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BRANISLAV NEDIMOVIC
Minister of Agriculture

Forests and Waters Are Our Greatest Treasure

DUSANKA GOLUBOVIC
Mayor of Sombor

Green, Green Grass of Sombor

Prof. BRANKO KOVACEVIC PhD
Prof. NIKOLA RAJAKOVIC PhD

CONFRONTATION
How to Exploit Coal Reserves

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Dear readers,

For the 18th issue of our Magazine, we chose the topic of NATURAL RESOURCES, which was a hot topic this winter. However, I have to admit that record air pollution, not only in Belgrade but also in other cities in Serbia, had a great contribution to this situation. The reasons for this pollution are numerous, but the most important is certainly individual furnaces and thermal power plants. Therefore, we easily chose a topic for the column Confrontation. This time we asked two eminent experts, Professor Branko Kovacevic, PhD, President of the Supervisory Board of Elektroprivreda Srbije EPS (EPS) and Professor at the Department of Power Systems at the Faculty of Electrical Engineering in Belgrade Nikola Rajakovic, PhD, how much coal-fired power plants emit greenhouse gases and thus harm air and health, what to do in our case when coal is the dominant energy source.

In addition to this interesting interview, after exactly two years, we have an interview with a Minister. Considering the topic of this issue, we decided to talk with the Minister of Agriculture, Forestry and Water Management Branislav Nedimovic, about the potential of our agriculture, yields, the fulfilment of forestry plans and whether the new law is being drafted which will allow GM food market.

Professor Dejan Ivezic, PhD, the Head of the Department of General Mechanical Engineering and Thermodynamics at the Faculty of Mining and Geology in Belgrade, wrote an opinion on the development of energetics in Serbia. No matter how the energy industry of Serbia develops, the maximum valorisation of renewable energy sources should be given priority; the professor pointed out.

Perhaps romantic barouche, rich history and cultural heritage may be the main reasons why Sombor exudes charm. Still, we must not forget the lush greenery due to which locals call it Greentown. The city government is also green, led by their Mayor Dusanka Golubovic, from whom we found out first-hand what the priorities of this municipality are when it comes to ecology, how to maintain communal order and keep the water, land and air clean, what the significance of the project for electricity production from wastewater, which is coming to an end, is and what is expected from the regional waste management centre whose construction is about to start.

Two domestic companies founded by young enthusiasts – Fresh Agriculture Technologies and Donorum – are focused on food. The first helps growers increase their yields; the second is humanitarian and works to combat food waste. Both have combined their economic and environmental components in their business but differently. What this is all about, you can find out in this issue.

How UNDP helps Montenegro develop low-carbon tourism and sustainable transport was revealed to us by Tomica Paovic, the head of the Program for Democratic Governance, Economy and the Environment. He also told us how he expects urban mobility to develop in this part of Europe and due to which obstacles, it is going slower than in other countries.

In addition to Montenegro, we have a story from Croatia. Jelena Jankovic shared with us the experiences of the Women's Association of Vukovar, as well as current projects on which they are working hard.

Many interesting stories we have prepared for you, so don't hold back. Not only did we enjoy working on them, but also came up with new and useful insights, and we hope you will!

Nevena Djukic,
Editor in Chief

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The Minister of Agriculture, Forestry and Water Management

Agriculture is One of the Main Pillars of the Serbian Economy

"We increase subsidies every year to raise processing capacities, which are measured in tens of millions of euros, regardless of whether it is the processing of fruit, vegetables or meat. I believe that the results will be getting increasingly better since it takes time for the agriculture to return to solid ground where it once was. Although one can always do better, I am personally to a great extent quite pleased with the direction we are taking," says Branislav Nedimovic, the Minister of Agriculture.

18 DUSANKA GOLUBOVIC

The Mayor of Sombor

We Treasure the Image of the Green City

Wastewaters have been treated since 1964 in Sombor, and biogas from the purifier, which was put into operation in 1986, was used for heating the buildings within the plant. Soon the biogas plant will be powered by a gas generator which will produce electricity. The Mayor of Sombor announces the construction of a Regional Waste Management Centre. According to the data from last year, the number of trees planted in Sombor exceeded the number of trees that had to be cut down due to old age. This is just a small insight into how the city government strives to preserve Sombor's recognition on the eco-city map.

IN THIS ISSUE »»

Photographs: (Nedimovic) courtesy of Branislav Nedimovic; (Golubovic) courtesy of Dusanka Golubovic

Photographs: (Paovic) courtesy of Tomica Paovic; (Ivezic) courtesy of Dejan Ivezic

FORESTS AND WATERS ARE OUR GREATEST TREASURE

We talked to Branislav Nedimovic, the Minister of Agriculture, Forestry and Water Management of the Republic of Serbia about the greatest potentials of Serbian agriculture, how to mitigate the effects of climate change and increase the yields, whether a new law to allow the circulation of genetically modified food is being prepared and whether we will meet the plan by 2050 to have 40 per cent of land under forest

Agriculture is most certainly one of the main pillars of the Serbian economy and any progress it records directly reflects the overall economic growth of our country. However, given that it has borne the brunt of severe economic and political crisis for decades, the key links in the production chain have been broken, especially the processing part which is primary for agrarian recovery. "This is why we increase subsidies every year to raise processing capacities, which are measured in tens of millions of euros, regardless of whether it is the processing of fruit, vegetables or meat. I believe that the results will be getting increasingly better since it takes time for the agriculture to return to solid ground where it once was. Although one can always do better, I am personally to a great extent quite pleased with the direction we are taking," says Branislav Nedimovic, the Minister of Agriculture, Forestry and Water Management at the beginning of the interview for Energy portal.

EP ***Climate change is widely felt in our country, particularly affecting agriculture as the periods of major droughts and floods follow one after another. Is there a national plan for adaptation to changed climate conditions and what concrete measures have been taken so far to mitigate the effects of global warming?***

Branislav Nedimovic The Ministry of Agriculture in co-operation with other institutions, developed the document on the impact of climate change on agriculture and prepared the list of proposals for adaptation measures. The first version was developed in 2015 and the second one in 2019. Part of the measures, such as anti-hail nets and irri-

Photographs: Marina Stancevic; (on the next page, Nedimovic) courtesy of Branislav Nedimovic

BRANISLAV NEDIMOVIC is a law graduate who was the mayor of Sremska Mitrovica, his hometown, for two terms. The first time when he was elected in 2008, he was the youngest mayor in the country. He has been the Minister of Agriculture, Forestry and Water Management since 2016. He is also the Vice President of the Board of Directors of the National Alliance for Local Economic Development.

gation systems, are subsidised by the Ministry through its annual programs, as well as loans for them. In terms of mitigation, harmonisation of legislation with the European Union and IPARD funds lead to it and help reduce agricultural emissions.

EP ***Our farmers do a lot of fruit-growing, but the yields are destroyed by hail every year in some parts of the country. In December last year, the first automatic anti-hail system which covers 13 municipalities was launched near Valjevo. What effects are expected in the first year of operation of this system, how many of those systems do we need across Serbia, and when will we purchase them?***

Branislav Nedimovic Since December, the automated defence system from hail has been fully operational on the territory of Valjevo radar centre, which covers the Macvan-Kolubara district, without the municipality of Ljig and with the municipality of Obrenovac. The system was put into operation in phases during 2019, and the fact is that minimal damage caused by hail was recorded the same year on this territory. The efficiency of this system of protection against hail is 70 per cent. There are 13 radar centres in Serbia, and 600 million dinars from the budget of the Ministry for 2020 has been allocated for the automation of the Uzice and Bukulja centres. The budget of Autonomous Province of Vojvodina envisages the modernisation of Fruska gora, Bajsa and Samos radar centres. It should be emphasised that through modernisation of the hail defence system, support in the construction of safety nets and subsidisation of insurance, farmers are provided with the maximum possible protection against this disaster.

EP ***The production and buying and selling of genetically modified food in Serbia are forbidden by the Law. However, we can still often hear that we have thousands of acres under GM soybeans, and that, despite the law and border checks, we import products that even exceed 0.9 per cent of GM ingredients. To what extent is this Law implemented and how much does the recently opened National Food Safety Laboratory help?***

Branislav Nedimovic Each shipment that enters our country is the subject of inspection and testing, thus in this respect inspections carry out absolute controls, which means that on our domestic market only GMO-free products can be found. In case that, it is established at the border that goods contain in any respect higher values than allowed, then the destruction or return of the shipment shall be carried out. According to the Law on Genetically Modified Organisms, testing of GMOs and products from GMOs to identify and quantify genetic modification in them is performed by authorised and accredited laboratories which we currently have five. They, for the needs of the Ministry of Agriculture, carry out testing of samples of plants and plant products to identify and quantify genetic modification in the tested sample.

EP ***Do you, as a citizen, buy products from the shelves without thinking or you read declarations carefully? Are you filled with apprehension concerning GM food?***

Branislav Nedimovic In this regard, I have no fear when shopping.

EP ***How much truth is there in the announcement of a part of the expert public that the Government of Serbia is preparing a Law that will allow GM food on the market? This topic can be heard very often in the media...***

Branislav Nedimovic We are not preparing it. We have a clear applicable law.

EP ***Water is one of the greatest natural resources of Serbia. However, many rivers are polluted, sources of drinking water, which are not inexhaustible resources, are exploited mainly by foreign companies, and our hydro potential, which is above the European average, is insufficiently utilised, which is why we import electricity. Which of these three issues is your Ministry most focused on and what measures do you take to preserve Serbia's water resources and use them responsibly?***

Branislav Nedimovic Waters are natural resources and owned by the Republic of Serbia and as such cannot be alienated. The Water law lays down appropriate obligations regarding the use, protection and abstraction of drinking water. The Ministry is committed to water protection from the pollution which is reflected in the preparation of regulations and strategic and planning documents (laws and regulations in the field of water, water management strategy, water management plan and others), on the one hand, but also the implementation of these regulations through measures for construction and reconstruction of facilities for collecting and treatment of municipal wastewater in residential areas, implementation of good agricultural practice rules and undertaking of agrotechnical and other measures, as well as implementing all other necessary measures to protect the waters from the pollution. It should be borne in mind that these measures not only require large investments which involve billions of euros but also take time from two to three decades in order to be fully implemented. To implement the enacted measures, the Ministry of Agriculture, Forestry and Water Management from the funds of Budget Water Fund of the Republic of Serbia in accordance with the Regulation on Determining Water Management Program, adopted by the Government for each calendar year, co-finances the construction and reconstruction of water facilities for collection, removal and treatment of wastewaters, as follows: the main collectors, wastewater treatment plants and wastewater collectors, as well as the preparation of technical documentation for these water facilities.

