensors and advanced analytics platforms, operators can now monitor equipment performance in real time, predict failures, analyze consumption trends, and optimize processes in line with broader energy system requirements. When such technologies are integrated with factory-wide management systems and efficiency strategies, they open a new chapter in how production is planned and executed.

National strategies in major markets underscore the importance of energy efficiency. In China, as many as 86 percent of companies plan additional investments in efficient systems. At the same time, India has adopted a carbon credit framework that rewards industries for reducing emissions through the modernization of their equipment. Energy efficiency is no longer just a technical goal; it has become a tool for financial, regulatory, and competitive positioning.

ABB is also a technological leader in this field. In 2025, working with partners in India, the company set a new world record for industrial motor efficiency—99.13 percent. Crucially for the economy, the cost of this motor was only one percent higher than that of a conventional model, with a payback achieved in less than four months. This example demonstrates that sustainability and profitability are not opposing forces; in fact, they often align within the same business equation.

Global analyses indicate that doubling the rate of improvement in energy efficiency by 2030 could deliver one-third of all the emission reductions required to meet international climate targets. That achievement would be equivalent to the entire annual energy consumption of China. In this scenario, industry plays a pivotal role—but not alone. Public policies, tax incentives, and smart regulation can create an environment where energy efficiency is seen not as a cost, but as an investment with guaranteed returns.

Through its Top Industrial Efficiency initiative and participation in the international Energy Efficiency Movement, ABB is already connecting companies, institutions, and innovators to accelerate this transition. The movement aims to promote efficient solutions, share best practices, provide collaboration platforms, and work with strategic partners to demonstrate the benefits of energy efficiency initiatives. By optimizing the performance of industrial electric motors, it is possible to return more than 10 percent of electricity back to the grid—without spending trillions on new infrastructure.

In a rapidly changing world, energy-saving technologies are becoming the foundation of every intelligent business. ABB today delivers solutions that provide greater control, safer operations, and long-term savings—available now and applicable to nearly every industrial process. The challenges of the modern era demand concrete responses, and energy efficiency stands as one of the most powerful. For ABB, the future is sustainable only if it is efficient. ABB

LAND, CLIMATE AND REGENERATIVE AGRICULTURE – IT'S TIME TO CHANGE THE RULES OF THE GAME

Agriculture is the largest global employer and the only sector whose products we all use every day, multiple times. It still primarily takes place on land, which is the source of as much as 95 percent of the food we consume. However, today land is much more than the basis of nutrition - it is a non-renewable resource, the habitat of two-thirds of living beings, an essential link in the carbon cycle, the infrastructure of future cities, and a strategic ally in the fight against climate change.

In a time of increasing pressure on natural resources, it is high time that soil regains the place it deserves – at the heart of policies, investments, and our attention.

Photograph: Regenerative farm Gellért Kaszás, Ada

Organic matter (humus) has always been an indicator of soil fertility. Due to intensive production, declining livestock numbers, burning of crop residues, loss of crop rotation, and erosion, most soils in our country are showing a downward trend in humus content

Soil Connects all Sectors

Agriculture plays a key role in food supply and biodiversity preservation, but at the same time, it contributes to greenhouse gas emissions. It is often cited that the agriculture, forestry, and other land use sector, known as the AFOLU sector, accounts for 13–21 percent of total anthropogenic greenhouse gas emissions. Less well known is that a significant portion of those emissions comes from land-use changes, including deforestation, which alone contributes around 11 percent.

Soil is no longer solely an agricultural issue – it is a strategic resource that links all sectors of development. Energy, construction, tourism, mining, and the management of protected natural areas – all rely at their core on the spatial capacity provided by land. Its value increases in proportion to the pressure exerted by society, as every sector demands more and more land, in ever larger areas.

Unlike air, rivers, or oceans, land can be owned and traded. This possibility of alienation makes soil a deep social and political issue, where fairness, sustainability, and long-term planning must be prioritized.

Healthy Soil – a Vital Link in the Carbon Cycle

The carbon cycle enables life on Earth and the functioning of life processes. Plants absorb carbon dioxide from the atmosphere during photosynthesis, and carbon is stored in their tissues. When organisms die, the carbon returns to the soil or atmosphere through decomposition. Although carbon sequestration is a slow process, it is possible – hence the slogan: "Put carbon back where it belongs – in the soil."

Soil down to a depth of one meter contains more carbon than aboveground vegetation and the atmosphere combined. However, over half of the world's agricultural land is already degraded in some way, mostly due to the loss of organic matter – humus – caused by intensive farming. Paradoxically, this leads to such degraded soils releasing even more carbon dioxide instead of storing it, which can cancel out all our other savings in the energy sector. Furthermore, degraded soils are especially vulnerable to climate change and extreme weather events, jeopardizing stable food production.

Organic matter (humus) has always been an indicator of soil fertility. Due to intensive production, declining livestock numbers, burning of crop residues, loss of crop rotation, and erosion, most soils in our country are showing a downward trend in humus content. Fewer and fewer producers can claim their soils contain more than three percent humus – the minimum threshold for successful and climate-resilient production.

JORDANA NINKOV, PhD, is employed at the Institute of Field and Vegetable Crops – an institute of national importance for the Republic of Serbia – in the Laboratory for Soil and Agroecology. She holds the academic title of Scientific Advisor in the field of environmental protection, within the scientific disciplines of soil physics, chemistry, and biology. She graduated in biology in 1997 from the University of Novi Sad and completed her master's studies in environmental protection in 2003 at the Multidisciplinary Centre for Environmental Protection. She earned her PhD in 2010 in the field of biotechnological sciences. With over 27 years of experience, she actively participates in agroecosystem research as part of a scientific team. She has led and participated in numerous scientific and professional projects, with a particular focus on soil quality protection and improvement. As an independent expert in sustainable land use, she has dedicated more than 15 years to developing and applying sustainable practices in agriculture. She is the author or co-author of over 250 scientific papers and the editor of 10 publications. PhD Ninkov has extensive experience in field research, working directly with farmers, analyzing production conditions, and conducting soil sampling, which she sees as a valuable contribution to mutual learning and the exchange of insights.

Photograph: courtesy of Jordana Ninkov

Carbon sequestration in soil is primarily a microbiological process, and favorable conditions are needed to activate it. Agronomic practices of regenerative agriculture specifically aim to improve these conditions and stimulate the resynthesis of organic matter. In analyses of greenhouse gas emission reduction potential in the food industry, the greatest impact is achieved precisely through improving soil. That is why more and more large agricultural systems are adopting regenerative agriculture as part of their ESG goals.

A Turn Towards Regenerative Agriculture

Regenerative agriculture is a method of food production that restores soil, conserves natural resources, and enhances climate resilience. Its goal is to increase humus content, biological diversity, and the activity of beneficial microorganisms – from bacteria to earthworms – so that plants can grow in more stable and natural conditions. Such soil is more fertile, retains moisture better, pro-

Photograph: Regenerative farm Kukutyin Műhely, Ferencszállás, Hungary

tects crops, and makes them more resistant to drought and disease.

Unlike organic farming, regenerative agriculture has not yet been formally defined or legally regulated, but many of its practices are already recognized and supported. Among the most commonly applied and widely accepted principles of regenerative agriculture are:

1) **A tailored approach for each farm:** a specific plan is created for each household, based on the natural environment and what each farm wants and is able to implement.
2) **Greater crop diversity** is achieved through intercropping, where multiple plant species grow together, with diverse crop rotations, and the inclusion of flower and buffer strips.
3) **Minimal soil disturbance:** practices like direct seeding (no-till), shallow tillage, and fewer passes are used to save fuel and preserve soil structure.
4) **Maintaining living roots in the soil year-round:** crops are rotated throughout the year, with cover crops sown between main crops.
5) **Permanent ground cover:** the soil remains covered all year, never left bare, with live plants or plant residues (mulch) to prevent erosion and retain moisture. In row crops, cover crops are sown between rows.
6) **Reduced external inputs:** especially lower use of pesticides and synthetic fertilizers. As humus and soil health improve, the need for agrochemicals decreases, though weed control may still occasionally rely on total herbicides.
7) **Integrating animals into crop production:** animals are returned to nature, with free grazing and manure contributing to soil fertility.

Photograph: Regenerative farm Gellért Kaszás, Ada

Challenges and Opportunities for the Development of Regenerative Agriculture

Given all the advantages of regenerative agriculture, one might ask: why isn't it being implemented on a large scale right away? Like any transition, the shift to regenerative agriculture faces a number of obstacles. This process is not quick and requires, above all, strong commitment from producers.

Transitioning to regenerative agriculture demands knowledge, time, persistence, and support. Planning production in regenerative systems involves complex crop rotations, access to cover crop seed mixtures, and new machinery. Results do not come overnight – it often takes five to ten years to see real effects. Additional initial investment is needed, especially for equipment like direct seed drills. Not all practices are suitable for every type of soil or every region, so outcomes are highly dependent on natural conditions. One of the main obstacles is the lack of institutional support – farmers often receive insufficient help from both the state and the market.

Despite all the mentioned barriers, considering the immense benefits of increasing humus in soil – particularly in the context of climate change – now is the right time to embrace these regenerative agriculture techniques. Simply put, there is no room to wait for future opportunities. After the climate extremes, uncertainties, and droughts we've witnessed over the past several years, the time for a turning point is now, because the future of our agriculture depends on how we care for the soil today.

Jordana Ninkov, PhD

WWF EXPANDS A NETWORK OF HOPE – FROM VIENNA TO THE DANUBE, FROM SCHOOLS TO FORESTS

Climate change in Serbia is no longer an abstract threat – it is a reality. Droughts, extreme weather events, and shifts in seasonality are leaving a profound impact not only on agriculture but also on plant and animal life, warns Aleksandra Ugarković from the World Wide Fund for Nature (WWF).

Aquatic ecosystems are drying up, forest communities are changing, and migratory species are losing their safe havens. To break this vicious cycle of habitat loss and climate impacts, WWF in Serbia is combining nature conservation with a just transition to renewable energy sources. Through projects in local communities, such as Obrenovac and Aleksinac, young people are developing green ideas that do not harm nature. The organization also works with municipalities and decision-makers to ensure that the energy transition is inclusive and sustainable.

– Our goal is to unite nature conservation with a just transition to renewable energy. Over the past four years, we have done this through projects that encourage the development of green ideas and activism among high school students in Obrenovac and Aleksinac. The idea is for young people to think in terms of businesses that do not threaten habitats and species, as opposed to past models that have unsustainably exploited nature and its resources. We also work with communities, municipalities, and decision-makers to make this transition inclusive and sustainable, said Ugarković.

Another example of concrete action in Serbia is the planting of native tree species in Gornje Podunavlje – by restoring black and white poplar, oak, and willow, WWF is reviving wetland ecosystems, increasing resilience to floods, and capturing CO_2 from the atmosphere.

– We launched tree planting in Gornje Podunavlje, the Serbian part of the European Amazon, because it is one of the last major wetland areas in Europe with immense importance for nature conservation, but which has been exposed to degradation for decades. Restoring trees such as black and white poplar, oak, and willow means restoring natural

Photograph: Pixabay/Gerd Altmann

balance, strengthening resilience against floods, and capturing CO_2 from the atmosphere. These species are native and adapted to the specific conditions of the Danube forests. They are not only a symbol of nature's return but also our allies in the fight against climate change in the Amazon of Serbia, Ugarković emphasized.

Floating Station in Vienna Safeguards the Future of Sturgeons

Hardly any animal species on the planet is closer to extinction than sturgeons – ancient river giants that have survived for over 200 million years. Today, they are among the most endangered species in the world. In an effort to halt their disappearance, the first European floating station for sturgeon breeding was recently opened in Vienna.

On the MS Negrelli, a 66-meter-long vessel currently moored at the Danube Island, a breeding stock and genetic bank of the remaining native Danube species will be established. The goal of the project is to breed and return about 1.6 million young individuals of four surviving sturgeon species to the wild by 2030.

Ugarković adds that through activities such as the European floating station for breeding young sturgeons, WWF contributes to their return to the Danube. There are similar initiatives in Serbia as well, but she stresses that broader international cooperation is essential.