EP ***How do we manage forests as our natural resource?***

Branislav Nedimovic Forests in Serbia are managed on the principle of sustainability, which involves managing and using forests and forest land in such a way and to such

Photographs: (middle) Goran Djordjevic; (bottom) Nikola Vasilic

Photographs: (top) courtesy of Branislav Nedimovic; (right) Goran Jordanski

an extent that biodiversity is preserved, and on the other hand, to meet the relevant environmental, economic and social needs of today and future generations without endangering or damaging any other ecosystem. Forest management in Serbia is carried out in accordance with the Forestry Development Strategy, as the basic strategic document in the forestry sector, and in accordance with the Forest Law, adopted in 2010.

For all forests in Serbia, whether state-owned or privately owned, planning documents are prepared based on which management is carried out. State forests are managed by public enterprises, and private forests are managed by their owners. The state, as the enactor of the Forest Law, monitors its implementation through the Forestry and Hunting Inspection of the Republic of Serbia, which equally monitors the implementation of the Law in both state and private forests.

What are we particularly proud of is the fact that the volume of illegal activities is decreasing year after year, and that the activities that we, as the Ministry, carry out have a great influence on this. Those activities primarily consist of the implementation of preventive measures, and if required by individual cases, even of punitive measures following the Law.

EP ***How close are we to achieving the strategy of getting from the current 30 per cent covered with forests to 42 per cent by 2050?***

Branislav Nedimovic According to the data from the National Forest Inventory, carried out in 2004-2006, forest cover in Serbia is 29.1 per cent. However, it should be pointed out that in Serbia we have municipalities like Majdanpek, with about 70 per cent of forest cover, and on the other hand KIkinda with 0.5 per cent. Perhaps it is not necessary to talk about forest cover at the national level but to focus more on increasing the forest cover of the municipalities with the smallest area covered with forest. These are mostly municipalities in Autonomous Province of Vojvodina. A project funded by the Global Environment Facility is currently being implemented, under which a new National Forest Inventory is being carried out.

What we can expect is that the forest cover will certainly be above 30 per cent due to the raising of new forests. The Ministry of Agriculture, Forestry and Water Management, through the Forest Fund of Serbia, annually allocates funds for afforestation of state forests and private plots. Only in 2019, the funds of this fund intended for afforestation amounted to 80,000,000 dinars, while 90,000,000 of dinars are planned in 2020 90,000,000 of dinars are planned.

Interview by: Tamara Zjacic

A NEW SMART AND SAFE WAY TO MONITOR POWERTRAIN EQUIPMENT IN HAZARDOUS AREAS

Operators can carry out remote real-time health checks on powertrain equipment in hazardous areas with ABB Ability™ Smart Sensors that offer improved analytics, functionality and communications.

ABB will launch its Smart Sensor for rotating machines operating in hazardous areas at Hannover Messe 2020, the leading international technology fair. It further extends the existing scope of applications for ABB Smart Sensors with a new generation design for powertrains in hazardous areas. Chemical and oil and gas customers can now benefit from cost-efficient condition monitoring in a wide variety of applications.

The wireless smart sensor monitors key parameters to provide detailed insights into the performance and health

of assets such as motors and pumps. Equipment installed in difficult or dangerous to access locations can be safely monitored from a distance. Combining connectivity and data analytics means operators can plan their maintenance activities in advance, reduce downtime and extend equipment lifetime.

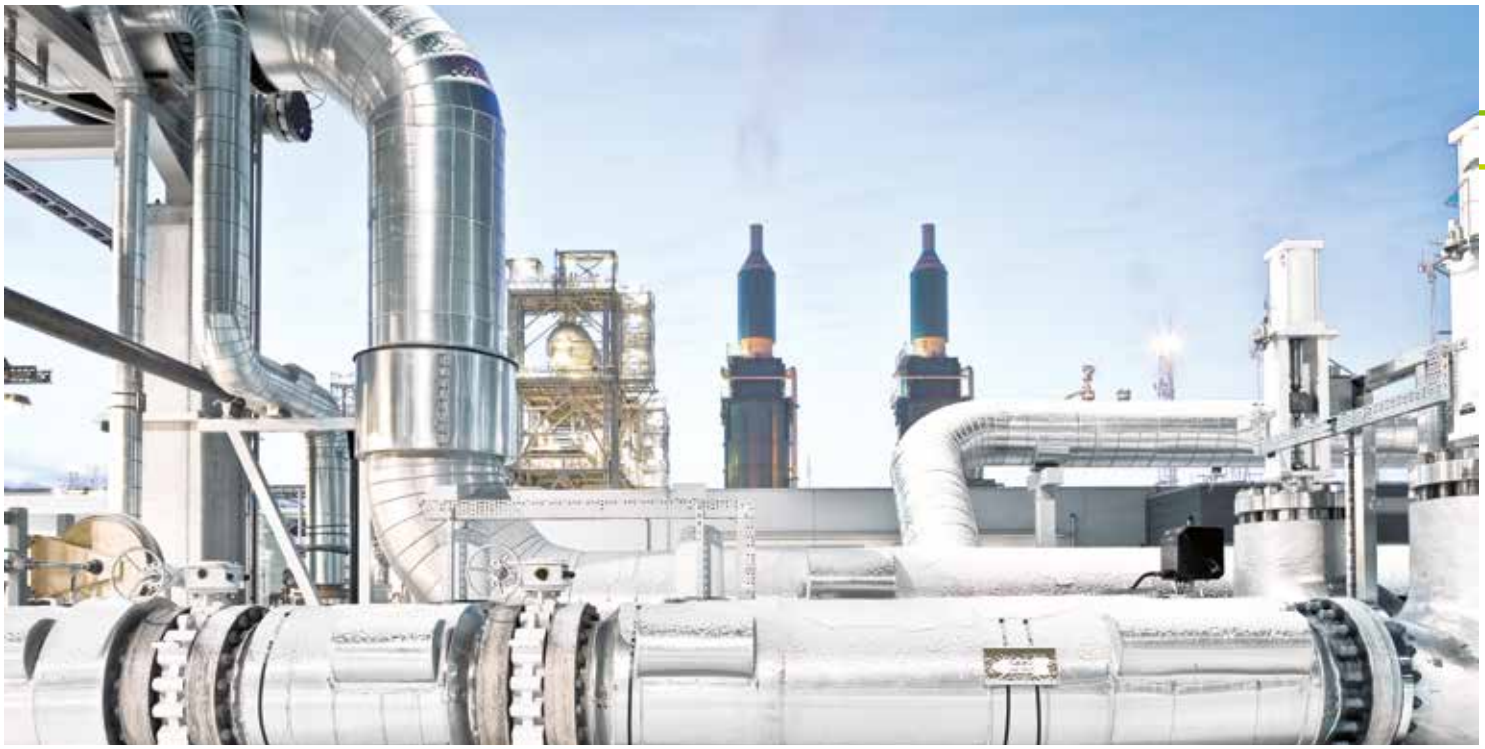
"Our new generation of smart sensors provide high quality data to enable ABB's advanced analytics to be used in hazardous areas," says Teijo Kärnä, Global Product Manager, ABB Ability™ Smart Sensor. "These smart sensors are more sensitive which allows customers to see problems earlier. They also offer more monitoring capabilities, a broader communication range and exceptional battery life."

This sensor offers a battery life of up to three times longer than most competing designs. It is sealed for life, with an IP66/67 rating, and can be mounted directly to the equipment in a matter of minutes using a simple mounting bracket.

The sensor communicates with smartphones, tablets, PCs and plant gateways using low energy Bluetooth or WirelessHART. A new antenna design has extended its range by a factor of three to four, meaning that reliable communication over distances of a few hundred meters (line of sight) is now possible.

Another crucial upgrade is that the sensors have greater sensitivity to small changes in the condition of the equipment, including advanced warning of bearing damage. This capability to generate a much wider range of data is matched with state of the art integrated electronics that incorporate advanced algorithms based on ABB's vast experience in electric motors. This helps operators and maintenance teams produce insightful information to predict potential failure, enabling remedial action to be taken before a breakdown occurs.

The Smart Sensor is currently completing certification for hazardous areas - ATEX, IECEx and NEC. Other certificates will follow over the coming year.



Photographs: ABB

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MULTI-PURPOSE ENAMELLED TANKS OF EXCELLENT RESISTANCE

Having heard that one company was established in 1828 and that 85 per cent of their products are exported worldwide, these are the credible facts. The company we talk about is Witkowitz, the famous Czech corporation, which apart from inheriting almost two centuries long tradition, has a new look. One of the companies it includes that today holds a name of Witkowitz ENVI delivers its products to dynamically developing markets related to the protection of water resource and other environmental projects. Their production program base consists of large capacity tanks made of enamelled, stainless and comaxite* sheets. The experienced team is responsible for design, manufacture, installation and maintenance of wastewater treatment plants (WWTP), biogas station and liquid fertilizer warehouses, as technological units based on their tanks. Although metalwork is a legacy of the parent company, the comeback to the industrial scene has occurred with the intense development of technology in the second half of 20th century, which had resulted in changes in all spheres of life. However, those changes haven't brought only well-being, but they left huge vestige when it comes to pollution in nature, lack of drinking water and an enormous increase in waste quantity. Meanwhile, the need for energy, especially for the quality and clean one, has been multiplied. As a response to these demands, being imposed by a different strategical development, the production programme was made, and Witkowitz ENVI covers it from 1966 when they became a new member of the company. Enamelled tanks from this factory have become a synonym for success and base for gradual adoption of present-day technological solutions in fields of wastewater treatment, storing biological waste and manure, and eventually in the field of biogas production and electricity generation. With Vladimir Sitta, the general manager and chairman of the Witkowitz ENVI A.S. Board, we talked about the technological solutions made by this company.

JUDr. VLADIMIR SITTA MBA has been managing industrial companies for more than 25 years. He got his bachelor and postgraduate degrees at several universities in the Czech Republic, Poland and the United Kingdom, where he studied international law, international business, crisis management and strategic business management. In 2016 he became a member of management at engineering holding group Vitkovice Machinery and had successfully worked on its reconstruction. He is now CEO and the chairman of the board.

EP ***On account of a rather long history in the field of metallurgy, and because of modern-day demands for environmental protection, you established the production of tanks made of enamelled sheets which for decades have been the strategic product. What is their scope of us and what industry are they mostly used in?***

Vladimir Sitta Sheets enamelling is done at the temperatures above 800 °C, where the surface of the steel is covered with a double layer of melted glass. The long-lasting protection of the surface of the steel is achieved this way, and enamelled tanks hold water just as drinking glass does. When it comes to quality, this is the unexcelled way of storing water and many other aggressive fluids and materials. That is the exact thing that ensured the good place of enamelled sheets at the market.

We have been into this business for more than 50 years, so it is no wonder that more than 10.000 tanks with our old and new logos can be seen throughout the world.

Above-ground tanks covered with glass have the broad-spectrum usage and can be applied in agriculture, industry, water management and energy sector. Our tanks and silos can contain liquid and bulk materials. High variability of design enables simple fitting of additional equipment into a currently wide-spread, above mentioned technology units. Aside from storing drinking and wastewater, sludge and rainwater, the tanks are designed to hold body fluids from cattle, pigs, and various industrial water, for suspension, silage, haylage etc. They are suitable for storing lime, cement, ash, biomass, gravel, salt, soot and other materials.

EP ***What companies already use the Witkowitz above-ground tanks in Europe and the world?***

Vladimir Sitta We make deliveries directly to end buyers too. Still, the majority of plants are built as a result of long-term cooperation with the multinational companies which try to solve problems with drinking water shortage or wa-

Photographs: Witkowitz

stewater treatment in all continents. Some of our clients are VEOLIA, SUEZ, SYMBIONA, AES Arabia, AQUARIUS, Tank Team, Gruppo Asham, Nijhuis Ind, Monostore, Agrofert, Hydrotech etc. On our web site, there is an interactive map where thousands of locations can be found where those projects were implemented. Also, visitors may see at our web site photo-documentation for certain facilities. A few hundred of water tanks were installed only in Arab states. However, a great number of them were implemented in Mexico, Malesia, north Africa, China, Spain, Poland, Russia, France, Bulgaria and Croatia. So, you can find our tanks from Vladivostok to Chile. Precisely in the Chilean town of Osorno is where our most distant reference is situated. This place and the Witkowitz region, where our production is located, are 13,407 km apart from each other.

EP ***What is the most significant comparative advantage of your products in relation to the existing offer at the market?***

Vladimir Sitta The construction of the tank is made of prefabricated elements, which ensures very fast assembling, and along with that, an optimal time for completing the whole project. Transportation of disassembled tank is very easy and simple since all is packed in pallets and containers. It takes a rather small surface for building a tank, which generally consists of a belt 1.5 m wide around the tank. In comparison to a concrete tank, those we make have a small weight. Also, it is easy to inspect the tank after installation and during testing. Machinery isn't required to build these tanks. Just a forklift or crane is needed. Occasionally, there is a necessity of crane for installing special roof. Mounting is done by using our technology for lifting from the foundation, which means that works are carried through from a ground level and having avoided almost entirely operations at altitude. That diminishes the risk of injuries at the construction site. The tank design can be adjusted to the installati-

Holding WITKOWITZ comprises 9 companies, including Witkowitz ENVI. Industrial tradition is renewed under the brand Witkowitz which stands for synergy of unique knowledge, human skills, technological know-how and international experience. Witkowitz is a brand of unique mechanical engineering solutions: large-size forgings made of special alloys, complex gearboxes, pressure tanks or heavy-duty steel structures. They can be found, for example, in the form of bridges; as a part of ship engines, industrial installations or hydro, wind and nuclear power plants operating with renewable energy sources. The return to the Witkowitz brand is not just a tribute to its 190-year history. It symbolizes a new beginning that benefits from the unique know-how, technological skills, production program transformation and the company's new vision. It includes its engineering and complete production with high added value.

on of technological equipment such as pumps, mixers etc. The tank modification, reassembling due to breakdown or relocation is done very quickly. It is also uncomplicated to repair the damaged tank parts, and it is quick and cheap to disassemble the tank. After the expiry date, the tank can be recycled – material can be sold as a steel waste, unlike concrete which remains as a ruin. We have a lot of experience with tank installation throughout the world and in various extreme conditions. The fusion of glass and steel is achieved by their melting at high temperatures, which makes these tanks very durable. The planned operating life of the tank is at least 30 years, and some of them were in use for more than 40 years. Tanks are highly resistant so suitable for storage of even very aggressive substances, in comparison to concrete or tanks made of plasticized steel sheets. Enamelled steel tanks are resistant even in extreme marine conditions. Enamel is resistant to most bases, acids and organic solvents, and it stays unaffected by substances from different emissions. They can be used for all the contents with 3-12 pH value. There is no need for the repainting of the tank. The surface is impervious to all abrasive materials with hardness less than 6 or 7 (glass is 7). It is not possible to scratch the surface with a metal object (knife or other tool steel), and unwanted graffiti and spray paints are easily removed from enamelled surface too.

EP ***Since these enamelled tans can hold drinking and seawater, and different kind of wastewater too, it isn't unusual that your offer contains also wastewater treatment plants. What are the biggest benefits of this technology?***

Vladimir Sitta Since we established the production of enamelled tanks, the development of society and increase in need of wastewater treatment plants have led to massive construction of wastewater treatment plants near the cities. We were developing our systems for water treatment for years, such as Hydrovit, but today the WWTP design is always adjusted to the client's needs. We have our design team and installers for fieldwork. The base of the WWTP used to be triple (or double) biological tank which consisted of enamelled sheet tanks placed concentrically: sludge tank, tank for activation and tank for deposition. Tank for activation was technologically used in the process of pre-denitrification (D-N) or sludge regeneration (R-D-N), as process variations during nitrogen removal. Computer-controlled aeration was used for air ventilation of the tank. It is the finest bubbles aeration which ensures high efficiency and low working costs. The new millennium has brought new rules. Design now follows investors' demands and local needs for technology, and to the extent imposed by production processes and available materials. Aside for above mentioned, plants can have line production and multi-lines production, and they can not only provide water treatment but they also frequently include sludge to energy treatment.

EP ***What happens to sludge which remains as a by-product after treatment?***

Vladimir Sitta Sludge coming from WWTP is today's topical issue. Sludge treatment options depend on relevant national regulations. There has been a tendency in the European Union for the past few years to tightening of regulations concerning sludge treatment. In the Czech Republic, typically in WWTP for up to 50.000 EO sludge that is formed in deposition chamber (in front of WWTP) and excess of sludge from secondary depository are taken to the reservoir where they get mixed and stabilized so that free biological decomposition can be prevented. A solid and fluid fraction is separated, a watery element is returned to the

treatment process, whereas the solid part after being sanitized and condensed is scattered in fields as manure. Also, sludges from big WWTPs (above 50.000 PE) after being processed are taken to landfills. In the past few years, there has been an increase in the number of sludge incineration plants (for sludge drying, firing, etc.). After being dried and processed, a mass can be added then as an aggregate to concrete (in the form of granules), can be used as fuel in cement plants and blast furnaces, or added as manure (after being grounded). Sludge is always processed or disposed of according to existing regulations, and it is logic to further optimize its treatment process to reduce the costs. In the EU there are several different norms and solutions. Many countries in the EU are committed to removing hard metals and antibiotics from sludge, while a lot of countries have the obligation to incinerate sludge completely. Criteria will be even tighter!

EP ***Aside from communities, can WWTP be used in factories which spend a lot of water in their production programs that eventually result in contaminating that water?***

Vladimir Sitta Absolutely. There has been an increasing trend towards building industrial WWTP that are always interesting technological projects. This system can be used, apart from the utility sector, in treatment of wastewater coming from slaughterhouses, breweries, dairy industry, sugar refineries, juice factories, as well as in the treatment of other impurities from the food industry. Factories need to solve the problem with wastewater originated in their production systems, but often it happens that they have material for establishing new technological plant – biogas station.

EP ***How much are operational costs in such biogas station and is it easy to manage its technological process?***

Vladimir Sitta There is no simple answer to this question. The investment costs for building biogas station are relati-

BIOGAS PLANTS WITH WET PROCESS OF DIGESTION

The solution which in the best way eliminates waste from agricultural production, providing in return much needed electric and heat energy, as well as natural gas, is a biogas power plant. New time imposes a need for efficient waste disposal and new energy, so biogas power plant emerged in the product range of the company Witkowitz ENVI.

"Our biogas stations work on the principle of wet fermentation. They use one degree or two degrees system of mesophilic or thermophilic anaerobic fermentation with continuous work. We have solution both for agricultural, namely waste stations for biogas, and for sludge to energy process from municipal WWTP. We offer optimal technological solutions for specific material input program. Primarily, it is the place where heat and electric energy is produced. At the same time, that is a modern solution for purposeful elimination of waste. Let's not forget production of biomethane, namely biogas that is purified to the quality of natural gas", says manager Vladimir Sitta and adds that they have experienced personnel and teams in fields of design and technology as well as in areas of construction and implementation.

"So, we are getting back to our enamelled tank that is also the base element of this technology. The basis of the biogas station are fermenters – designated tanks made of enamelled sheets from our production. All the construction phases are remarkably fast and efficient, and the most biogas station we built in the Czech Republic and Poland, but also in China and other faraway countries."

From the very beginning, the Witkowitz ENVI a.s. company works with their customers on setting the goals and finding the optimal solution for biogas stations. The owners (farmers, factories, etc.) who buy this biogas technology have mostly these several objectives:

- **stabilisation of animal excrements and reduction of odour;**
- **organic waste to energy usage.**
- **environmentally friendly production of electric and heat energy;**
- **reduction of the company's energy costs;**
- **high-quality organic manure production;**
- **closed loop for better of soil fertility;**
- **reduction of dependency on fossil fuels and reduction of greenhouse gas emissions;**
- **more activities and income sources for farmers and rural areas;**
- **higher competitiveness by waste reduction and energy production.**

vely high. In this instance, they depend on material which is going to be processed in biogas station, as well as from capacity needed for biogas production and its further stage of processing into biomethane. However, since biogas falls into renewable energy sources (RES), most of the countries have their own or regional subsidy policy for that matter. So, the overall investment and the faster return of an investment will depend on this policy and the nature of the problem this station solves. Biogas station management requires trained operators, and naturally, we train them to be able to continue independently with their work. It should be stressed that today's electricity generated from RES is very interesting merchandise on the energy market and that considerable added value has been created on the

stock exchange with clean energy trading. Several high-tech companies and modernized communities in economically developed countries have chosen precisely the use of clean energy as a pillar of their business, so this is one of the factors that in Serbia could also be of importance.

EP ***By raise in animal production, the amount of material for power plant increases too. Do you have a solution to that situation?***

Vladimir Sitta This question is related to local growth of the relevant production and state policy. The Czech Republic, upon becoming a member of EU, for many years was registering growth in this industry, while for the past few years, the ongoing fall has been evident. The present situation in the Czech Republic isn't as much favourable as before, but we have more than 650 biogas stations and a long history of their constructions. Each investor, and in best scenario precisely the farmer, who decides to build biogas plant, must have his sources of material input or by contract secured supply of needed inputs. The kind of material inputs is determined by biogas station technology, and every local market features different prices of electricity, waste, animal feed etc.

EP ***There are 30 MW installed in biogas plants for electricity production in Serbia whose owners hold a status of either temporary or permanent privileged producer of electricity. Naturally, the plants generate electricity for consumption at farms. It might be the biggest potential for implementation of biogas stations.***

Vladimir Sitta Certainly. However, it is of high importance to have an in-depth knowledge of Serbian subsidy policy, as well as the system of buying electricity from RES. In case the additional biomass is needed, it is good to know if the establishing plantation for biomass growing pays off. Every country has its reality of optimization and subsidiary budget. In practice, usually, there is a problem with heat energy use. To get subsidy, a new biogas station in EU must use up to 100 per cent of generated heat energy. And that is where our company Witkowitz ENVI comes in. We also offer a technology that turns excess of heat energy into electricity. Our expertise revolves around biogas usage issues, and we have vast experience in this field. It is also necessary to know the relevant price policy, to ensure subsidies and then implement a certain project.