Earth Hour: More than Turning Off the Lights, a Beginning of Change

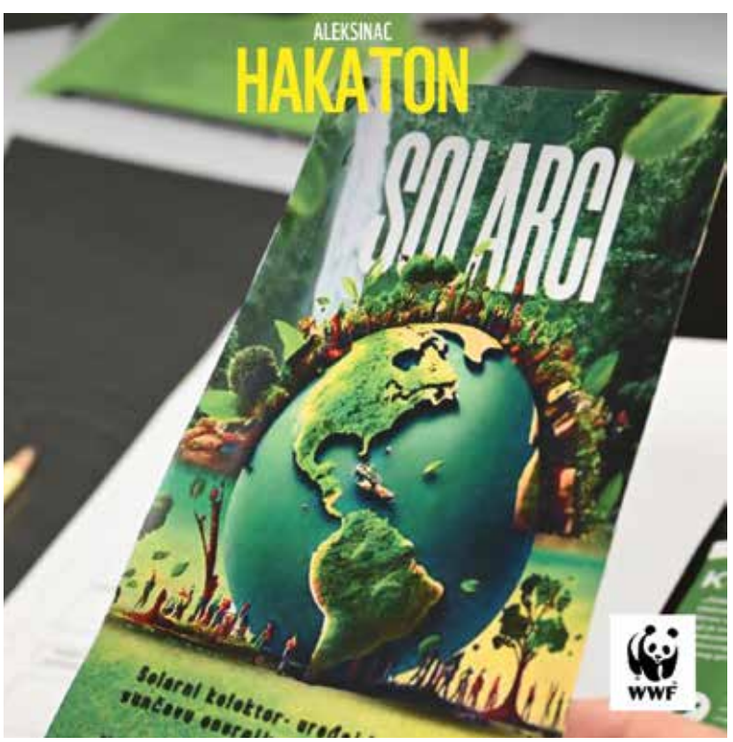
The global campaign Earth Hour once again brought together more than 20 cities and municipalities from Serbia this year. The message was clear: let us use our moment for the planet – through small but meaningful actions.

– Earth Hour is much more than turning off the lights – it is a moment when we remember that we are all connected. This year's message was simple: to use our moment for the planet. Whether it is planting a tree, talking about climate with friends, or switching off the lights, everyone can contribute. From Serbia and the region, more than 20 cities and municipalities joined this year, and support also came from institutions, schools, media, and individuals. This shows that awareness is growing, said our interviewee.

In the coming period, WWF will continue with projects for the conservation of rivers, forests, and species, with a strong focus on the energy transition. The goal of having 70 percent of energy come from renewable sources by 2040 is ambitious but achievable – if, as WWF says, we work together and start with ourselves.

Our goal is to unite nature conservation with a just transition to renewable energy

Prepared by Milena Maglovski



Photographs: WWF

47% reduction

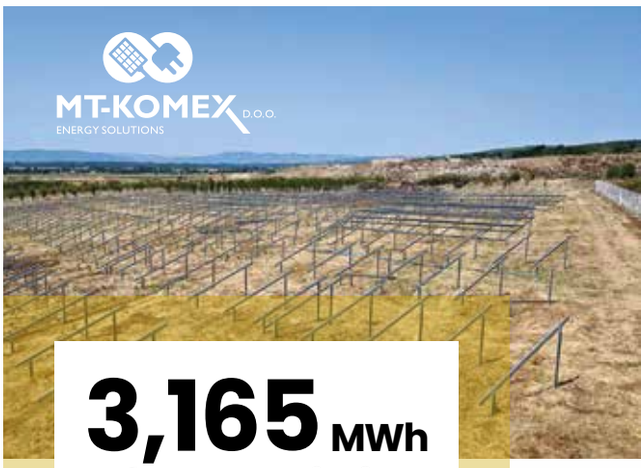
in greenhouse gas emissions compared to 1990 levels has been recorded by the Czech Republic..

[PAGE 6]

>40%

of Serbia's territory is currently covered by forests and other tree covered land.

[PAGE 16]



3,165 MWh of electricity

annually will be produced by two solar power plants in Aleksinac being built by MT-KOMEX.

[PAGE 60]

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

>100 million euros

in international loans has been secured by Serbia to subsidize households and small businesses for energy efficiency measures.

[PAGE 20]

The first

European floating sturgeon farm was opened in Vienna – by 2030 it is expected to release around 1.6 million juveniles.

[PAGE 48]

WWF

Photographs: (top) Pixabay/Jaromír Čižinský; (middle left) Unsplash/Geranimo; (middle right) MT-KOMEX (bottom left) GIZ; (bottom right) WWF

The first

state sustainability-linked bonds in the European Union were issued by Slovenia in June 2025.

[PAGE 62]

99.13%

efficiency of an industrial motor is the new world record set by ABB.

[PAGE 42]

The new project

"Smart Garden" by the Mihajlo Pupin Institute enables farmers to overcome the consequences of climate change.

[PAGE 68]

The first

Net Zero calculator for small and medium-sized enterprises was developed by ProCredit Bank.

[PAGE 22]

The prestigious award

"Golden Tisa" was granted to the Institute for Protection and Ecology of Republika Srpska as part of the "Nature Protection Champions, BH Green Awards 2025" campaign.

[PAGE 38]

Photographs: (top) Unsplash/Francisco Ghisletti (top right) Mihajlo Pupin Institute; (middle) ABB; (middle left) ProCredit Bank; (bottom) Institute for Protection and Ecology of Republika Srpska

JAPAN AGAINST TSUNAMIS – 400 KILOMETERS OF CONCRETE AND 9 MILLION TREES

Fourteen years ago, Japan's eastern coast was struck by the powerful Tōhoku earthquake and tsunami, which claimed more than 15,000 lives, devastated cities, and triggered the Fukushima nuclear disaster. In the aftermath, the Japanese government decided to invest billions of dollars in new infrastructure to protect against future tsunamis.

The so-called "Great Wall of Japan" is a massive concrete barrier stretching nearly 400 kilometers along the country's northeastern coast. According to international media, the wall rises more than 14 meters high in some areas, with foundations reaching depths of up to 25 meters. While seawalls were not a new concept at the time, this one differs from earlier versions by having a wider, reinforced base. It was designed to withstand waves up to eight meters high, weaken their force, and provide precious time for evacuation.

Still, waves can exceed those limits, as seen in 2011 when some reached 15 meters, destroying many protective barriers then in place. For this reason, the Great Wall of Japan was complemented by additional natural reinforcements. Alongside it, authorities launched a coastal project to plant nine million trees and shape artificial hills.

However, this infrastructure has not been universally welcomed. Critics argue that the walls spoil the natural landscape and, in some regions, block ocean views. Concerns have also been raised about potential declines in coastal tourism and skepticism among residents regarding whether the wall can truly prevent a major disaster.

Experts emphasize that these walls provide what is known as "Level 1" protection, intended for tsunamis occurring once every 50 to 160 years. For rarer, more extreme "Level 2" events, the seawalls alone would not be sufficient. What remains crucial, specialists stress, are public education, well-planned evacuation routes, and early warning systems to minimize the catastrophic impact of natural disasters.

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METHANE FROM ABANDONED MINES REMAINS A CLIMATE CHALLENGE FOR EUROPE

Europe is taking numerous steps to reduce greenhouse gas emissions, but some of these efforts do not necessarily mean that the problem is truly solved. More and more coal mines are being closed, yet methane from abandoned mines continues to escape into the atmosphere unnoticed.

This greenhouse gas is over 80 times more potent than carbon dioxide in the short term, and methane emissions from these mines can last for decades after closure.

AMM – Abandoned Mine Methane – emissions from abandoned mines are not always constant. As explained on the EMBER website, they behave like a mine's "breathing." Changes in atmospheric pressure cause the mine to "inhale" air and "exhale" methane. When the pressure is higher, air is pushed into the mine, and when it drops, the accumulated gas is released.

There are thousands of closed coal mines across Europe, and in 2021 alone, the European Union estimated that closed and abandoned mines emitted 235,000 tons of methane. The largest share comes from Romania, as much as 83 percent. The challenge remains that there are no direct measurements, so these figures are only approximate.

Research by Global Energy Monitor shows how underestimated official figures are. In Poland, the government reported 21,500 tons of AMM emissions for 2021, while a 2024 analysis revealed that mines closed since 2015 emit around 75,000 tons annually – more than three times higher.

Technology to monitor, capture, and utilize AMM already exists. One way to use it is for supplying households and industry. Although burning methane releases CO_2, it is a better option than venting it into the atmosphere, as methane is a significantly more potent greenhouse gas than carbon dioxide.

While possibilities are open, the following steps remain dependent on political will.

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Photographs: (left) Unsplash/Ilona Froehlich; (right) Pixabay/Pablo Valerio

REVOLUTION IN REFORESTATION – AI ROBOT PLANTS 100 TREES PER HOUR

Humans destroy, humans repair – like in a vicious circle, we live in an age that develops and changes at lightning speed, yet also degrades. How many times must nature suffer for our benefit? Blinded by the desire to make life "better," we often fail to see that in the long run, we are causing greater harm. Our forests are suffering huge losses – from land repurposing, fires, climate change, pollution, urbanization, the timber industry, and energy production – all contributing to their disappearance.

Then comes the moment when we become aware and want to correct the mistake. But can the human hand in restoration keep pace with the speed at which it once destroyed? This is exactly why Brazil has called technology to the rescue – the Plantio-100 robot, which plants as many as 100 trees per hour, taking reforestation to an entirely new level.

This robot uses artificial intelligence, giving it an advantage not only in speed but also in precision and planting quality. Plantio-100 moves across previously destroyed areas and analyzes soil conditions. Based on data about nutrients, moisture, and shading, the robot chooses the most suitable seedling species for each location.

A planted seedling is not forgotten – the robot later returns to the same spots to monitor its growth, hydrating it when needed or providing additional protection against pests. This method of planting shows an exceptionally high success rate – nearly 90 percent of seedlings survive, which is almost twice as much as with traditional mass planting methods.

Plantio-100 is also environmentally sustainable – thanks to its solar power system, it does not depend on fuel and can operate in remote and hard-to-reach areas.

With the goal of restoring 12 million hectares of land by 2030, Brazil is currently preparing and training dozens of such robots, laying the foundation for a new era of reforestation.

The development of artificial intelligence today is incredibly fast – so much so that it's hard to keep up with all its possibilities without constant learning. Like any powerful innovation, AI sparks justified concern, as its power can be used for the wrong purposes. Still, the example of the Plantio-100 robot shows how technology can be used for good – to help both humanity and nature by restoring what has been degraded for decades. In responsible hands, AI becomes an ally in protecting and renewing the world around us.

Katarina Vuinac

Photograph: Unsplash/Declan Sun

GOOGLE PUBLISHES FIRST DETAILED REPORT ON ENERGY CONSUMPTION OF ITS AI APPLICATIONS

Google has released a technical report that, for the first time, provides precise data on the amount of energy consumed by its Gemini artificial intelligence models when processing queries. According to the company, an average query requires 0.24 watt-hours of electricity – equivalent to the energy consumption of a standard microwave oven running for one second.

In addition to energy consumption figures, Google also published estimates of water usage and carbon dioxide emissions per single text query, becoming the first major technology company to present its environmental footprint in such a transparent manner.

The report states that an average query generates about 0.03 grams of carbon dioxide. This value was calculated by multiplying the total energy required to process the query by the average carbon intensity of electricity generation.

At the same time, the data centers powering artificial intelligence consume water for cooling. Estimates show that one query uses around 0.26 milliliters of water – roughly five drops.

The analysis also reveals that AI chips (TPUs) account for 58 percent of total electricity consumption, while processors and host machine memory contribute 25 percent. Backup equipment in standby mode consumes about 10 percent, and the remaining 8 percent is spent on overhead costs such as cooling and energy conversion in data centers.

"We wanted to be comprehensive in everything we included," said Google's Chief Scientist Jeff Dean in an interview with MIT Technology Review.

Experts note that this report marks an important step toward better understanding the environmental footprint of artificial intelligence.