EP ***What is the reduction of CO_2 emission if biogas is used for electricity production instead of fossil fuels?***

Vladimir Sitta Anaerobic digestion makes 25-45 per cent of carbon-dioxide, which depends on the quality of the anaerobic process. Still, the CO_2 generation is a natural part of the biogas process too. Later, during the biogas incineration, carbon-monoxide and carbon-dioxide are again produced, but not to the extent as with fossil fuels. The additional advantage is also that no particles are produced during the process of biogas burning. From this point of view, the results aren't that much significant, and it is rather interesting to look upon it taking into the account methane generation, which in these raw materials would emerge naturally. In contrast, we produce it and by controlled incineration, we generate heat and electric energy for further usage at the site and sell. And methane is the biggest factor of the ozone depletion.

Interview by: Tamara Zjacic

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GREEN, GREEN GRASS OF SOMBOR

It is not just the hackberries and yew trees that are the green symbol of Sombor given that the environmental standards and clean technology are also being more and more applied in the industry and communal life in this municipality. How far ahead the Sombor citizens are regarding the strategy of sustainable development and how it affects their life, as well as the Sombor's tourism and economic potential, we are discussing with the Mayor of Sombor Dusanka Golubovic.

Everyone who visits Sombor remembers this city by its greenery. Still, those who spend a little more time in the company of Somborians will realise that when it comes to lifestyle and environmental protection, the residents of this municipality think green. So does their city administration, led by the Mayor Dusanka Golubovic, from whom we learn firsthand what the priorities of this municipality are in terms of ecology, how to maintain the public order, as well as keep the water, land and air clean. Also, we learn the significance of the project of producing electricity from the wastewater, which is nearly being finalised, and what the expectations of the regional waste management centre are which is about to be built in Sombor.

EP ***With the length of 120 kilometres of tree-lined alleys and more than 18,000 trees, they say, that Sombor is the greenest city in the country and Europe. Is that officially true?***

Dusanka Golubovic The data you provide is accurate, but unfortunately, there are no official records of the greenest city in Serbia. What we claim with certainty is that everyone who visits Sombor remembers our town by its greenery. The most common species of trees in the tree alleys is the honeysuckle, known among Somborians as *bođoš*, which was brought to our city as early as 1903. It was

Photograph: Milos Nikolic

planted as a medium for combating dust, as its rugged leaf collects dust from the air, but also as a means for combating excess water since this terrain was once a wetland. For the same reason, the centuries-old yew survived here, besides the ones in Kalemegdan which are the only other ones still in existence in Serbia. Besides the hackberry and yew, there are significant numbers of maple, elm, birch, wild chestnut and other woody species in Sombor's alleys and parks. Many trees are over a hundred years old and have reached their maximum lifespan, so they need to be rejuvenated. Over the last year alone, we have removed 493 trees and planted 952.

EP ***Is that much greenery also followed by green standards in the environment, public order and the economy? Do you belong to a few local governments that have a strategy for improving the quality of the environment, and what are your priorities?***

Dusanka Golubovic The City of Sombor has a Sustainable Development Strategy for the period 2014-2020, and

For the operation of the waste treatment centre, **recruiting and creation of new jobs** for the production of energy raw materials will be required

the creation of a new one is underway this year. It shows that the priority is a better quality of the environment, and it will be implemented through specific goals such as the reduction of harmful links between the environmental pressures and the health of the local population; the improvement of the ambient air quality; the effective management of the risks of endangering the human health and environmental pollution. Also, we have been performing the monitoring of the surface and groundwaters for many

DUSANKA GOLUBOVIC is a born and bred Somborian who, after graduating from the Faculty of Law in Belgrade and her internship at a law office, returned to her city where she has been working in the city administration since 2007. She was elected mayor of Sombor in 2016.

years now, since 2018, the monitoring of air quality, as well as the noise pollution monitoring, and earlier this year we adopted the regulations concerning the control of the soil. In accordance with the Air Protection Law, we have drawn up a short-term action plan for the air protection in Sombor's territory for the period of 2020-2023, which has been forwarded to the Ministry of Environmental Protection for their approval. What we consider to be one of our principal activities is a regular education of school children to raise their awareness of the need for environmental protection.

EP ***Who are currently the biggest polluters in Sombor and how much are the green standards implemented in the business of the companies and manufacturers in your municipality?***

Dusanka Golubovic We are currently in the process of data collection for the year 2019, which will be published on the city's official website probably after March 31st, which is a deadline for the polluters to submit their reports to the competent department of the City's Administration. However, it can be said that in the City of Sombor, the biggest problem is the Veterinary Institution "Proteinka" with the emission of unpleasant odours that are sometimes felt throughout the city. The final solution of the "Proteinka" problem is what we all expect from the Ministry of Agricul-

Photograph: (top right) courtesy of Dusanka Golubovic; (bottom left and right) Cabinet of Mayor of Sombor

ture in the near future. On the other hand, we also have an example of good practice so we can mention the plant of the company "Agroplus", which is the first bio-gas power plant built in West Backa district, which obtains biogas from manure and green waste. This company has built a facility based on German technology adjacent to their farm in Svetozar Miletic, where they obtained a singular production unit from which 1.2 MW of electricity is supplied to the Serbian power network. Besides, we have an announcement of an investor who already operates in our territory and who shares our opinion about the necessity of the introduction of solar sources for obtaining energy, that they are preparing for an investment in solar panels in a capacity that will exceed their needs. The surplus of the generated electricity will be available to the Serbian power network.

EP ***Not only are you the first and one of the few municipalities in Serbia that acquired a wastewater treatment plant, but you also announced last year that the electricity generation from the wastewater would be starting soon. Is this process completed?***

Dusanka Golubovic The Sombor's PUC "Vodokanal" has a long tradition in the process of collection, drainage and treatment of wastewater. The first wastewater treatment plant was put into operation in 1964, while the wastewater treatment plant built in 1986 is still in operation today and has a much higher capacity. The purifier is developed based on a waterline (with a primary and secondary purification) and a sludge line, which is also composed of anaerobic conversion of biogas. The biogas from the plant has been used to heat the technological process and the buildings within the plant. To utilise the biogas completely, the plan is to use it to power the gas generator that is part of the IPA Serbia-Croatia Cross-Border Cooperation Project. From an economic point of view, we expect significant savings here. In addition to the gas generator, the technical documentation for the project of the future solar power plant at the wastewater facility has also been prepared. By using renewable energy sources, "Vodokanal" will strive to achieve full energy independence at the wastewater facility in the future. The installation of the gas generator is the first stage in the process of obtaining electricity from biogas, and this phase has been completed. The second phase contemplates the use of new raw material in addition to the sewage sludge already in use, which is maize silage. The gas generator with the inlet basket has been entirely built with a new transformer station, and we foresee the construction of the switchgear which has been contracted. It represents the link between the wastewater treatment plant and the electricity buyer - EP S. The switchgear is planned to be completed by early summer.

EP ***How did you acquire this facility and why did not other municipalities (except Subotica and Sabac) follow your example?***

Dusanka Golubovic A small number of purifiers are operational in Serbia. For an active and functional purifier, an organised sewer system (network) is required, and these are few in Serbia. That is precisely the main requirement for a municipality or city to compete on projects such as the IPA project mentioned above, whose main objective is the promotion and increased use of different forms of renewable energy in the scope of cross-border cooperation. The expected project's result is to improve energy efficiency and increase the independence of the utility companies in the field of water supply as well as to make a positive environmental impact. For this project, € 498,000 has been allocated to "Vodokanal" for the purchase of the gas generator and the equipment that is going to enable better exploitation of biogas. In this international cooperation project, where PUC "Vodokanal" Sombor is the partner, the

For an active and functional purifier, **an organised sewer system** (network) **is required**, and these are few in Serbia

Photograph: Cabinet of Mayor of Sombor

University of Novi Sad and the Fund for European Affairs of AP Vojvodina take part, and "Water Supply and Sewerage" from Vinkovci and the Agricultural Institute from Osijek joined from the Croatian side.

EP ***At the end of last year, it was announced that a Regional Waste Management Centre was soon to be built in Sombor. What kind of a project is it, and when is it supposed to be completed?***

Dusanka Golubovic The "Regional Waste Management Centre" project has significant potential for improving the waste management system, not only in Sombor but also throughout the region, the West Backa District territory, respectively. The project involves the tidying up and rehabilitation of the existing Rancevo landfill and the establishment of a waste treatment centre in line with modern environmental and sustainable development standards. This, primarily involves collection, treatment and disposal of waste, which through the recycling process, converts into raw material for the production of alternative fuels. The idea for this project is to be carried out based on a public-private partnership model, and a deadline for the project's completion is to be three years after the signing of the agreement. If we talk about the significance of this project for Sombor, its implementation would, above all, mean a responsible approach to environmental protection, but also an effort to preserve our recognizable image of a green city. Furthermore, there is also a corresponding economic interest, considering that for the operation of the waste treatment centre recruiting and creation of new jobs for the production of energy raw materials will be required.

We also have an example of good practice. The plant of the company "Agroplus" is **the first bio-gas power plant** built in West Backa district, which **obtains biogas from manure and green waste**

Photograph: Cabinet of Mayor of Sombor

EP ***Sombor has a beautiful environment - the Danube River, the Special Nature Reserve Upper Danube, hunting and fishing spots, farmhouses and ethno houses, developed wine and rural tourism. If someone came to visit you for two days, what places would you take him to and what would you show him?***

Dusanka Golubovic The City of Sombor is fortunate that our partners in joint projects, friendly and fraternal cities, are very much interested in visiting us precisely because they feel comfortable here and because of what Sombor has to offer. From the manifestations, stays in beautiful and preserved nature of the Backo Podunavlje Biosphere Reserve and boat trips along the Grand Backa Canal, cultural events, carriage rides through the green city streets, to the gastronomic delight of excellent food and fine wine. These are precisely the places we promote in every way and at every opportunity. And all that that you and I have both mentioned is what we show to all those who come to our city, whether for business, sports, or tourism. Everyone is welcome in Sombor, the city whose "potentials" are also praised in songs!

EP ***How satisfied Somborians are, along with you as their fellow citizen, with the life in your town and its surroundings? Why is it nice to live in Sombor?***

Dusanka Golubovic Being the responsible authority, two years ago we introduced the open-day mechanism in rural and urban local communities every first Saturday of the month, which allows constant communication with citizens to hear their problems firsthand and to help solve them. Very often, the issues that our fellow citizens identify as personal are, in fact, issues of the wider community, so by solving one person's problem, we are also solving problems for establishing a better quality of life for the whole community. We must strengthen economic activity and enrich our lives with quality content in the field of culture, art, sports. It is the reason why we have invested considerable funds in the last few years to fully equip 40 hectares of the industrial zone, which is ready for the arrival of investors and increase of economic activity. That is why we are investing in water supply, in equipping kindergartens and schools, that is why we have renovated the Health Centre and are preparing a major reconstruction of the hospital; that is why we are also restoring the Nursing Home, reconstructing streets and intersections, investing in culture and children's programs. When to all this we add the argument that Sombor has preserved the epitome of a peaceful and safe city, with high aesthetic and cultural criteria, and that more and more tourists are coming back, it is indeed lovely to live in Sombor...