However, the presented figures refer only to an "average query." More complex tasks – such as processing and synthesizing content from dozens of books or running advanced reasoning models – can require significantly more energy.

Moreover, the report applies exclusively to text queries, while image and video generation demand much higher energy consumption, as shown in previous analyses.

Google also stated that the energy consumption of an average Gemini query in May 2025 was 33 times lower than a year earlier, thanks to model improvements and software optimizations.

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Photograph: Unsplash/Israel Palacio

HEATWAVES DRIVE UP ELECTRICITY PRICES IN EUROPE – SOLAR POWER SOFTENS THE BLOW

Heatwaves brought record temperatures to Europe in June and July 2025, with some areas exceeding 40 °C, posing serious challenges for the electricity system due to a sudden spike in power consumption.

The biggest contributor to the surge in demand was air conditioning use – during the hottest days, electricity consumption rose by up to 14 percent. At the same time, thermal power plants experienced outages, further straining the grid and leading to a significant increase in electricity prices. In some countries, prices even tripled, surpassing 400 euros per megawatt-hour during evening hours, according to EMBER.

Compared to June 24, average daily electricity prices during the heatwave rose by 15 percent in Spain, 106 percent in Poland, 108 percent in France, and as much as 175 percent in Germany.

Heatwaves also caused power lines to overheat, which in Italy led to failures and further hindered cooling at thermal power plants. As a result, many facilities had to reduce capacity, and some were forced to shut down entirely. In France and Switzerland, nuclear power production was also reduced due to elevated air and water temperatures, which hampered reactor cooling. In France, 17 out of 18 nuclear plants faced operational restrictions.

Heatwaves and Solar Energy

Despite the challenges, June 2025 was the most productive month in EU history in terms of solar energy generation, with 45 TWh produced, 22 percent more than in the same month the previous year.

In Germany, at the peak of the heatwave, solar energy was generating up to 50 GW, covering nearly 40 percent of the country's total electricity consumption.

Heatwaves, which are expected to become more frequent, clearly show that without smart grid management and investments in renewables – along with storage capabilities and better interconnections – there can be no stable supply or energy security in the face of climate extremes.

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SPACE-BASED SOLAR PANELS COULD CUT EUROPE'S NEED FOR LAND RENEWABLES BY 80 PERCENT

Solar energy harvested in space could be a game-changer for Europe's energy transition, potentially reducing the need for land-based renewables by up to 80 percent, according to a new study by researchers at King's College London.

Published in the prestigious journal Joule, the study is the first to analyze the potential impact of space-based solar power on Europe's energy system. The scientists assessed NASA's RD1 concept, one of two developed designs for space solar power generation systems. Their findings show that this technology could reduce the need for battery energy storage by more than two-thirds, while lowering the overall costs of Europe's power system by 15 percent – equivalent to savings of around €35.9 billion annually.

Professor Wei He, lead author and senior lecturer at the Department of Engineering at King's College, emphasized that the results open up a new perspective for Europe:

"For the first time, we have demonstrated the positive impact this technology could provide for Europe. While feasibility is still under investigation, our research highlights the enormous economic and environmental potential if adopted. Achieving net-zero emissions by 2050 will require a major shift to renewables, and space-based solar systems could play a crucial role in that transition," said He.

Unlike ground-based solar plants, panels mounted on satellites in orbit are exposed to much higher levels of sunlight. They can generate power continuously, unaffected by clouds, precipitation, or the day-night cycle. The energy harvested in space would be transmitted wirelessly to receiving stations on Earth, where it would be converted into electricity and either fed into the grid or stored in batteries.

Although the technology is still under development, its potential advantages are numerous: more stable supply, greater energy security, resilience against natural disasters such as floods and earthquakes, and a significant reduction in the need to build new solar and wind farms on land.

The authors underline that this is the first paper to provide a comprehensive assessment of the costs and benefits of space-based solar energy for the European market. If proven feasible and commercially viable, the technology could become a turning point in the fight against climate change and in the transformation of Europe's energy system.

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Photographs: (left) Pixabay/Gerd Altmann; (right) Pixabay/SpaceX-Imagery

ECOMONDO 2025: GREEN INDUSTRY GATHERING FROM NOVEMBER 4 TO 7 IN RIMINI

From November 4 to 7, 2025, the Italian city of Rimini will once again become the epicenter of sustainable development and green innovation. This time, it will host the 28th edition of Ecomondo – the most important international event in Europe dedicated to ecological transition and the circular economy.

This year, Ecomondo exceeds expectations with a rich program that brings together companies, startups, researchers, decision-makers, and experts from over 120 countries. With 165,000 square meters of exhibition space, 1,700 exhibitors, and more than 250 conferences, the fair offers insight into the latest technologies, research projects, and regulatory developments shaping a sustainable future.

Main topics include:

- the current state of implementation of leading projects from Italy's National Recovery and Resilience Plan (NRRP),
- the adoption of the circular economy at both national and European levels,
- the regeneration of land, waterways, and coastlines,
- models for the "circular and healthy cities" of the future.

Special emphasis will also be placed on networking and knowledge exchange in the fields of research funding, innovation, and specialized training. The program is aimed at public administration, freelancers, managers, and sustainability professionals, offering practical tools and resources for transitioning to sustainable processes.

At the previous edition, the fair welcomed over 103,000 visitors who attended to grow their businesses, adopt advanced solutions, and improve compliance with new regulations. Ecomondo positions itself as an unmissable event for all who wish to actively shape ecological transformation – through technology, policy, education, and partnerships.

More information is available on the official event website: en.ecomondo.com

Energy Portal

NEW ELECTRICITY PRICES AND BILLING CHANGES FOR HOUSEHOLDS IN SERBIA EFFECTIVE OCTOBER 1

The Council of the Energy Agency of the Republic of Serbia, at its session held last week, approved new prices for access to the electricity system.

According to the AERS website, as of October 1, 2025, the transmission tariff will increase by 10 percent compared to the level from October 2021, while the distribution tariff will rise by 16 percent.

At the same session, amendments were adopted to the Methodology for Determining the Price of Access to the Distribution System. The deadline was extended for system users in the Wide Consumption category – Household customer group, who are entitled to have a reduced charge for approved capacity without changing their connection approval decision. This option will remain in force until December 31, 2026.

In addition, the Council adopted amendments to the Methodology for Determining the Price of Electricity for Guaranteed Supply. The threshold between the "red" and "blue" consumption zones for wide consumption customers has been lowered from 1,600 kWh to 1,200 kWh.

Furthermore, households with a three-phase connection and an approved capacity between 11.04 and 17.25 kW may continue to be billed as if they had 11.04 kW. If the monthly consumption of active energy in the household does not exceed 350 kWh, the approved capacity for that month will be billed at 6.90 kW. This option also remains valid until December 31, 2026.

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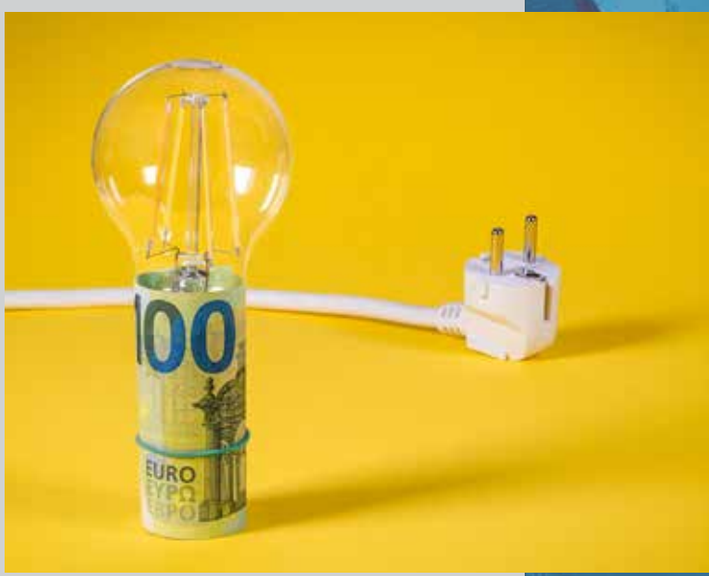

Photographs: (left) Ecomondo; (right) Pixabay/Willfried Wende

SOLAR TREES: A NEW CHANCE FOR SOLAR ENERGY DEVELOPMENT WITHOUT DESTROYING FORESTS

The global expansion of solar energy often comes with a high ecological cost—massive deforestation to make way for solar panels, creating a deep conflict between the need for renewable energy and the preservation of natural ecosystems. However, new research conducted by scientists in South Korea shows that so-called solar trees can offer a sustainable solution: simultaneously increasing electricity generation capacity while preserving forest landscapes.

According to the results of a quantitative comparison carried out by researchers at the Korea Maritime Institute, a linear arrangement of solar trees makes it possible to preserve 99 percent of forest cover, while traditional flat fixed-panel installations require the removal of up to 98 percent of existing forests to achieve the same electricity generation capacity.

These findings were obtained through a combination of 3D geospatial simulations and standardized testing conditions, and the methodology can also be applied in other countries aiming to accelerate the energy transition while preserving natural carbon sinks.

How Does Solar Tree Technology Work?

Solar trees are innovative vertical structures that mimic the natural form of real trees: solar panels are arranged like canopies and branches, producing energy at the top while allowing enough light to pass through for vegetation to grow underneath. This way, two key goals are combined—renewable energy production and the

preservation of forest ecosystems. Unlike conventional solar farms, which completely remove trees and disrupt biodiversity, solar trees maintain forest functions such as protection from erosion, landslides, noise, and strong winds.

The example from South Korea clearly illustrates the importance of this concept. In just three years—from 2016 to 2018—the expansion of solar farms in the country's mountainous regions led to deforestation of over 4,400 hectares. The removal of mature forests caused soil erosion and numerous landslides near solar installations. Similar risks threaten coastal forests, which are particularly valuable since, beyond producing oxygen and storing carbon, they serve as natural protection against winds, salinity, and tsunamis.

Until now, most research has focused on measuring the performance of individual solar trees, yielding limited results. The new study, however, shows that the same installed capacity as traditional fixed panels can be achieved with just 63 solar trees, although up to 97 could be arranged in the experimental area.

Since panels are becoming increasingly efficient at using the same surface area, solar trees can deliver higher capacity with a smaller spatial footprint. This opens up the possibility of precisely planning the expansion of solar energy in forested and coastal landscapes without dramatic destruction of nature.

Researchers emphasize that solar energy already delivers the highest power output per unit area compared to other renewable sources and, with falling production costs, is on track to become the most cost-effective technology in most regions of the world. As global commitments call for a tripling of renewable energy capacity by 2030 while also preserving forests, solar trees emerge as a promising dual solution.

Energy Portal

Photograph: AI generated/Canva


Subotica
120 kW
Sombor
120 kW
Bačka Topola
180 kW
Kikinda
22 kW
Nova Crnja
60 kW
Novi Sad
+10
Zrenjanin
150 kW
Martinci
180 kW
Sremska Mitrovica
22.5 kW
Inđija
60 kW
Stari Banovci
50 kW
Pazova
50 kW
Beograd
+16
Pančevo
60 kW
Vršac
120 kW
Šabac
60 kW
Smederevo
22,5 kW
Požarevac
22,5 kW
Kladovo
22 kW
Loznica
120 kW
Ub
120 kW
Lazarevac
22.5 kW
Mladenovac
150 kW
Velika Plana
50 kW
Valjevo
22.5 kW
Lapovo
120 kW
22 kW
Kragujevac
+6
Sokolići
50 kW
Konjevići
50 kW
Lučani
30 kW
Jagodina
110 kW
Zaječar
60 kW
45 kW
Kraljevo
70 kW
Kruševac
130 kW
180 kW
Kopaonik
2×22 kW
Prokuplje
60 kW
Niš
120 kW
Doljevac
140 kW
Leskovac
50 kW
Gradina
90 kW
Vranje
120 kW

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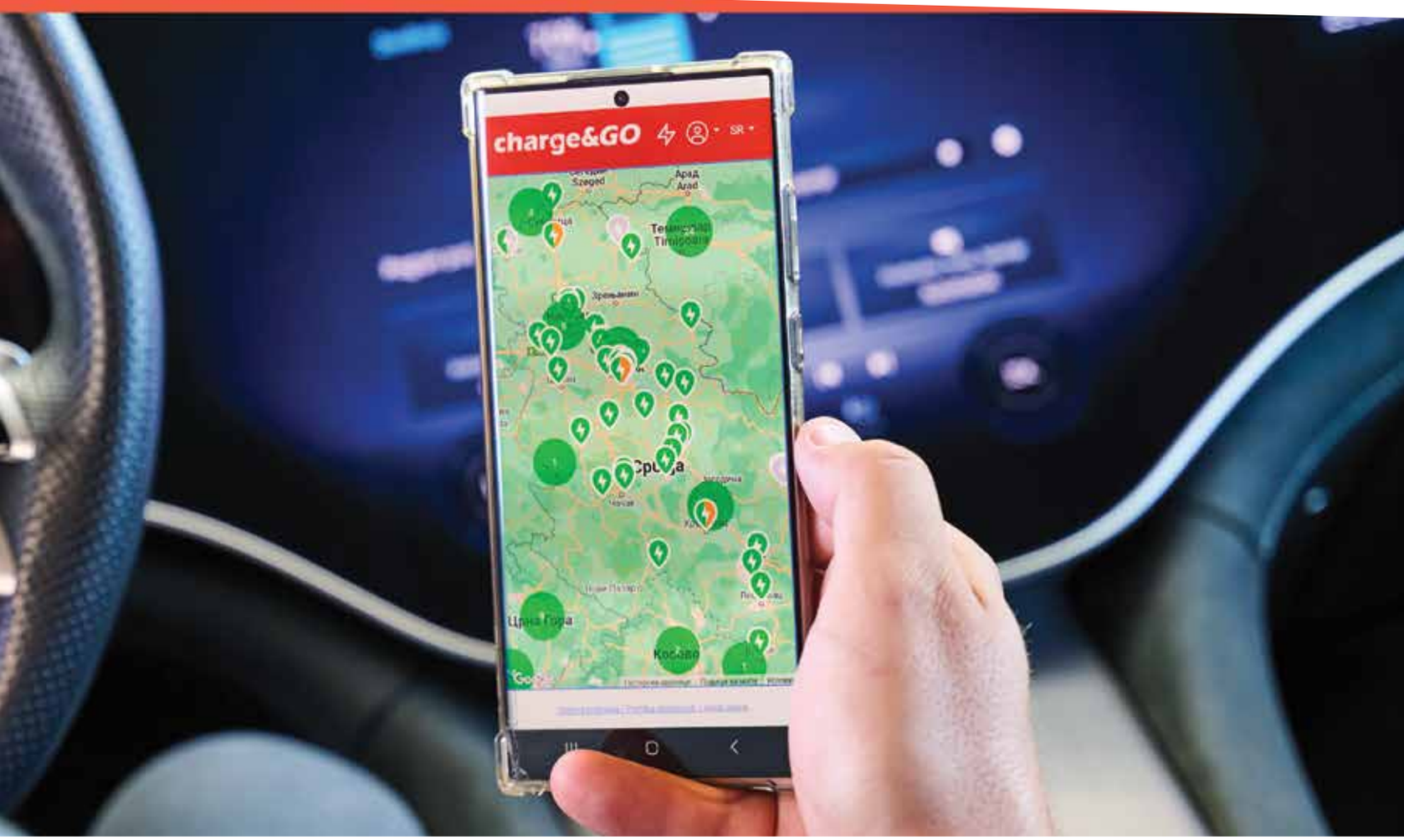

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FLUO VAROŠ 1 AND 2 – CONSTRUCTION BEGINS ON TWO MODERN SOLAR POWER PLANTS IN ALEKSINAC

Sunny days inspire great undertakings, and the investor SE Solar Fluo has entrusted the realization of two important projects to MT-KOMEX, one of the leading domestic contractors in the field of solar energy.

The first month of summer 2025 has been marked by the start of construction of two ground-mounted solar power plants – Fluo Varoš 1 and Fluo Varoš 2. The works are being carried out at a sunny location within the municipality of Aleksinac, where the average annual level of global solar radiation reaches 1,300 kWh/m² to 1,400 kWh/m², while optimally positioned panels can receive up to 1,550 kWh/m², making this site highly suitable for solar power generation.

Within the Fluo Varoš 1 solar power plant, a total of 1,952 panels manufactured by Aiko Solar, each with a power of 650 Wp, will be installed, with a total installed capacity of 1,268.8 kWp and an active connection capacity of 999 kW AC. The expected annual electricity generation is approximately 1,650 MWh.

The second project, Fluo Varoš 2, includes the installation of 1,792 Aiko Solar panels, with a total capacity of 1,164.8 kWp and an active connection capacity of 900 kW AC. The solar power plant is expected to generate about 1,515 MWh of electricity annually.

Photographs: MT-KOMEX

Reliable Technology and the Highest Safety Standards

Both plants will be equipped with Huawei inverters of 100 kW each – a total of 10 for the Fluo 1 project and nine for the Fluo 2 project. The panels will be mounted on a steel structure manufactured by Sigma Energy, while the assembly and complete execution of works are being carried out by MT-KOMEX, in accordance with domestic and international quality standards.

To maximize the solar potential of the location, especially during the summer months, the panels will be installed at a 20-degree tilt, oriented southward. The structure rests on support poles driven into the ground at a depth of about 1.5 meters, which also form a highly efficient grounding system.

The power plants will be connected to the distribution system at the 10 kV voltage level, in accordance with the technical requirements of the competent electricity distribution company, and all generated energy will be delivered to the grid.

Fluo Varoš 1 and 2 are not only an investment in renewable energy but also an important incentive for the development of green infrastructure and energy independence, both for the local community and beyond

Both facilities will be equipped with Level I lightning protection, in line with the Rulebook on Technical Norms for the Protection of Buildings Against Atmospheric Discharges. In addition, a complete monitoring system will be installed, along with sophisticated grounding and lightning protection systems.

Fire safety is further ensured by the fact that the solar panels are made of glass and aluminum, which are completely non-combustible, as well as the steel mounting structure. The only combustible elements – DC cables and inverters – are additionally protected and mounted beneath the panels, which together form a Faraday cage, protecting the system from direct lightning strikes.

Fluo Varoš 1 and 2 are not only an investment in renewable energy but also an important incentive for the development of green infrastructure and energy independence, both for the local community and beyond.

Prepared by Katarina Vuinac

SLOVENIA ISSUES FIRST SOVEREIGN BONDS LINKED TO CLIMATE TARGETS

Bonds are one of the main ways in which states borrow money. When a country needs to raise funds, it issues bonds and offers them to investors. Investors then "lend" money to the state, and in return, they receive a promise that the state will repay the principal within a set period and pay a specified interest rate each year.

In June 2025, Slovenia set a new standard for implementing climate policies in Europe precisely through this financial instrument. By issuing the first sovereign

Photograph: Unsplash/Francisco Ghisletti

Slovenia set a new standard for implementing climate policies in Europe precisely through this financial instrument

sustainability-linked bond (SLB) in the European Union, the country made a breakthrough compared to previous sovereign borrowing practices, since in this case, a direct link is established between the interest rate and the country's success in achieving its defined climate targets.

With sustainability-linked bonds, the interest rate (or other financial terms) depends on whether the issuer achieves defined sustainability-related goals. This time, it is not about green bonds, which are used to finance specific green projects. The SLB is tied to results but not to the purpose of spending the funds. Green bonds have been issued for years and are designated for financing specific environmental projects. Still, Slovenia's move introduces a different approach – instead of earmarking funds strictly for green investments, Slovenian sustainability-linked bonds tie the cost of borrowing to the success of climate policy implementation. Under this model, the state commits to achieving defined greenhouse gas (GHG) reduction targets. At the same time, the interest rate, starting from the ninth year after issuance, will adjust depending on whether those targets are met or not.

Slovenia raised €1 billion from investors in exchange for the bonds, with a 10-year maturity, i.e., July 2, 2035. The initial interest rate is 3.12 percent annually and will apply until the ninth year from issuance, after which it may change depending on the achievement of climate targets.

Two Sustainability Performance Targets (SPT) have been set, with the main indicator being the total annual GHG emissions measured at the national level:

- SPT 1.1: a reduction of at least 35 percent by 2030 compared to 2005 levels.
- SPT 1.2: a more ambitious reduction of at least 45 percent in the same period.

If Slovenia fails to meet the baseline target (SPT 1.1), the interest rate will increase by 0.5 percent during the final year of repayment, until July 2035. If the higher target is achieved, the interest rate will be reduced by the same margin, and the adjusted rate will remain in effect until maturity.

In this way, the state assumes concrete financial responsibility for the success or failure of its climate policy. At the same time, investors gain a clear and measurable mechanism for tracking performance through the terms of sovereign borrowing. Verification will be based on officially available data and subject to independent review.

Investor interest was six times higher than the offer. Thanks to this demand, Slovenia secured a favorable interest rate of 3.12 percent, considered very competitive under market conditions. The strong demand enabled the country to borrow under better conditions than would have been possible with a weaker market response.

The issuance of Slovenia's SLB was dominated by institutional investors actively applying sustainable investment policies, including asset managers, pension and insurance funds, central banks, and other public financial institutions.

The funds are not earmarked for specific projects, which means they can be used for general budgetary purposes. However, the ultimate borrowing cost directly depends on whether Slovenia meets its climate targets by 2030.

If the state wishes to issue new SLBs in the future, it will need to define new targets and a new timeframe — meaning that each issuance is treated as a new, independent contract with the market. This makes the borrowing not only a fiscal instrument but also a climate accountability instrument.

Prepared by Milica Vučković

GUARDIAN OF BOSNIA AND HERZEGOVINA'S MOUNTAIN WATERS – AN AMPHIBIAN FROM THE ICE AGE WHOSE SURVIVAL IS NOW THREATENED

On the plateau of Mount Vranica, in the heart of Bosnia and Herzegovina, lies Prokoško Lake – a natural jewel of exceptional biological value. In the cold, clear waters of this mountain lake and its surroundings, a unique amphibian species has survived for centuries – the Bosnian alpine newt (*Ichthyosaura alpestris reiseri*). This special subspecies of the alpine newt lives nowhere else in the world, making it a true natural rarity. As a post-glacial relict, it survived the last Ice Age precisely in this area and represents the only true stenoendemic amphibian in Bosnia and Herzegovina.

This special subspecies of the alpine newt lives nowhere else in the world, making it a true natural rarity

Photographs: VTF studio

However, due to human influence, this species is now endangered. What extreme weather conditions failed to accomplish, humans did in the late 1960s, when an invasive predatory fish – rainbow trout (*Oncorhynchus mykiss*) – was introduced into Prokoško Lake. Its presence caused a drastic decline in the newt population, and the subsequent introduction of additional fish species in recent years led to its complete disappearance.

Today, a team of experts and young biologists gathered around the National Museum of Bosnia and Herzegovina is dedicated to protecting the Bosnian alpine newt and its natural habitat. We spoke with herpetologist Adnan Zimić, project leader and one of the most knowledgeable experts, about its significance and the ongoing conservation efforts.

Prokoško Lake is the site where this subspecies was first scientifically described, but today it no longer has a stable population there, which, as Zimić emphasizes, is particularly sad. Although individual specimens occasionally appear, they fail to establish a sustainable population due to the presence of invasive fish.

Climate change further worsens the situation by accelerating the eutrophication of water bodies, while fungal diseases affecting amphibians worldwide also pose a threat. Nevertheless, invasive fish remain the main problem.

The Bosnian alpine newt differs from other alpine newts by its more robust build and more prominent head. Although relatively little is known about its biology, it plays an important role in the ecosystem – particularly in regulating invertebrate populations – making it an indicator of healthy aquatic habitats.

Conservation of the Bosnian Alpine Newt

The conservation team has been formed around the project of the National Museum of BiH, with the participation of biology students from the Faculty of Science, University of Sarajevo, and members of the Herpetological Association ATRA. Through joint field activities, students acquire practical knowledge in monitoring and conservation biology. At the same time, the entire team works on mapping potential habitats and restoring aquatic areas that newts use throughout the year.