Prepared by: Tamara Zjacic

COME RAIN OR SHINE MAY THE (CEE)FOR-CE BE WITH YOU!

According to the Institute for Energy Research, demand for fossil fuels globally skyrocketed during 2018, triggering a consequent increase in carbon dioxide emissions, despite the significant share of renewables in the planet's energy mix. Increased demand for energy is attributed, among other things, to weather conditions that forced the population from different parts of the world to rely more on heating and cooling the premises. Coal, oil and gas certainly have their eco-friendly alternatives heating the space during the winter days – and at the same time its cooling during summer

For users who want to save both their own financial resources and the environment from the negative impact, heat pumps are an excellent option. They work on the principle of "reverse refrigerator" and they "extract" the accumulated heat from air, groundwater or soil, and increase it. That way, a large amount of energy of relatively low-temperature becomes high-temperature energy.

The main advantage of heat pumps over the competition in the market for heating and cooling appliances is that the facilities equipped with heat pumps receive much more energy compared to the costs. The system is powered by electricity and generates between 3.5 and 6 kW of thermal energy per kilowatt consumed.

Investment costs for heat pumps

We contacted the experts of the partner company CEEFOR (Center for Energy Efficiency and Sustainable Development) asking how much it would cost us to heat and cool a 60 m^2 house or apartment with a heat pump. They explained that in this situation, the most appropriate choice would be an air-to-water heat pump since water-to-water and ground-to-water are more suitable for larger buildings - private houses.

The price of the recommended 9 kW heat pump is approximately € 1,700 in our country. With the cost of installing a heat pump, installing underfloor heating and installing a hot water system and air conditioning, the total investment would reach 7,000 euros.

The heat pump recommended to us, according to the engineers' calculations, would generate 3.5 kW of thermal energy per each kilowatt consumed.

The payback period depends on the energy class of the household, as well as the way it was previously heated.

TYPES OF HEAT PUMPS AND THE PRINCIPLE OF OPERATION

Depending on which of Earth's unlimited "free" energy sources they use, heat pumps are divided into ■ air-to-water; ■ water-to-water; ■ ground-to-water.

They all operate on the same principle of heat transfer from one place to another. The main parts of heat pumps are evaporator, compressor, condenser and expansion valve.

The company engineers calculated your annual heating costs during a heating season of 180 days if you live in an average isolated home already of previously mentioned square footage. It mostly depends on current costs how much it pays off to install a heat pump.

The fastest return on investment for a heat pump installation will be achieved by those households that are heated with propane-butane gas and electricity, considering the current situation in the market. In eight or thirteen years they will be "in the black". There is also a possibility of shortening the repayment period of the investment – the heat pump installation through programming device operation during the lower tariff – 0.04 €/kWh. In this case, the total amount of your bills in the heating season will be 102.86 €. The payback period will be shortened to 7 years if you use propane-butane gas for heating, or 11 years if you use electricity.

Photographs: (on the previous page) Unsplash/Gaelle Marcel; Pixabay

However, as other energy sources skyrocket as well, it is a matter of time before our table in attachment becomes "outdated" - and your repayment period if you use pellets for heating, for example, shortens drastically.

Other benefits of heat pumps

Of course, saving is just one of the motives for the energy transition of households, so additional benefits of heat pumps should not be neglected.

Quiet, fully automated and easy to operate, depending on the regime, they can be used both for heating and cooling, and their use in hot water preparation is increasingly being represented.

On top of that, maintenance is unnecessary. Manufacturers emphasise that by introducing heat pumps smoke, ash, heating with wood or coal, as well as "leakage" and condensation on boilers, will sink into oblivion. There are no worries and additional expenses for connection, meters and tanks, and before winter, there is no need to stock up on any energy product. They have a long-life expectancy.

With the application of adequate energy efficiency measures, the usefulness of heat pumps is further increased.

They also have a positive effect on air quality, reducing carbon dioxide emissions by up to 50 per cent over petroleum-based heating.

Prepared by: Jelena Kozbasic

WHO STANDS BEHIND (CEE)FOR-CE?

For more information on heat pumps, contact our Project Bureau. Since its founding in 2010, it has established itself as one of the pioneers in the shift towards renewable energy sources, energy efficiency, sustainable development and electromobility in the Balkans. The experts of this company based in Belgrade will support you in the development of projects and the preparation of technical and project documentation. Their extensive portfolio guarantees you superior service in both industry and construction.

	Furnace efficiency	Quantity per year	Price	Cost per year
Boiler, natural gas	0.90	1,080 m³	0.3 €/m³	324.03 €
Boiler, pellet	0.85	2.5 t	150 €/t	381.84 €
Boiler, liquid propane	0.90	763.13 kg	1.39 €/kg	1,060.76 €
Heat pump	3.50	2,571.43 kWh	0.084 €/kWh	218.57 €
Electric heaters		9,000 kWh	0.084 €/kWh	756 €

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HOW TO EXPLOIT COAL RESERVES?

The increase of energy production from renewable sources and higher energy efficiency are definitely directions towards a sustainable energy future of Serbia. Energy experts have no dilemmas about that. However, the subject that makes them differ, including our interlocutors, is what to do with coal reserves: whether to invest in the exploitation of coal in an environmentally friendly way or to start with the decarbonisation of the electricity system now and turn exclusively towards clean energy

Photograph: Jan Valo

The record air pollution in cities across Serbia this winter has raised the question of how much coal-fired power plants with their emission of harmful substances are affecting the air and our health and what to do in a situation where coal is still the dominant source of energy in our country and judging by the reserves, we can continue to exploit it for at least half a century. Is the economic viability of coal a justifiable reason to base the electricity system on it in the near future, is coal at all the cheapest source of energy, how much we are able to use coal in an environmentally friendly way, or it is already wiser to move to the decarbonisation process and invest as much as possible in renewable energy sources - we asked the opinion of two eminent experts in this field, Branko Kovacevic, PhD, President of EPS Supervisory Board, formerly Professor and Dean of the School of Electrical Engineering in Belgrade and Rector of Belgrade University, and Nikola Rajakovic, PhD, Professor at the Department of Power Systems at the Faculty of

Branko Kovacevic, PhD
President of EPS Supervisory Board

Nikola Rajakovic, PhD
Professor at the Department of Power Systems at the Faculty of Electrical Engineering in Belgrade

Electrical Engineering in Belgrade, who chaired the EPS Steering Committee from 2002 to 2004, and also was the Secretary of State at the Ministry of Mining and Energy from 2008 to 2011.

EP ***EU member states are planning to close all coal-fired power plants by 2031, while in our country the new ones are still being built led with an argument that electricity production in this way is three times cheaper than energy generated from solar power plants or wind farms. What was taken into account in that calculation and what was omitted?***

Branko Kovacevic EU member states indeed have long-term plans to stop using coal for electricity production by mid-century, but 2031 is not the deadline. Coal will undoubtedly be a significant source of energy in the European Union for the next 15 years. I am not familiar with the details and the input of the calculation you mention with regards to the price/cost ratio of energy obtained from coal and renewable energy sources (RES). However, it is certainly a fact that RES are more expensive for exploitation. Coal is less expensive, while water is still cheaper than coal. Electric Power of Serbia obtains one-third of its energy from hydropower plants and has invested many resources in their revitalisation and modernisation to increase these capacities and extend their working life.

Nikola Rajakovic The cost of electricity produced by the coal power plants nowdays must include the cost of environmental protection (i.e. the cost of health care), as well as the cost of the entire life cycle of the thermal power plants, which are partly related to the expense of closing down the mines with surface exploitation, the rehabilitation of thermal power plant locations, ash dumps... With such calculation, kWh produced in lignite-fired thermal power plants becomes noticeably more expensive than kWh produced by the solar power plants. The question is why we favour thermal power plants. Thermal power plants were built in the 1970s when carbon dioxide emissions were not even taken into consideration. The concern about nitrogen oxide and desulphurisation seriously started to arise in our country only in this century! A key feature of the modern energy transition is a fast pace of changes. The resources that we need to rely on are the sun, wind, biomass, hydropower, geothermal energy, and above all our knowledge and technical ability to create through energy transition an energy system based on principles that contribute to environmental protection, but which is sufficiently reliable and cost-effective and surely predominantly based on domestic renewable resources.

EP ***The fact is that Serbia has coal available for mining for the next 50 years, but it is also known that our thermal power plants do not meet European environmental standards. What is preventing us from using the coal more healthily and how will this gap between the resource that is available and the damage we are doing be reduced in the near future, given the enormous consequences of pollution on health?***

Branko Kovacevic In the 1990s, EU Member States began with significant investments in environmental protection, especially in the field of energy production. At that time, Serbia was going through a severe economic and political period. And while electric filters were being installed on thermal power plants throughout Europe, we fought for every kilogram of coal and kilowatt-hour of electricity to keep the light bulbs on. In recent years, we have been rapidly catching up with Europe. The task that EPS has ahead of themselves is difficult, but we have experts who are ready to deal with them competently. By 2019, EPS invested by far the most in environmental protection in Serbia - 500 million euros. Ninety-seven million euros has been invested in the reconstruction or replacement of the existing electric filters on the power plant units. In the reconstruction of burners by which nitrogen oxide emissions are being reduced, 69 million euros have been invested. In the flue gas desulphurisation on blocks - 193 million euros.

We talk a lot about how and from what sources we produce electricity but until we change our bad habits in the consumption of that energy – the future doesn't look well

Regarding the use of coal in an environmentally acceptable manner, there has been an investment in the most modern system for coal quality management in the Mining Basin Kolubara. The whole project is worth 181 million euros. EPS is planning further environmental investments

Photographs: (Kovacevic) courtesy of Branko Kovacevic; (Rajaković) courtesy of Nikola Rajaković; (right) Ljubica Stivic

worth more than one billion euros in a series of projects that involve the protection of air, water and soil and improvement of environmental quality. In the coming years, investments from EPS will reduce the sulfur dioxide emissions by 90 per cent, nitrogen oxides by 45 per cent and particulate matter by 95 per cent.

Nikola Rajakovic In Kolubara and Kostolica basins, there will likely be lignite for the next 50 years with this intensity of exploitation, but it is a crucial energy fact that we consume it with very low efficiency. Roughly speaking, only about 30 per cent of the available energy from coal is converted to electricity in our thermal power plants. I am confident that our generation does not have the mandate to consume all coal in such an inefficient way. Therefore, I advocate that future generations should be left with enough coal which they will know how to exploit more efficiently. The use of coal in a healthier way is costly, and the transition to clean technologies in thermo-energetics with carbon dioxide storage is prolonged and uncertain. The gap between the available resource and the damage we are doing is impossible to bridge by shutting down all thermal power plants overnight. But an exit strategy must exist and must be started with the closure of all the old thermal units, therefore, with the gradual abandonment of thermal energy based on lignite and switching to renewable sources (primarily solar and wind power plants). The plans for innovation of Kolubara B is absolutely inappropriate for the times we live in!