The activities were launched through a UNDP project on the sustainability of protected areas, in cooperation with the public utility company Šćona. During 2023, aquatic habitats were restored at two sites – Zavol and Šestica – where hibernacula (overwintering shelters for newts) were also built. At the same time, regular population monitoring and mapping of new sites around Prokoško Lake are being carried out.

An ex situ unit has also been established at the National Museum – a specially arranged space where individuals are kept and bred under controlled conditions. This population serves as the basis for future reintroduction, should the conditions allow it.

Experts emphasize that without the removal of invasive fish species from Prokoško Lake, the Bosnian alpine newt will not be able to survive in its original habitat. The process of fish eradication is complex but crucial for the recovery of this endangered species.

A Broader Perspective: The State of Other Amphibians and Reptiles in BiH

Zimić warns that amphibians and reptiles are among the most endangered vertebrates in Bosnia and Herzegovina. Habitat loss, pollution, climate change, and invasive species threaten their populations. Many species are tied to specific and sensitive microhabitats, such as small ponds, which are easily disrupted.

Amphibians are particularly vulnerable due to their thin, permeable skin, which they use partly for respiration, making them sensitive to pollution, drought, and changes in temperature and humidity. In BiH, all species of tailed amphibians, many frog species, all turtle species, and a large number of snakes are endangered. Each faces specific threats and requires special attention.

As our interviewee concluded, helping these species requires the preservation and restoration of habitats, a ban on the introduction of foreign species, and raising awareness among the local population.

Prepared by Katarina Vuinac

VELIKO GRADIŠTE AWAITS AN INFLUX OF SOLAR ENERGY

The right moment to invest in solar power plants in Serbia no longer needs to be awaited – it is already here. Lower equipment prices and rising electricity costs together create excellent conditions for achieving a return on investment in solar energy. This situation is now being recognized by people across Serbia, in all regions and municipalities.

In Veliko Gradište, the construction of a new solar power plant, Solar VG, is planned – a project of the Belgrade-based company BOP SOLAR d.o.o. On the investor's plot, which has obtained a building permit, a 3 MW system will be installed, intended exclusively for generating electricity from sunlight and delivering it to the distribution network. In doing so, the municipality will gain a modern energy project that directly contributes to a higher share of renewables in Serbia's energy mix.

The project design of this solar power plant in eastern Serbia, along with all accompanying technical documentation, was prepared by the Center for Energy Efficiency and Sustainable Development (CEEFOR) – a company with extensive experience in developing renewable energy projects.

The power plant will be equipped with 30 inverters of 100 kW each, with the proposed manufacturer being Huawei. It is planned to include 5,688 photovoltaic panels of 625 Wp each, or an appropriate number of panels within the range of 570 to 720 Wp, depending on the final equipment selection. The solar plant will have a trapezoidal shape, with panels arranged in rows, oriented southward, and will include a total of two transformer substations.

The project design stipulates that at least half of the complex area will remain green space, while constructed facilities may occupy no more than 30 percent of the parcel. The entire site will be enclosed with a protective fence up to 2.7 meters high, featuring fire access roads and designated parking areas.

Upon completion, Solar VG will become a local source of clean energy, designed to blend harmoniously into the landscape.

A 3 MW power plant, such as this one in Veliko Gradište, could, under ideal conditions, be compared to the simultaneous supply of around 1,000 average households, considering that an average household consumes approximately 3 kW at peak load (lighting, household appliances, air conditioning, etc.).

Compared to the same amount of energy produced in a coal-fired thermal power plant, this solar facility could potentially prevent emissions of 3,500 to 4,000 tons of carbon dioxide annually, thereby significantly contributing to the reduction of air pollution.

Prepared by Milica Vučković

Photograph: Wikimedia/Zoran Cvetković

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SMART GARDENS – A TECHNOLOGICAL RESPONSE TO CLIMATE CHALLENGES IN AGRICULTURE

Photograph: Mihajlo Pupin Institute

Agriculture in Serbia faces significant challenges today. Climate change brings increasingly unpredictable weather conditions, while the average age of the farming population is high, and producers' financial capacity is often limited. Added to this are problems in the organization of procurement and subsidy systems, forcing producers, especially smaller ones, to rely on their own resourcefulness and new knowledge to survive on the market.

In recent years, climate change has revealed its actual impact: prolonged droughts, heavy rainfall, hailstorms, heatwaves, and sudden frosts have become increasingly common occurrences. Traditional farming methods are increasingly unable to secure stable yields, so agriculture is gradually turning to technological solutions that can link nature and science, while at the same time safeguarding the economic interests of producers.

The Mihajlo Pupin Institute, Serbia's leading research organization in the field of technical and technological sciences, has recognized the need to provide farmers with concrete tools to overcome the consequences of climate change. One of its most recent projects is the "Smart Garden" – an integrated system for planned irrigation and drainage of land, particularly suitable for open-field vegetable production.

How Automated Irrigation Is Changing Agriculture

The data clearly show the seriousness of the situation: in Serbia, every second year is a drought year, every third year has excessive rainfall, and only every fifth year falls within the range of the multi-year average. Moreover, rainfall patterns have changed – from March to June, there is more rain than needed, while from July to October, there is a pronounced lack of soil moisture. The "Smart Garden" was designed precisely as a response to such climate extremes.

The basic idea of the system is simple yet powerful: excess water during rainy periods is collected, stored, and utilized during droughts. Beneath the soil surface, a network of drainage pipes gathers water from the root zone of plants and directs it into reservoirs or storage basins. That water is later returned to the crops through a precise drip irrigation system or perforated hoses.

What sets this system apart from conventional solutions is its full automation. The operation of drainage, pumps, and irrigation is managed by a PLC – programmable logic controller connected to sensors for moisture, temperature, and light. Based on the data collected by the sensors, the system itself decides when and how much to irrigate a given sector. An additional advantage of the "Smart Garden" is its energy independence. It is powered by a combination of a 3 kW small solar power plant and a 600 W wind turbine, which provide electricity for all key components – soil sensors, solenoid valves, control units, and water pumps. In this way, the system becomes completely energy independent, without the need for additional power sources from the grid.

There is also the possibility of liquid fertigation – the application of dissolved nutrients directly through the drip irrigation system. Nutrients are thus added in precisely controlled amounts and during the plant growth phases when they are most needed, thereby contributing to optimal growth and higher-quality yields.

The entire system is managed by MobiSun – a device that is at the same time the "brain" of the process. It not only produces electricity from solar panels but also serves as a communication hub, transmitting sensor data remotely to the farmer's computer or mobile application. This allows the user to monitor crop conditions in real time and adjust system parameters even when not physically present in the field. A pilot project carried out in the village of Belegiš, municipality of Stara Pazova, in cooperation with the Institute of Agricultural Economics, showed that such technology delivers tangible results. The system user achieved up to 30 percent higher income on the same land area, thanks to more stable yields and reduced damage from weather extremes.

As emphasized by Prof. Aleksandar Rodić, PhD from the Mihajlo Pupin Institute, the time when smart systems were a luxury has passed – today they are a necessity for anyone who wants stable, economically sustainable, and environmentally responsible production. The "Smart Garden" demonstrates that agriculture in Serbia does not have to be hostage to weather conditions – technology can provide it with security, resilience, and competitiveness.

Prepared by Milena Maglovski

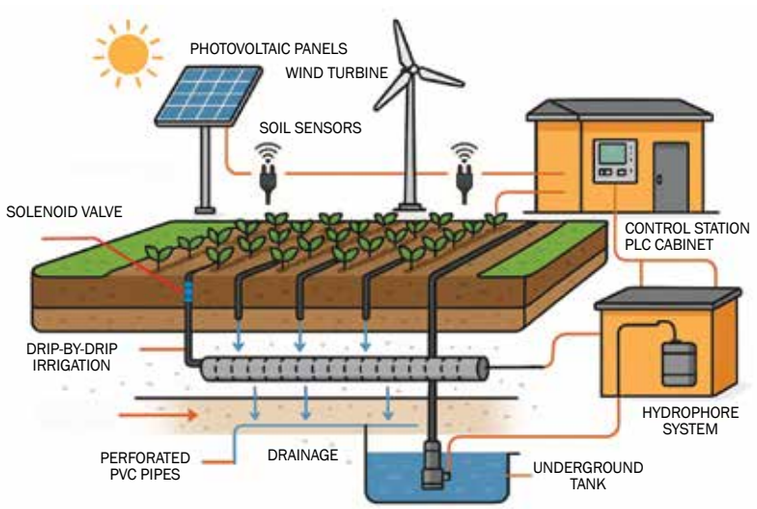

Illustration: Mihajlo Pupin Institute

DANUBE4all – RESTORING DANUBE FLOODPLAINS FOR THE BENEFIT OF NATURE AND PEOPLE

The Danube is much more than a river. It is a link between cultures, a vessel of stories written through history, and a legacy for future generations. Connecting ten countries along its course, it serves as an important route for trade and transport. The river provides water for millions of people, while its beauty is enriched by the diverse array of plant and animal species that inhabit it. Preserving the Danube is of exceptional importance for both nature and people, especially given that today as much as 80 percent of its floodplains are degraded and disconnected from the main watercourses that feed them. As emphasized by Marija M. Smederevac-Lalić from the Institute for Multidisciplinary Research, University of Belgrade, preserving the Danube is not only an environmental issue but also a matter concerning the future of the entire region.

DANUBE4all is a five-year Horizon Europe project that brings together 48 partners and associated partners from 14 European countries, with the goal of restoring freshwater ecosystems in the Danube Basin through the development of a scientifically based yet practical Danube Basin Restoration Action Plan. The project connects science and restoration practices, involving local communities as well as business actors.

– By the end of 2027, all EU member states are required to adopt national restoration action plans, which

Photograph: DANUBE4all

The project also tackles biodiversity loss and the need for nature-based solutions, which can contribute not only to revitalization but also to economic development

is why this project is in the public spotlight, says Marija.

Key ecological challenges addressed by the project include the loss of river connectivity due to damming and watercourse alterations, which lead to ecosystem degradation. The project also tackles biodiversity loss and the need for nature-based solutions, which can contribute not only to revitalization but also to economic development. In this context, Marija notes, the project aims to demonstrate the economic and social benefits of restored ecosystems, supporting long-term efforts for their protection.

– Our Institute for Multidisciplinary Research, University of Belgrade, participates as a partner and leader of the work package focused on the scientific aspects of biodiversity. Our role is to assess the state of biodiversity, primarily using fish as bioindicator species – among the best indicators of aquatic ecosystem health – to highlight shortcomings and propose measures to be implemented for the restoration and protection of aquatic ecosystems in the Danube Basin, Marija explains.

The significance of the project also lies in the fact that concrete restoration measures are being carried out at three locations along the Danube – in the Upper Danube in Austria, the Middle Danube in Hungary, and the Lower Danube in Romania. Before implementing specific hydrotechnical renaturalization works, detailed monitoring was conducted, and after the measures are applied, post-monitoring of aquatic ecosystems will follow to determine the effectiveness of the activities.

According to Marija, Western European countries have realized that urbanization and industrialization have severely endangered river ecosystems and riparian areas.

Besides harming nature, such impacts entail high financial costs. This is why investments are increasingly being directed toward nature-based solutions. These require habitat revitalization and renaturalization, providing an example of how effective measures can contribute to ecosystem sustainability and full use of ecosystem services that support both general and economic well-being.

– I assume that for many, the economic dimension of the project is particularly significant, and this project makes exactly that possible – the economic valorization of conserving and revitalizing natural resources, she adds.

Finally, Marija emphasizes the demonstration site in the Upper Danube in Austria, near Vienna, where partners plan to restore the natural dynamics of the river and its banks. The aim is to enable water to penetrate the floodplain once again and to transform an existing island into a wild one, which, once vegetation develops, will become a habitat for species characteristic of floodplain areas. This example is also important for Serbia, as similar wild islands near Belgrade need to be protected from conversion, urbanization, and industrialization.

The Role of Floodplains in Preserving Nature and Societal Well-Being

Floodplains are among the most valuable natural resources, as they simultaneously provide habitats for numerous species, contribute to maintaining a balanced climate, protect against flooding, and bring direct benefits to people.

Thanks to their unique characteristics, floodplains provide living space for a wide range of microorganisms, plants, insects, amphibians, reptiles, birds, fish, and mammals. As our interviewee pointed out, these

areas can be viewed as "biological supermarkets" because they abound with food used by many animal species. The combination of shallow water, high levels of nutrients, and intensive primary production makes them ideal places for the development of organisms that form the foundation of the food chain. In addition, many species use these

Photographs: DANUBE4all

International Framework for the Protection of Floodplain Habitats

The protection of floodplain and wetland habitats of international importance is regulated by the Ramsar Convention (The Convention on Wetlands). In Serbia, 11 sites of international importance have been designated so far. The importance of these habitat types has also been recognized at the international level through Natura 2000 and Emerald sites, while at the national level, their protection is implemented due to their rarity, sensitivity, and vulnerability. These areas are also covered by other international agreements, such as the Bern and Bonn Conventions, the Convention on Biological Diversity, and the Habitats Directive.

areas for breeding, raising offspring, as shelter, or as permanent habitats. Dead plant matter decomposes in water, creating detritus – fine particles of organic material that feed aquatic insects, mussels, and fish, which in turn serve as food for larger predators.

They also play a crucial role in maintaining global ecological cycles. Organisms found within them participate in the circulation of water, nitrogen, and sulfur. Today, many scientists believe that floodplains and wetlands may also function in maintaining the atmosphere. As our interviewee explained, these areas store carbon, thereby contributing to mitigating the effects of global climate conditions.

Floodplain habitats provide values that no other ecosystem can offer, such as natural improvement of water quality, flood protection, bank erosion control, opportunities for recreation and aesthetic enjoyment, as well as natural products we use. For these reasons, protecting such areas has a positive impact on human health and well-being.

Floodplains act like natural sponges – they retain and gradually release rainwater, melted snow, groundwater, and flood waves. Trees, roots, and riparian vegetation slow down water flow and allow its even distribution, thereby reducing the intensity of flood impact and soil erosion. These areas are significant for cities, as they alleviate extreme climate conditions and reduce the need for costly works such as excavations and the construction of embankments. They are also important for agriculture, as they prevent excessive crop inundation.

Riparian Vegetation and the Role of Humans in Its Preservation

Riparian vegetation depends on climate and river flow characteristics. Since the Danube in Serbia is a typical lowland river, the dominant native vegetation consists of various willow species, white poplar, and black and white alder. However, the riparian zone is often afforested with Canadian poplar – an allochthonous, non-native species that negatively affects wet habitats. The second river terrace, i.e., the next vegetation zone that is flooded for shorter periods, is mainly inhabited by pedunculate oak and narrow-leaved ash.

– Unfortunately, in our country, we could say that all these autochthonous native species are endangered, as entire wetland floodplain habitats are threatened by various anthropogenic influences, says Marija.

In floodplains, logging is unnecessary – nature itself regulates the cycle of nutrients, and human intervention can only cause harm. Citizens should primarily be educated about the ecosystem values and services provided by such habitats. Specific protection measures are often debatable, as in our country, they usually do not yield real results.

– Personally, I react by objecting to field teams, requesting meetings with responsible authorities, and then addressing institutions – both municipal and national – as they are precisely the ones responsible for preserving these areas, Marija explains.

As the best example of civic activism in floodplain protection, our interviewee highlighted the work of the NGO Bela čaplja (White Egret). Sustainable management of floodplains requires a systemic approach, based on science, institutional responsibility, and the active role of citizens.

Prepared by Katarina Vuinac

APPLES AS A SUSTAINABLE ALTERNATIVE TO ANIMAL LEATHER

The world is constantly searching for sustainable solutions. Although it may seem like a modern topic, the debate over the use of leather and fur in fashion and interior design has been ongoing for decades, dating back to the 1970s, when animal rights organizations first began to challenge the ethics of using animal materials. During the 1990s, fashion brands faced protests and campaigns demanding an end to the use of leather and fur, while in the 2000s, the concept of ethical fashion developed, and more brands began switching to synthetic alternatives.

However, since synthetic leather is plastic-based, in recent years the focus has shifted toward plant-based options, which are both ethical and environmentally friendly. Materials made from pineapple, mushrooms, grapes, and apples have been under development since 2015, with commercial use expanding between 2017 and 2020. Today, plant-based leather is seen as a sustainable replacement that simultaneously addresses the issues of animal cruelty and plastic pollution.

Leather – although it cannot truly be called that – can now be produced from numerous alternative

Photograph: Unsplash/Priscilla du Preez

materials. Technically, these are not genuine leather but substitutes that imitate its appearance, texture, and functionality. They are often much more sustainable, cheaper to produce, and ethically acceptable since they do not involve animal products.

One of the most notable examples comes from Denmark. The company Beyond Leather Materials has developed an innovative material called Leap®, a sustainable and vegan alternative to natural leather. Leap is made from apple by-products – specifically, the leftover fibers from juice and cider production. Instead of discarding this biological waste, the company uses it as the base for a new material.

Leather – although it cannot truly be called that – can now be produced from numerous alternative materials

The name Leap comes from the abbreviation LEftover APples, and the raw material also includes natural latex, Tencel fabric, and a protective bio-coating. Leap consists of three layers: a fabric base, an apple layer, and a final protective coating. This creates a texture and look similar to leather, but without the use of animal ingredients or harmful chemicals. More than 85 percent of its composition is bio-based, and each square meter of Leap material prevents 1.8 kg of waste from ending up in landfills.

In a world increasingly oriented toward sustainable solutions, apple waste – the remains from juice or cider pressing, such as peels, stems, and cores – becomes a resource. Globally, around three million tons of this waste (known as apple pomace) are generated annually, most of which is simply discarded. Although biodegradable, its large-scale disposal can have serious consequences: fermentation releases methane, affects soil, and creates additional costs for producers.

The Danish company sees precisely this waste as an opportunity for innovation. After seven years of development, Leap has become a high-quality material that is largely biodegradable, representing a sustainable alternative to animal leather and plasticized materials.

Leap is produced in rolls 1.5 meters wide, which is the industry standard, and has already been tested in the production of fashion accessories, furniture, interiors, and even the automotive industry. A new industrial production line in Germany, with a capacity of over 100,000 square meters per year, marked the company's transition from research to serious production.

Beyond Leather Materials focuses exclusively on B2B cooperation (Business-to-Business), and Leap® is used as a material in industries that traditionally rely on leather, fashion accessories, interiors, furniture, and automotive components.

Interestingly, apple waste is not only useful for producing leather-like materials. It can also be used for generating bioenergy (biogas, bioethanol), extracting organic acids, aromas, antioxidants, and even bioplastics (biopolymers), as well as for producing fiber-rich food. However, Leap demonstrates how waste can be transformed into a high-value product with real market potential, particularly in the clothing and furniture industries, which are known for their high ecological footprint.

While traditional leather and its synthetic variants leave a significant negative impact on the environment, Leap and similar innovative materials change the way we think about waste – not as a problem, but as a resource. It symbolizes a paradigm shift: that it is possible to combine sustainability, functionality, and aesthetics. The material is certified as vegan-friendly, its production requires significantly less water, and it emits far less CO_2 compared to traditional leather. It is adaptable, available directly from stock, and used in a wide range of products.

Leap is an example of how innovation can emerge from leftovers – and how the future of sustainable materials is already arriving in 1.5-meter-wide rolls, made possible by apples.

Prepared by Milica Vučković

Photograph: Unsplash/Kelly Sikkema

THE PRIMEVAL FORESTS OF THE FEDERATION OF BIH AMONG THE FEW IN EUROPE

Primeval forests are one of the most valuable and most sensitive ecosystems on Earth. They absorb large amounts of rainfall, serve as a crucial regulatory core of global climate and biogeochemical processes, and provide a home to a vast number of plant and animal species. Although we most often associate them with tropical regions, primeval forests also exist in temperate areas, including Bosnia and Herzegovina.

Bosnia and Herzegovina is among the few European countries that still have preserved primeval forests and forests of high conservation value – areas where humans have never significantly intervened.

In the territory of the Federation of BiH, there are nine primeval forests, and to highlight their richness and importance, the Forest and Mountain Protected Areas (FEA) published an educational brochure titled Guardians of Biodiversity – Exploring the Primeval Forests of the Federation of BiH and Raising Awareness of the Importance of Their Protection. The project was co-financed by the Environmental Protection Fund of the Federation of BiH.

Lejla Hukić, project coordinator at FEA, emphasized that through this brochure, they want to bring primeval and high conservation value forests closer to the wider public, aiming at a better understanding of how important they are, not only for nature but also for our lives, health, and future.

– The primeval forests in Bosnia and Herzegovina are among the few that have remained almost untouched in Europe, and their preservation is a shared responsibility of us all. In them, nature lives at its own pace, without human influence, and it is

Photographs: FEA

precisely in this untouched balance that their priceless value lies. Through education and awareness-raising, we want to encourage people to recognize this value and to contribute to their protection through their actions, says Hukić.

Complexes such as Ravna Vala, Bobija, Mačen Do, or Crni Vrh prove that nature can survive untouched, but only if we protect it. Their formal designation as protected areas would not only mean the fulfillment of international obligations but also represent an investment in the long-term security, health, and economic development of the country.

According to FEA, all remaining primeval forest complexes in the Federation of BiH could be formally protected through a new forestry law by being placed in the highest international protection category – IUCN Category Ia (Strict Nature Reserve). – Such a status would mean that these areas are recognized as Other Effective Area-based Conservation Measures (OECM), which would include their surface in the total coverage of protected areas in Bosnia and Herzegovina.

Complexes such as Ravna Vala, Bobija, Mačen Do, or Crni Vrh prove that nature can survive untouched, but only if we protect it

In this way, our country would significantly contribute to meeting national and international biodiversity protection goals, particularly those defined by European and global strategies, FEA stated.

The mountain forests of Bosnia and Herzegovina, especially those within the Dinaric mountain system, are distinguished by their high naturalness and the preservation of their ecosystems. Unlike much of Central and Western Europe, where forest ecosystems have been largely altered by human activity, BiH's primeval and high conservation value forests represent an exceptional comparative advantage. Therefore, as the organization stresses, their preservation means protecting one of the last proofs of what European nature looked like before industrialization and mass logging.

The Importance of Primeval Forests

Primeval forests produce about 20 percent of the oxygen we breathe and play a key role in the fight against climate change. They store large amounts of carbon dioxide in their trunks, leaves, and roots, while at the same time absorbing solar radiation and helping regulate temperature. The Amazon rainforest, for example, stores around 48 billion tons of carbon. Primeval forests are home to more than half of the world's plant and animal species. On an area of just 10 km², up to 1,500 species of flowering plants can be found, along with hundreds of other organisms. The Amazon ecosystem, which covers 6.7 million km², contains about 40 percent of the remaining primeval forests, 25 percent of terrestrial biodiversity, and the highest number of freshwater fish species in the world.

Primeval forests also provide resources and jobs for local populations, especially where other opportunities are limited. It is estimated that services such as carbon storage, water regulation, and eco-tourism are worth over 400 million dollars annually for communities in the Brazilian Amazon.

Prepared by Jasna Dragojević

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SMART FARMLAND PROTECTION – AN INNOVATION BY YOUNG PEOPLE FROM MOSTAR

Agriculture is no longer reliant solely on human labor and experience, as technology is increasingly taking over key tasks. Innovations such as autonomous drones enable precise crop monitoring, quicker responses to problems, and more efficient resource management. This approach modernizes everyday work in the fields, eases the burden on farmers, and contributes to higher yields with lower costs.

Such an innovation has been developed by students of the University of Mostar, who launched a technological project set to change the way farmland is protected. It is an autonomous drone that independently monitors crops, with the aim of offering a practical and innovative solution to the problems faced by farmers.

The drones will automatically analyze plant conditions and alert the user to possible diseases, pests, or other risks, thereby increasing yields and reducing losses

The drone is accompanied by a functional application that allows farmers to easily enter and define the monitoring area on their land. The application then connects this data with the drone, which automatically monitors the designated sectors, detects threats such as diseases or intruders, and reports to the user in real time.