EP ***The example of Kostolac B TPP, which has relatively modern technology for limiting sulfur dioxide emissions, is often***

Photograph: Radovan Zivanovic

cited but is seemingly not used because of the cost of the use of this technology. On January 15, this year, the Energy Community Secretariat initiated a lawsuit against the Republic of Serbia for exceeding the prescribed emissions of pollutants from thermal power plants. How much will we be forced to align with the European standards if not for ourselves, then for the impact on pollution across Europe?

Branko Kovacevic The flue gas desulphurisation system for the Kostolac B Thermal Power Plant was completed in 2017, and through warranty measurements, it has been proven that its operating parameters are in full compliance with the agreed and below the current European standard of 200 milligrams per cubic meter. Final adjustments to the EIA study are in process. I expect that the operating permit will be obtained during 2020 and that the plant will enter into continuous operation. When it comes to the lawsuit, the Energy Community itself is aware that non-EU countries after decades of crises and wars, cannot implement the Large Firebox Directive overnight, as is the case with the EU members. That is why the Energy Community has accepted that the National Emission Reduction Plan - NERP - should be applied instead in countries such as ours. The Government of Serbia adopted this document on January 30, 2020, but EPS has begun to implement NERP's regulations as of January 1, 2018. In addition to the desulfurization system constructed in Kostolac B TPP worth 96 million Euros, a flue gas desulphurization system worth 217 million euro is being built for the four TENT A units. There are plans for the projects for the remaining two blocks in the TENT A, as well as the blocks in TENT B, TPP Kostolac A and a new Kostolac B3 block whose construction is ongoing. EPS' total investment in flue gas desulphurisation systems, for the constructed and planned facilities, amounts to approximately 595 million euros. EPS is also planning both primary and secondary measures to reduce nitrogen oxide emissions from thermal power plants. In doing so, EPS meets strict EU environmental standards.

I am confident that our generation does not have the mandate to consume all coal in such an inefficient way. Therefore, I advocate that future generations should be left with enough coal which they will know how to exploit more efficiently

Nikola Rajakovic The alignment with the European standards is beyond question. Nevertheless, I think it is illogical that someone from Europe cares more about us than we do ourselves. I would also like here to point out the relationship between the developed industrial world and the countries in development (where we stand) and related to this a lack of logic in the fight against climate change. That is, cumulatively speaking, if the contributions of developed countries to global warming are much higher, then viewed as a whole, developing countries almost have the moral right to meet their emission quotas. On the other hand, the awareness that the planet is endangered does not give enough leeway to developing countries to meet their emission quotas.

EP ***Even though we mostly use coal to produce electricity, we continually hear that the future of energy for Serbia, as it is in the EU, is in renewable energy sources. Where do you see it - in wind farms, biogas power plants or some other energy mix or a different approach?***

Branko Kovacevic There is a significant potential for improvement of energy efficiency in all segments of consumption in Serbia. We talk a lot about how and from what sources we produce electricity but until we change our bad habits in the consumption of that energy – the future doesn't look well. How serious this issue is, shows us the example of Germany which has allotted 17 billion euros to improve energy efficiency, primarily through better insulation in buildings, the purchase of more efficient electric motors, pumps, ventilators, increased investment in energy-saving systems, etc. Significant resources need to be invested in energy efficiency and, of course, renewable energy sources, to be able to create the best and most efficient energy mix. For such systems to be sustainable, it is necessary to work on connecting regional markets, as this not only guarantees stability but also reduces the costs.

Nikola Rajakovic The future of modern energetics stands in a complex energy mix in which renewables are dominant, in energy efficiency, in the integration of the electricity sector with the transportation, heating and industry sectors, in demonopolisation of sectors, in the active role of customers, in the market development and above all in the introduction of smart technology networks without which all of the above would not be possible to put into effect. The best references in the field of energy can be seen in the energy mix from the end of this century - up to two-thirds of the energy from solar power plants, and the rest mainly from wind farms and hydropower plants. However, we should not ignore any form of renewable sources. The technologies for converting surplus electricity into heat and liquid hydrogen are especially emerging as the essential energy sources in transportation where fossil fuels are no longer in use.

The future growth in the use of electric cars is a great challenge, not only for us but for the entire planet

EP ***The increased opposition to the construction of small hydropower plants has led to the fact that some local governments are already announcing or even adopting their ban. Should the hydro potential only be seen in the context of the construction of big hydropower plants, such as Bistrica or Djerdap 3, or do you consider it necessary to turn to some other energy source?***

Branko Kovacevic Concerning big hydropower plants, Serbia has used the highest potential, which is 11 out of 19 TWh. The question is how much technically and financially viable the remaining capacity is. EPS produces about 30 per cent of electricity from renewable energy in hydropower plants. Those are big hydropower plants such as Djerdap 1 and 2, Bajina Basta, Zvornik. When it comes to small hydropower plants, EPS also has a system of 16 small hydropower plants with a total capacity of 21 MW. It is less than one per cent of installed capacity in the hydro sector. Among them are also the power plants that are more than a century old. To preserve the patrimony and increase production from renewable sources, EPS is also implementing the project of reconstruction of 13 small hydropower plants and the construction of two new ones, but at the existing water management facilities. In this way, the existing potentials are being exploited without damaging the environment. Small hydropower plants can be the right solution at a local level, to supply towns and their surroundings, but only if all the parameters and standards are followed which then make this production sustainable and usable, in a way that it does not endanger biodiversity. In my opinion, the construction of small hydro capacity in the protected areas of nature is entirely unacceptable.

Nikola Rajakovic A couple of negative examples of the construction of small hydropower plants with the closure of mountain water flows and their conversion into long pipelines are not an argument enough against the excellent locations of small hydropower plants. It is worth mentioning that small hydropower plants have been in operation for more than a century in Serbia and some favourable locations can still be found for them. Therefore, small hydropower plants should be built in places where this is justified in terms of the water supply, the environment and energy demand However, their contribution to overall energy demand is very

Photograph: Jelena Nesic

The alignment with the European standards is beyond question. Nevertheless, I think it is illogical that someone from Europe cares more about us than we do ourselves

modest. The large reversible hydroelectric power plants that we have in Bajina Basta and which can be built (Bistrica and Djerdap 3) are an extremely high-quality resource in terms of operational flexibility of the system. For the integration of large amounts of electricity from solar and wind farms, they can indeed be of great benefit.

EP ***Does the more massive integration of renewables present a challenge for the system? And how will the expected growth and greater integration of electromobility into the electro energy system affect its technical performance? Let me stress that according to some estimates about 100,000 electric vehicles are expected to be on our roads by 2025.***

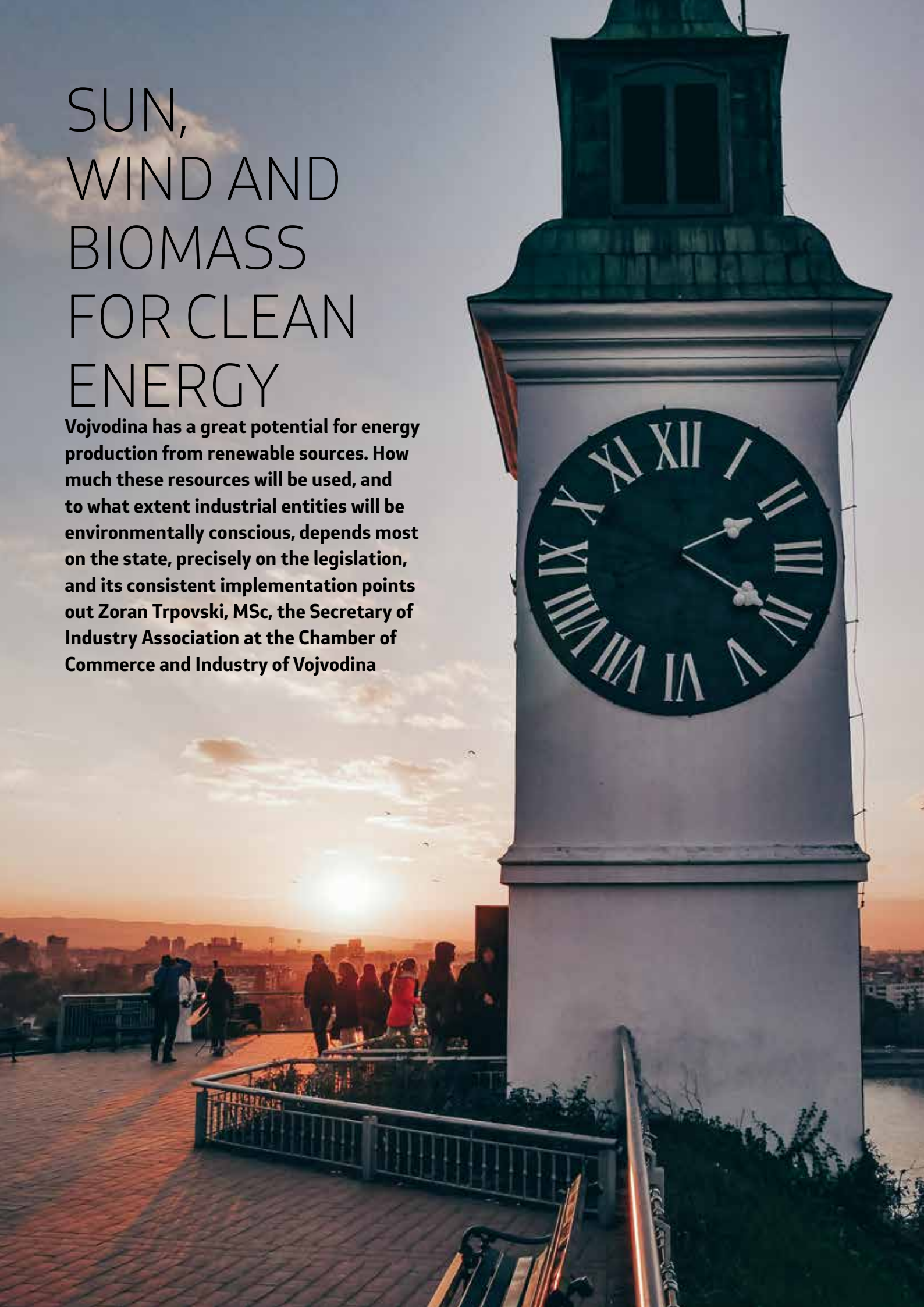
Branko Kovacevic The technical potential of wind and sun that is usable for the electricity production is a variable quantity that will depend on the dynamics of development of the transmission and distribution networks of the electro energy system of the Republic of Serbia. The construction of new conventional electro energy facilities (coal, natural gas, large hydropower plants), and in particular of the reversible hydroelectric power plants, significantly increases the technically available potential of these intermittent sources, due to greater opportunities for the balancing of power in the system. Of course, the future growth in the use of electric cars is a great challenge, not only for us but for the entire planet. For this whole idea to be sustainable, electric vehicles must use energy from renewable sources. It is also fundamental to significantly reduce electricity consumption. So once more, we return to the principle of energy efficiency, which is not without reason identified as another source of energy. There will be no room for energy waste. The environmentally friendly use of coal, the increased production from RES and energy efficiency are the paths to a sustainable future in Serbia.

Nikola Rajakovic The massive integration of renewables is a system challenge which today's engineering experts successfully overcome with smart grid technologies, energy storage and additional system flexibility in various ways, and especially through the consumption response. The consumption response is a concept in which consumer's devices can be switched on and off according to the needs of the system without disturbing the comfort of the end consumer. Electric cars, as tomorrow's reality on our streets, with the infrastructure (charging stations), will have a significant impact on the electricity sector. It is particularly important to point out that smart grid technologies should prevent simultaneous charging of the massive number of electric car batteries so that the distribution network would not be overloaded. It is estimated that total consumption for the full electrification of passenger cars in Serbia would increase overall consumption by 15 per cent. The supply of this additional consumption, according to the current energy doctrine, must be enabled with green kWh.

Prepared by: Tamara Zjacic

SUN, WIND AND BIOMASS FOR CLEAN ENERGY

Vojvodina has a great potential for energy production from renewable sources. How much these resources will be used, and to what extent industrial entities will be environmentally conscious, depends most on the state, precisely on the legislation, and its consistent implementation points out Zoran Trpovski, MSc, the Secretary of Industry Association at the Chamber of Commerce and Industry of Vojvodina



Through the unique chamber system, the Industry Association of the Chamber of Commerce and Industry of Vojvodina brings together industrial entities operating in the Autonomous Province of Vojvodina (AP Vojvodina). They currently have groups which cover metal complex, energetics and construction and there is the Circular Economy Council. Through these forms of organisation, by applying the prescribed procedure, the Association raises current issues concerning these branches of the industry, and it increasingly addresses the topic of energy efficiency. With Zoran Trpovski, MSc, the Secretary of the Industry Association at the Chamber of Commerce and Industry of Vojvodina, we have talked about how much industrial companies are following the global green trends and standards when it comes to business. Since Vojvodina has the highest number of oil industry facilities and the highest potential of renewable energy sources, we are interested in what is the relation between the greatest environmental risks and benefits in this province.

Zoran Trpovski, MSc, the Secretary of the Industry Association at the Chamber of Commerce and Industry of Vojvodina

EP ***The modern industry today is unthinkable without clean technologies, renewable, green inventions and circular economy. To what extent does the Industry Association deal with these topics and how environmentally conscious are the industrial production companies in Vojvodina?***

Zoran Trpovski It is difficult to give a global assessment, since the scene is very diverse, especially if we bear in mind that the awareness of people, when it comes to the importance of industry as a whole, is re-created after a long period, in the sense that production is necessary to create new value. It is certain that every company tries to follow and implement the current trends in its field. Regarding ecology, regulation is the key, and consistent application of regulations can impose environmental awareness of all industrial entities. I think there is a similar analogy with citizens and their environmental awareness since owners or responsible persons in companies are citizens in the first place and then the persons from those companies. Either you have the awareness, or someone has to "make" you raise it. Within the new concept of work of the Chamber of Commerce and Industry of Vojvodina, both in the Industry Association and the Chamber as a whole, the importance of these issues has been recognised, and I am sure that they will be even more significant in the future.

EP ***It was established once refineries and wastewater were the largest polluters in Vojvodina. Do you know what the black ecological spots on the industrial map of Vojvodina are?***

Zoran Trpovski There is now one refinery in the Vojvodina, and it has constantly being pointed out that new owners have invested significant funds in modernisation and advancement of technology, especially for the increase the depth

Photographs: (on the previous page) Unsplash/Jure Tufekcic; (top right) courtesy of Zoran Trpovski; (bottom) Slobodan Nicic

of oil refining. Considerable funds have directly been invested in environmental protection, and a higher proportion of fuels with lower sulfur content further contribute to less pollution. Still, the question of oil wells remains, since they carry a certain environmental risk, and the refinery in Novi Sad, that no longer operates, but that was as well as Pacevo refinery, unfortunately the target of bombing during the NATO aggression on our country. In recent years, people have been mentioning the pollution that occurred during the aggression, which is still affecting the environment. Wastewater is a general problem throughout the country and Vojvodina is no exception. Our lagging behind in environmental protection can be best observed in this area. The Chamber of Commerce and Industry of Vojvodina is fully involved in these issues through the Energy and Energy Mining Group of the Industry Association, as well as other forms of organisation, especially through the recently formed Circular Economy Council.

EP ***At the end of the October last year, the Chamber hosted the International Clean Energy Technology Forum. What are the specific activities and successful local projects that indicate that Vojvodina is heading towards the development of clean technologies?***

Zoran Trpovski This was the 13th Forum and the Chamber is the traditional host of the second day of the conference. The main merit for the traditional maintaining of the forum and having burning topics belongs to Mr Tihomir Simic and his associates. The last Forum was dedicated to Serbia's energy digital perspective. There were many real-life examples on the second day, such as heat pumps, solar energy and other renewable energy, and a special session was devoted to the field of refrigeration. Traditionally, after this gathering, the conclusions and recommendations were sent to the decision-makers. Moreover, when it comes to the Chamber's standalone activities, we are very proud of the International gathering held in 2018 and organised by the Energy and Energy Mining Group, which was dedicated to all aspects of biomass utilisation.

EP ***What is the perspective of the fossil fuel processing industry in Vojvodina, and what is the perspective of renewable energy sources?***

Zoran Trpovski When it comes to fossil fuels, the company that performs the exploitation knows the answer to this question. Depending on the market trends in consumption patterns, circumstances in the world and other elements, future exploitation will be realised. When it comes to renewable energy, Vojvodina is a part of our country that has excellent conditions for the development of wind, solar and biomass energy production. Depending on the policy of the state, in terms of implementing the obligations of the defined participation of these sources in gross final consumption, as well as on the initiative of private investors in this field, it depends how much cleaner energy we will produce.

EP ***One of the topics on which the Chamber of Commerce and Industry was working last year was the circular economy. How much has the industry of Vojvodina turned to this global trend, which involves, above all, energy and raw material efficiency?***

Zoran Trpovski As already mentioned, over the last year, we formed the Circular Economy Council, with the desire to influence certain environmental issues and transition from linear to a circular economy at the Province level. Special attention will be paid to responsible waste management, as it is generated daily in our homes as well as in all sectors and segments of industrial production. Every day we witness that businesses are implementing projects of energy efficiency, efficient use of raw materials and others, which

Photographs: (middle left) Sinisa Ljubisavljevic; (bottom) Davor Hadziomerovic

affect their financial position and at the same time they also have a positive impact on the environment. There are many good examples, and perhaps it should be noted that biogas power plants, whose development is extremely significant since, in addition to energy production, they provide us with high-quality organic fertilizer.

EP ***Which funds are at disposal to the industry of Vojvodina for the transition to clean technologies and energy efficiency?***

Zoran Trpovski Quite a large number of institutions are involved in financing energy efficiency projects. These institutions define the conditions of use of these lines, and that significantly ensures the earmarked use. At the same time, different levels of government, from local, provincial to republican finance individual segments in this area. Finally, and perhaps most importantly, the industrial entities themselves invest in this area to reduce costs and improve the productivity of their businesses.

EP ***How much do you cooperate with the Chambers of Commerce of Hungary, Romania and Croatia as your closest neighbours? How much can we apply their experience in the environmental advancement of the industry, since all those countries are the EU Member States?***

Zoran Trpovski We try to take every opportunity to present positive experiences of neighbouring countries in this field. That is sometimes done through colleagues in the Chambers of Commerce, i.e. representative offices of Croatian Chamber of Commerce in Belgrade, but very often through Embassies, among which the Embassy of the Republic of Slovakia stands out. Very often, business entities

Photograph: (top right) Jan Valo

from numerous counties, which are involved in these activities offer their services. Between above mentioned countries, we have had several successful gatherings organised together with our Hungarian colleagues.

EP ***Which activities does the Chamber of Commerce of Vojvodina plan for the current year to encourage more intensive development of the "green" industry?***

Zoran Trpovski The stakeholders in this area should be Energy and Energy Mining Group and the Circular Economy Council. These bodies will organise appropriate gatherings and events to develop this segment and inform a wide range of subjects about the current events. We will always be ready to assist in the implementation of all projects in this field by connecting them with decision-making institutions. Besides, very good cooperation with governmental institutions should lead to joint actions in organising public hearings, panels and roundtables which should increase the perception of the public and entities when the topics from these areas are on the agenda.

Interview by: Nevena Djukic

SCHNEIDER ELECTRIC'S EV CHARGERS

– for charging in public facilities and at home

In line with the global trends in the area of energy efficiency, reduced negative impact on climate change and preservation of the planet, switching to electric vehicles represents one of the options which will drastically contribute to reduced greenhouse gas emissions. To that purpose, chargers for electric vehicles are also being improved, namely new charging options are being established

Countries across the world encourage switching to EVs, which, with all of their advantages, represent a suitable alternative. Based on new emissions standards put forth by the European Union, as many as a third of the new cars in the EU will be electric or hydrogen-powered by 2030.

As reported by Inside EVs, global sales of new electric cars surpassed two million units for the first time in 2018, which is a 72 percent increase over the previous year at an average market share of 2.1 percent. Simultaneously with the increase of the number of EVs, the number of charging stations has been rising as well.

In Europe, up to 66% of all chargers are located in four countries: the Netherlands, Germany, France and the United Kingdom, and it is estimated that the total number of chargers in Europe will reach two million by 2025.

In regard to Serbia and the countries in the region, a rising trend of delivered and installed EV chargers has been registered, getting us closer to the countries with highly advanced electric mobility and the leaders of that trend. Schneider Electric has delivered nearly 100 EV chargers in Serbia and Montenegro so far, and in the past two years companies in the public and private sectors have been increasingly interested in installing EV chargers at their parking lots and in garages.

In Belgrade, EVlink chargers Schneider Electric are installed at several locations, with those in the reconstructed public garage at Obilićev venac as most available for citizens of the capital.

Home Ev Chargers – New Trends

An increase of the number of electric vehicles and further expansion of their use lead to the need for the production of EV chargers with an option of charging at home

Drivers are embracing EVs not only for their improved fuel economy, reduced emissions, and lower fuel expenses, but also because the cost of charging a car at home in a garage over the course of a year can be less than running an air conditioner. And research shows that "electric cars are already cheaper to own and run than petrol or diesel cars in the UK, US, and Japan".