Behind the name SkyGuard stands a team of young individuals (Vinko Jakeljić, Vedran Marić, Petar Vladić, Oliver Vujica, Nikola

Photographs: Blaž Perić

Šimunović, Mijo Galić, Mija Sabljić, Magladela Primorac, Antonija Kožul, Juraj Previšić, Ivan Galić, Mate Marić, and Blaž Perić), students of computer science, law, and other fields. This multidisciplinarity enables them to build SkyGuard not only as a technically advanced solution but also as one that is legally and commercially relevant, tailored to the real needs of farmers in the region. Explaining the project for Energy Portal Magazine was project leader Blaž Perić.

– SkyGuard is an innovative system that uses autonomous drones to protect farmland from theft and unauthorized access. The system consists of a drone, a base station, and a web platform that allows users simple management and real-time monitoring. The drones patrol defined routes, utilize advanced AI analytics to detect intruders (people, vehicles, animals), and automatically notify the user of any threat via the application, SMS, or email, according to Perić.

Their goal, as he points out, is for SkyGuard to become more than just a security system.

– The drone is equipped with a standard camera, a night-vision camera, and a thermal camera. Around the farmland, sensors are installed that, upon detecting an intruder, activate the drone, which then automatically takes off from the base, flies to the location, records the area, and sends the footage to the database. If it is an animal, a siren is activated to drive it away, explain the SkyGuard team.

Perić emphasizes that they are actively working on developing functionality that will enable drones to recognize early signs of crop disease and stress by analyzing aerial images. He notes that in this way, farmers can detect problems in the field on time, without the need for expensive and complex sensor networks.

– The drones will automatically analyze plant conditions and alert the user to possible diseases, pests, or other risks, thereby increasing yields and reducing losses. Through this approach, SkyGuard becomes a comprehensive solution for crop security and health, available and simple to use for every farmer, regardless of farm size or technical expertise, he says.

When it comes to the long-term plans of the SkyGuard team, their intention is to expand the system to other agronomic functionalities and adapt it to different types of crops and markets in the region.

So far, they have already achieved notable results in local student competitions. To conclude our conversation, Perić points out that they have another six months of work ahead on developing a business plan, and next year they plan to present the project at the Podim Conference in Maribor.

Prepared by Jasna Dragojević

Drones Are Changing the Way Food Is Grown

Drones in agriculture represent one of the most advanced technologies, enabling more precise, faster, and more efficient crop management. With the help of drones, farmers can monitor plant conditions from the air, detect diseases, pests, and a lack of water or nutrients in time. Equipped with cameras and sensors, drones capture high-quality images and data that assist in making informed decisions. They are also used for the precise application of pesticides and fertilizers, thereby reducing chemical use and harmful effects on the environment. By using drones, productivity increases, resources are saved, and the sustainability of agriculture is improved.

BIRDS OF SERBIA UNDER THREAT FROM CLIMATE CHANGE

All birds have, through evolution, adapted to specific environmental conditions – temperature, precipitation patterns, seasonal changes, and the availability of food. This complex ecological framework that enables their survival is now rapidly being disrupted under the influence of climate change. The increase in average temperature acts like pulling a thread from a carefully woven fabric: once that balance is disturbed, the entire ecological network begins to unravel. To what extent birds in Serbia are affected by these processes, why they are endangered, and whether society sufficiently recognizes the need for their protection was explained to us by Uroš Stojiljković from the Bird Protection and Study Society of Serbia.

– Almost every summer, we witness apocalyptic scenes, and even now, as we speak, images are circulating of the Gruža reservoir, which, due to drought, has reached a record low water level. It is an Important Bird Area (IBA), significant as a migratory corridor and a wintering site for birds, where nearly 200 species have been recorded. This means that breeding birds are left without nesting sites and conditions, food availability decreases, and the physical condition of both parents and chicks is impaired, which is particularly risky for migratory species, says our interlocutor.

He points out that birds, faced with unfavorable changes in their habitats, may attempt to find areas with better conditions. However, this opens a whole new set of challenges — a greater number of individuals are forced to share limited resources, face new competitors and predators, as well as diseases to which they are not adapted.

At the same time, many migratory birds, such as swallows, are arriving earlier each year, which makes them vulnerable to sudden weather changes. Last year, there was a mass

Photographs: Nikola Stevanović

die-off of urban swallows in Vojvodina, caused by a sudden cold spell at the end of summer, for which the young birds were unprepared. Climate disruptions, accompanied by increasingly frequent and destructive extreme events, also leave tragic consequences for other species. White storks are particularly threatened, as their nests on utility poles are exposed to strong winds and storms, resulting in significant losses every year. There are many such examples, and it is difficult to list them all, but they all share the same cause – the destabilization of the natural rhythm on which birds have based their survival for centuries.

Although it is impossible to single out climate change as the only factor behind the disappearance or drastic decline of certain species, it further complicates already existing threats such as poisoning, habitat alteration and loss, poaching, electrocution, and collisions.

For species already endangered, climate change further reduces the chances of recovery

123 Endangered Species in the Red Book of Birds of Serbia

For species already endangered, climate change further reduces the chances of recovery. An illustrative example is the critically endangered eastern imperial eagle, whose population has been slowly recovering over the past eight years thanks to intensive protection measures. However, the adverse effects of climate change on this species are becoming increasingly evident in the field. Old trees suitable for nesting, which are already scarce in Vojvodina, are increasingly perishing due to prolonged droughts, weakening their structure. At the same time, solitary trees are being toppled by strong winds and extreme weather events. Such events directly destroy nests or displace chicks, further endangering an already fragile population.

According to the Red Book of Birds of Serbia, as many as 123 bird species are listed as endangered in one of the categories, which testifies to the scope of the problem we are facing.

In Serbian legislation, there are no explicit provisions pointing to specific measures that need to be applied to preserve natural values, biodiversity, or birds in the context of climate change. – That part of the legislation is clearly lagging behind, as is much else in the field of environmental protection, says our interlocutor.

The Alarming State of Natural Habitats

The condition of natural habitats in Serbia can be most briefly described as alarming. It is the result of a complex interplay of negative influences that together degrade ecosystems. Birds, as some of the most mobile organisms, are often forced to use several different habitat types in a single day, moving from one ecological mosaic to another in search of resources essential for their survival.

Stojiljković adds that the key shift that needs to happen on both the individual and collective level is to start looking at the world from the perspective of biodiversity conservation and to align our actions with it as much as possible. It is a series of actions that may often seem meaningless daily, but we must persevere until they become the new normal.

– Be curious again in exploring the living world around us, because we do not know it, and that is the fundamental prerequisite for being able to protect it. Reduce your own waste production and separate it, compost, plant and water shrubs, trees, and nectar-rich plants in cities, install nesting boxes, feed birds during winter, take part in citizen science projects and broader social movements and organizations that deal with nature and resist the insatiable hunger of the existing system, which is the main generator of the climate crisis and before which nature is disappearing, says Stojiljković.

Prepared by Milena Maglovski

INNOVATIVE MATERIALS:

MORE EFFICIENT PRODUCTION OF GREEN HYDROGEN FROM SUNLIGHT

Illustrations: OpenAI

Hydrogen is increasingly described as the fuel of the future and one of the best solutions for decarbonizing heavy machinery, such as airplanes and ships, where electrification is not easily feasible. However, a degree of caution is needed in this field – not all hydrogen is produced sustainably. There are different types of hydrogen, and the method of its production is crucial for its environmental value.

Grey hydrogen is produced using fossil fuels, most commonly natural gas, and during this process, large amounts of carbon dioxide are released. Blue hydrogen is created in a similar way, but with the application of carbon capture and storage technology. In contrast, green hydrogen is produced using renewable energy and does not pollute the environment.

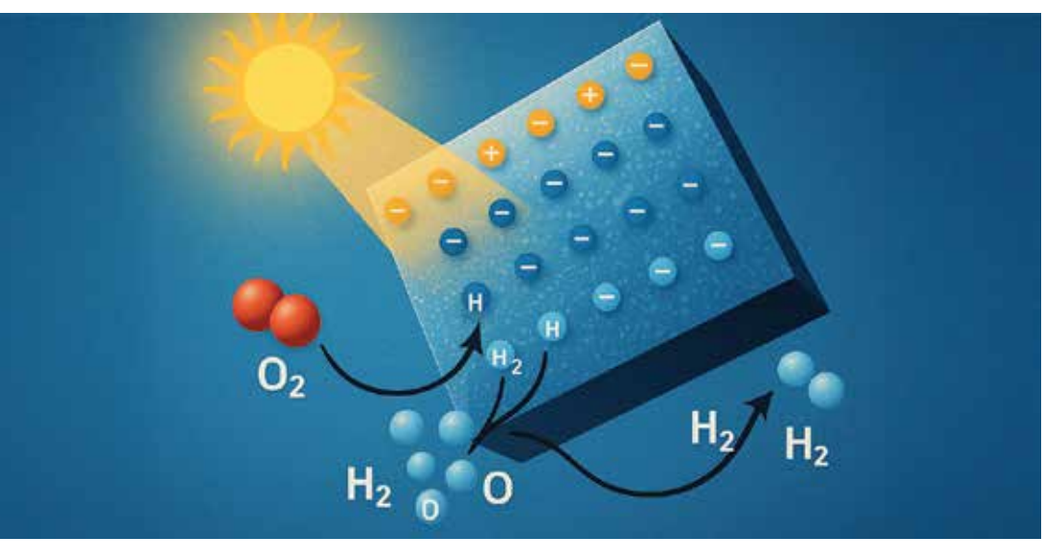
Hydrogen production requires electricity, and if that electricity comes from fossil fuels, the hydrogen itself will carry embedded carbon dioxide emissions. Data published by Linköping University in Sweden show that the production of one ton of grey hydrogen causes emissions of up to ten tons of carbon dioxide. On the other hand, green hydrogen is a sustainable solution. However, its wider use is still limited – precisely because of the challenges of securing sufficient renewable energy at an affordable price.

While the use of renewable energy sources is not new, on a global scale, grey hydrogen still dominates the market. Although renewables are used for hydrogen production, their efficiency is very limited.

A Technological Breakthrough in Green Hydrogen Production

Scientists at Linköping University have devised a new technology that has achieved significant progress in the efficiency of hydrogen production directly from sunlight. The latest technology uses a special three-layer material that harnesses sunlight more effectively to produce hydrogen from water. Compared to previous materials, this innovative material has increased the efficiency of the process by as much as eight times.

The latest technology uses a special three--layer material that harnesses sunlight more effectively to produce hydrogen from water



These three layers are composed of: silicon carbide (3C-SiC), cobalt oxide, and a special catalyst that accelerates the entire process. When sunlight strikes this material, it generates small positive and negative electric charges. These charges split water molecules into hydrogen and oxygen. One of the main challenges in developing such materials is preventing the charges from recombining and thereby canceling out, which would reduce the efficiency of water splitting. The secret of the three-layer combination lies in the fact that the new material successfully prevents charge loss, making the entire process significantly more efficient.

Thanks to the new, more efficient material, it is possible to obtain more hydrogen from the same amount of sunlight, which will directly reduce production costs.

As noted by the University, most materials currently under development have an efficiency between 1 percent and 3 percent. However, for this technology to be commercialized, efficiency must reach 10 percent. Researchers estimate that it will take another five to ten years of work on material improvement to reach that level.

These innovations in hydrogen production come at a crucial moment, as the European Union prepares for major changes in the transport sector. According to university data, from 2035, the production of cars powered by gasoline and diesel will be banned in the EU. As a result, electric motors will become the dominant alternative for this type of vehicle. However, heavy trucks, ships, and airplanes require much larger amounts of energy, and today's batteries are an inefficient solution for them. This is why it is important to develop alternative fuels, and hydrogen has great potential precisely in this field.

Prepared by Katarina Vuinac

RES SERBIA 2025 – FIVE YEARS OF DIALOGUE ON THE ENERGY FUTURE OF THE REGION

The summer of 2025 has been marked by significant progress in the energy sector of Serbia and the region, and its conclusion brings an opportunity to round off the key topics of the energy future, through the largest and now traditional regional conference dedicated to renewable energy sources – RES Serbia.

This year's fifth anniversary edition of the conference will bring together the most important actors of the green energy transition on September 17–18 in Vrdnik. The event is organized by the Renewable Energy Sources of Serbia Association, and will take place at the Vrdnička Kula Ethno Complex, located next to the Fruške Terme hotel, at 34 Staza zdravlja, 22408 Vrdnik, Serbia, in the Vrdnička Kula conference hall.

The conference brings together representatives from state institutions, international organizations, investors, energy companies, and experts from across the region. This year's program will feature as many as eight panel discussions, providing the latest insights and analyses from various areas of the energy transition.

Participants will devote particular attention to key topics for the further development of the renewable energy sector – from the challenges faced by investors, through decarbonization processes and the electrification

Photographs: RES Serbia

of industry, to the digitalization of energy and the integration of new capacities into the grid. Focus will also be placed on battery energy storage as well as on opportunities for financing green projects. The implementation of RES projects will also be discussed, both those awarded in auctions and those that will secure electricity placement through other models.

Financing renewable energy projects will also be one of the highlighted topics, through a dedicated panel featuring representatives of the banking sector. The topic of ESG standards and the role of education as a key prerequisite for the energy transition will be addressed through the expertise of speakers from various fields.

A special part of the program will be a surprise panel, aimed at answering a key question: What currently dominates the renewable energy scene in Serbia?

– The renewable energy sector in Serbia, and indeed in Europe, is facing major uncertainties that surpass all the challenges and situations we have encountered over the past 15 years of working in this field. Our conference will be an opportunity to open some of these issues, to confront reality, and to publicly seek answers to urgent questions. I also believe this will be an occasion for some of our members to publicly announce good news and successes, as has been the case in previous years, said Danijela Isailović, manager of the RES Serbia Association.

This reflects the importance of such conferences, which provide an opportunity for experts from various spheres of society to come together to share knowledge and experience – as well as for the media, which will convey the most important information and conclusions to the wider public.

Among the confirmed speakers are representatives of the Ministry of Mining and Energy, Public Enterprise Elektroprivreda Srbije (EPS), Elektromreža Srbije (EMS), the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), Masdar from the United Arab Emirates, German wind turbine manufacturer Nordex, the Serbian electricity exchange SEEPEX (South East European Power Exchange), Siemens, the Montenegrin Transmission System (CGES), and New Energy Solutions, along with many other important actors on the energy scene. The moderators will include Marijan Rančić, Goran Vukojević, Tamara Bullock, Nenad Jovanović, PhD, Miloš Laković, and Dragoljub Sretenović.

In addition to dynamic panels and expert discussions, participants with registered passes will also enjoy socializing at the RES Serbia Party, held after the first day of the conference, featuring a performance by Igor Simić's band.

This year again, participants will have the chance to take part in exclusive promotional activities from partners, among which BMW – the official vehicle of the conference – stands out. During both days, test drives of the latest luxury electric and hybrid models powered by green energy will be available, further enhancing the atmosphere of innovation and sustainability.

The conference enjoys the support of renowned domestic and international companies and organizations from the energy and infrastructure sectors. The RES Serbia Association emphasizes that its sponsorship clearly demonstrates the importance of synergy between business and institutions in accelerating the green transition and achieving sustainable goals.

Prepared by Katarina Vuinac

TRGOVSKA GORA – A QUARTER CENTURY OF RESISTANCE TO NUCLEAR WASTE

Trgovska Gora is a hilly-mountainous area on the border of Bosnia and Herzegovina and Croatia, which has come into the public spotlight due to Croatia's plans to establish long-term storage facilities for radioactive waste from the Krško nuclear power plant at the Čerkezovac site. This has caused concern among residents over possible adverse effects on human health and the environment, given that the location is only a few kilometers from the River Una and populated areas in BiH.

The issue of Trgovska Gora dates back to 1999, when the Croatian Parliament adopted a decision designating the BiH-Croatia border area as the location for disposing of radioactive waste. Although Croatia initially had four potential sites available in 1997 – Psunj, Papuk, Moslavačka Gora, and Trgovska Gora – the BiH border site was the only one retained.

The Green Team Association has been engaged with the Trgovska Gora case since its founding in 2016, stating that Trgovska Gora is less suitable than the sites that were excluded, a conclusion confirmed by ten PhD experts from BiH.

– Within this case, there are a significant number of complicated segments, but the essence is really quite simple. Two EU member states benefited from the operation of the Krško nuclear power plant, and Croatia intends to push its share of the burden, in the form of radioactive waste, into the border area between Croatia and BiH. It is not neighborly, it is not in line with good practices, it is not fair, and it is not in line with the principles of sustainable development. However, BiH does not possess the same level of leverage as other countries, nor does it have sufficient international influence to resolve this issue at the negotiating table. For that reason, the struggle

Photographs: Green Team Association

When someone intends to build a nuclear facility in an area where there is strong opposition, where there is a very serious history of different conflicts, every time we mention that 39 fish species are being endangered, we get asked whether we have counted how many children will be at risk

has lasted now for more than 25 years, with no clear end in sight, says Mario Crnković, president of the Green Team Association.

What Is Actually Planned

Crnković explains that Croatia intends to form practically two units at Trgovska Gora, referred to publicly as the so-called Radioactive Waste Management Center.

– The first thing they want, which is hardly ever discussed, is the establishment of a central storage site for institutional radioactive waste (IRAW) from Croatia. This would host an entire spectrum of hazardous waste from Croatia, ranging from that generated in science, research, industry, the military, and medicine. In addition, they intend to build a nuclear facility for the long-term storage of low- and intermediate-level radioactive waste from Slovenia, says Crnković.

Distance from the Una River

The entrance to the Čerkezovac barracks complex is located about 800 meters from the River Una, while the storage facilities are just over two kilometers away. The site was chosen so that the storage facilities are actually closer to the center of Novi Grad in BiH than to Dvor, a municipality in Croatia with about 2,000 inhabitants.

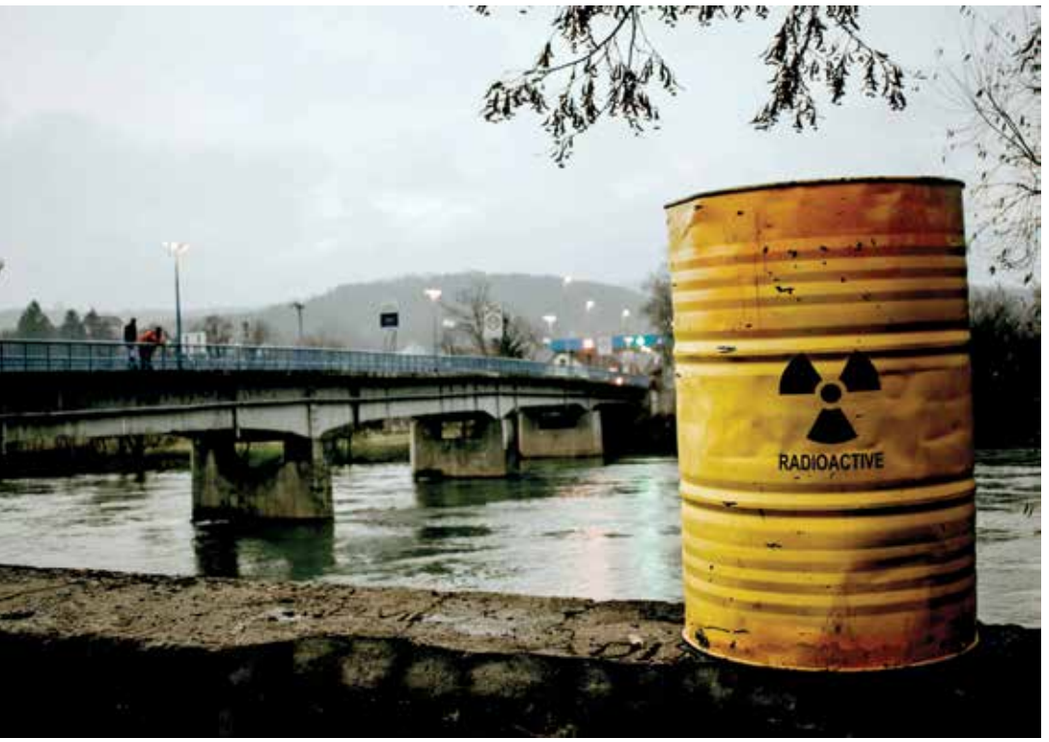
– When you draw a circle around that site, it is evident at first glance that most of the territory falls within BiH. Adding to that the slope of the terrain, groundwater, and prevailing winds, we conclude that this is a clear example of risk transfer to a neighboring country. For this reason, some ecologists have studied the extent to which this could be described as environmental racism, since the overlaps with the theory that explains this phenomenon are more than concerning, says Crnković.

He points out that Trgovska Gora is the primary reason young people are leaving Novi Grad, followed closely by economic and career-related reasons.

There is also the example of the protected area of Una Nature Park, whose development should be based on one of the most beautiful rivers in Europe, but which is now burdened by announcements of possible radioactive and other hazardous waste disposal.

– When it comes to environmental protection, it is difficult even to talk about it, because it falls into the background given the scale of the problem. When someone intends to build a nuclear facility in an area where there is strong opposition, where there is a very serious history of different conflicts, every time we mention that 39 fish species are being endangered, we get asked whether we have counted how many children will be at risk. What we need is harmony between humans and nature, cooperation and sustainable development, and yet someone else's burden is being imposed, one that our children are left to suffer, emphasizes Crnković.

The Green Team Association is now conducting activities in three directions. The first is supporting the activities of the Expert Team of



Young people are the most valuable thing we have, and it is the shared responsibility of all of us to teach them about the importance of responsible relations toward the environment

Bosnia and Herzegovina, while also highlighting the importance of cooperation between institutions and civil society organizations when it comes to issues important to citizens. The second is monitoring the case and acting as a corrective factor.

– The Trgovska Gora case has a significant number of complexities, and given that Croatia is hiding relevant information, it is not rare that information reaches citizens before it reaches institutions in BiH. That is not good, but it is reality, that is the Balkans. That is the attitude of an EU member state toward a country aspiring to become one, says Crnković.

The third direction is preparing and creating materials and activities related to the case, since, as he puts it, "we do not have the luxury of waiting for institutions to act and then basing our comments on whether what they did was good or not."

Given that Croatia has already begun construction work on Trgovska Gora, and that for 25 years they have in no way included the citizens of BiH, preparations are underway to appeal to committees for the implementation of various conventions.

Institutional Contribution

The duration of the Trgovska Gora case over all these years shows that not enough has been done to address the problem. Still, the Green Team points out that, considering the nature of Bosnia and Herzegovina as a state, things are not entirely bleak.

– We have engagements in all segments, but all of them must be far more intensive. We can start with inter-institutional cooperation. We have constructive involvement even from ministries that are not directly responsible for environmental issues, which is excellent and rare to see, regardless of the topic. In this respect, we must be aware that this is a multidisciplinary issue that truly requires joint engagement, and rationally speaking, it is possible to see that there is significant room for the involvement of additional resources relating to the economy, agriculture, public health, and other sectors. There is coordination, there are activities, but the intensity of these activities is still not at the level it needs to be, emphasize Green Team representatives.

In the coming period, the plan is to consolidate and publish all documentation related to the Trgovska Gora case, with the expectation that materials will be available online by autumn.

In this way, they want to make it easier for interested parties to take the first step toward understanding the issue, but also to create space for deeper analysis and the development of expert knowledge in related fields.

– As an organization, we are under heavy pressure; we are giving our best, but I don't know how long we can continue like this. In the remainder of the year, we will devote additional efforts to a systematic approach to working with young people in the field of environmental protection. Young people are the most valuable thing we have, and it is the shared responsibility of all of us to teach them about the importance of responsible relations toward the environment. It is our duty and obligation to do everything in our power to ensure that, at the very least, they do not bear the consequences of our inaction and poor decisions, concludes Crnković.

Prepared by Jasna Dragojević

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