They have two options for charging at home at disposal –chargers supplied when buying a car, with basic charging features, and chargers with advanced options, helping drivers to reduce concerns about running out of electricity while driving.

Enhanced EV charging solutions - the EVlink by Schneider Electric – are available in the market, working faster than standard ones and delivering a host of additional benefits.

EVlink chargers can be part of a comprehensive smart home solution, with an option of integrating them with home's electrical system to keep a car from charging during peak-demand times, i.e., when other electrical appliances are likely to be in use. A charger can also be set to operate at the cheapest times.

Rated for indoor safety, EVlink's intuitive design facilitates daily use and for additional flexibility in installation and usage, each station comes complete with a docking bracket.

Photographs: Schneider Electric

Environmentally Conscious Tourists Are Attracted To Eco-Friendly Destinations

If you are a fan of unspoiled nature hidden between the Montenegrin mountains and the Adriatic Sea, surely it must have happened to you, at least once, to be stuck for hours in traffic at the beautiful Bay of Kotor. It seems like such the hustle and bustle could end, especially if you decide to park your cars and use public eco-boats during your vacation. If you take another eco-friendly step and decide to stay in a "green" hotel, you will also have a variety of choices. There are 27 Green Key certified hotels in Montenegro

Mr Tomica Paovic
Democratic Governance & Economy and Environment Team Leader at the UNDP

Recently, with the support of UNDP, **the territory of the protected area has been enlarged by proclaiming Komovi for a nature park** at the territory of Kolasin municipality

Photographs: (top) MORT; (bottom, left) courtesy of Tomica Paovic

The owners of electric vehicles will be pleased by the fact that that UNDP has supported the installation of 11 chargers in Podgorica so far. We talked about the progress in the field of ecology, as well as the other innovative and sustainable projects to Mr Tomica Paovic, Democratic Governance & Economy and Environment Team Leader at UNDP.

EP ***You have organised a network of eco-friendly hotels in Montenegro. How does a hotel get a Green Key certificate? What motivates hotel managers to enter a process of obtaining this document?***

Tomica Paovic Montenegro currently has 27 certified hotels, and their number is constantly increasing. Doing business following the principles of environmental protection, rational use of resources, that is water and electricity, while continually improving the quality of offers – are prerequisites for obtaining the Green Key. Certified hotels are energy efficient; they use renewable energy, implement measures for the reduction of waste that hotel produces, have a responsible attitude to employees and the local community and are less harmful to the environment.

Due to all this, eco-certified hotels have lower operating costs, can operate throughout the year, and since they are competitive, they position more easily in the markets of Western and Northern Europe. Eco-conscious tourists expect a high quality of service and full experience, which is the reason why they are ready to spend more money to stay in a certified accommodation.

EP ***Environmentally conscious tourists are attracted to the destinations that offer a stay in unspoiled nature and enjoy the wild beauty, which is exactly the thing distinguishes Montenegro. How many municipalities have participated in the UNDP's "Low Carbon Tourism" program so far?***

Tomica Paovic Sustainable or "green" tourism in Montenegro has a great potential due to its relatively untouched nature and preserved cultural heritage. UNDP, in cooperation with numerous partners, successfully implemented 31 investment projects in 12 Montenegrin cities: Podgorica, Cetinje, Kolasin, Mojkovac, Savnik, Pluzine, Zabljak, Pljevlja, Budva, Tivat, Herceg Novi and Ulcinj.

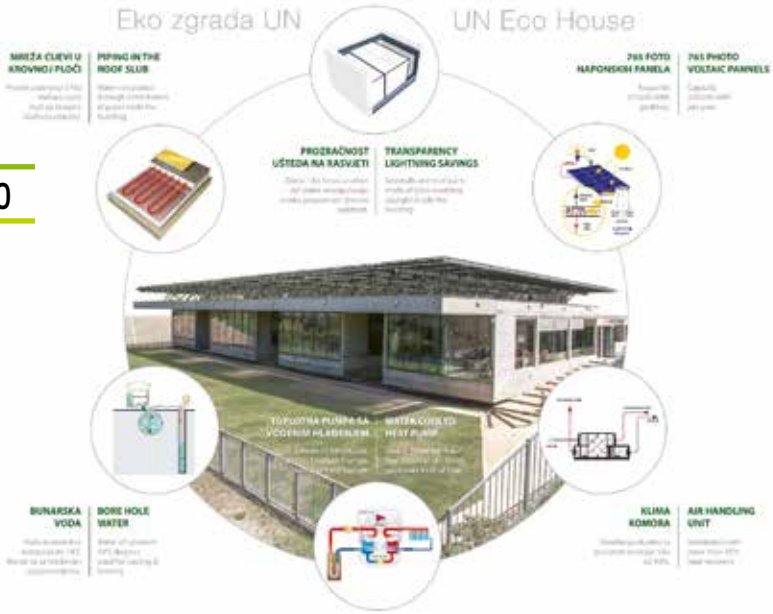
These are very diverse projects, from supporting ecological water transport in the Bay of Kotor, through investing in the development and equipment of bicycle and pedestrian paths, the installation of solar water heating systems at hotels, the replacement of conventional public lightening with LED bulbs and the procurement of electric vehicles, to the introduction of modern, automated and highly energy-efficient heating and cooling systems. All projects have significantly contributed to the promotion and diversification of Montenegro's touristic offer.

Electric and hybrid trimaran sailboats, designed for short-distance tourist trips, **are ideal for coastal cruising and interurban transport** in coastal cities

EP ***What kind of program did you implement in these municipalities?***

Tomica Paovic In addition to the savings of 60 per cent on electricity bills, the modernisation of public lightning in Zabljak and Savnik achieved better illumination, increased safety of traffic participants and eliminated light pollution. Since last year, electric vehicles for the local transport of tourists have been available to visitors of Cetinje, Ulcinj and Zabljak and there are more and more electric vehicles inside hotel complexes.

Photographs: UNDP



Forty households in katuns (shepherds' temporary summer house in the mountains) in Pluzine and Zabljak got access to electricity for the first time when solar power systems were installed in their households. Solar panels will contribute to creating better working and profit conditions for the farmers and shepherds who take their livestock to the katuns. In addition to the traditional role the katuns play, the tourists like to visit Montenegrin katuns, thus they are becoming an important part of the tourist offer of the northern part of the country.

This project has encouraged both the public and the private sector to implement concrete measures and introduce new technologies, contributing to the fight against climate change. The regulation dealing with carbon dioxide (CO_2) reduction has been improved, and the framework

ALL ADVANTAGES OF THE UNITED NATIONS ECO-BUILDING IN PODGORICA

Designed as energy-efficient, United Nations building is unique in its concept. More than 750 solar panels produce electricity. All produced energy is exported to the distribution network, and it is imported from the network as much electricity as it is needed at that moment. The energy efficiency of the building is also reflected in energy savings, since most of the vertical surfaces and walls of the building are made of three-layer law-emission glass, allowing the daylight to penetrate thus reducing electricity consumption for lighting. Energy-saving bulbs were used in the entire building. In addition, significant savings are achieved through advanced heating, cooling and ventilation systems. Also, for this purpose, geothermal energy is used. It is taken from the ground by a well-pump. The temperature in the building is constant and less dependent on external conditions thanks to the thermal inertia of the object, which is in summer mode enabled through the ceiling cooling – roof "cool" plate, through which circulates water drawn from the well from the depth of 40 meters through the pipe system.

The eco-building of UNDP was financed by the Government of Montenegro, and the conceptual design was done by Austrian architect Daniel Fügenschuh with the help of King Shaw Associates from the UK. According to our interviewee, Mr Tomica Paovic , it is a functional, well-designed and energy-efficient system which creates a very comfortable working environment.

Photographs: Milos Vujović, Dusko Miljanic

was established for sustainable mechanisms of financing. I am here primarily referring to the Eco Fund, as support for innovative initiatives with a green background. With our partners, we have managed to raise over 13 million euros in investments in sustainable tourism, and a little bit more than 30 new "green" jobs have been created on the territory of these municipalities.

EP ***Last summer, electric and hybrid ships started operating as part of the "Bella Boka" project on the route from Kotor to Herceg Novi. The company "Bella Boka" has announced that it will expand its fleet this year. To what extent has UNDP helped in the development of this project and will you continue to support this project?***

Tomica Paovic The project "Bella Boka" is of significant importance for the Bay of Kotor and Montenegro. It establishes sustainable water transport with electric and hybrid trimaran sailboats through the Bay of Kotor. That will have a positive effect on solving the problem of congestion in road transport, especially during the summer season, when you need an hour and a half or two hours at its best from Kotor to Herceg Novi due to traffic jams. From a cultural point of view, this project is important because it revives the tradition of using waterways for the transport of residents and tourists – which was forgotten in the past decades. Electric and hybrid trimaran sailboats, designed for short-distance tourist trips, are ideal for coastal cruising and interurban transport in coastal cities.

This project will reduce the emission of harmful gasses in traffic and offer visitors an exciting eco-friendly travel experience. More than 4 million euros have been invested in this unique project at the Adriatic, while co-funding through UNDP was 150.000 euros.

The Investor has announced that this year another 9 such sailboats will be providing the service of public transport at sea.

UNDP has supported the reconstruction of the 100-year-old-ship, which rock musician and environmental activist Antonije Pusic, also known as Rambo Amadeus, turned into a solar sailboat. With a sophisticated design, this sailboat is powered by solar energy, without CO2 emission, exhaust gases and noise. This venture combines the local nautical tradition with sustainable materials and clean technologies, and it is an example of how innovations in design, renewable energy and the private equity investment for the public good, combine economic opportunity with the need for environmental protection.

EP ***Electromobility is on the rise in the Scandinavian countries and in the Balkans, it has just started developing. What is the role of UNDP Montenegro in the development of this sector?***

Tomica Paovic The increasing global awareness of climate change has led the automotive industry, which contributes significantly to environmental degradation, to put in great efforts in resolving this issue. One of the most important moves is the production of more environmentally-friendly

Forty households in katuns (shepherds' temporary summer house in the mountains) in Pluzine and Zabljak got **access to electricity for the first time when solar power systems were installed in their households**

Photograph: UNDP

vehicles. It is true that European countries, such as Norway and Sweden, advanced most in terms of electrification of the traffic. However, the road to full e-mobility, not only in Montenegro but also globally, is undoubtedly a long one, taking into account many challenges, which are primarily related to the inadequate offer of electric vehicles and the long period from ordering to delivery, then underdeveloped charging infrastructure, the absence of various incentives such as financial, economic and regulatory for e-vehicle owners. In order to make transport truly sustainable globally, society, as a whole, needs to re-examine the entire mobility system and to find innovative ways for the reduction of our dependency on vehicles. Here, I primarily refer to the implementation of the car-sharing model, development of better public transport infrastructure and greater use of low-emission or zero-emission transportation.

Alternative solutions that contribute to the sustainability of transportation are necessary, and the introduction of electric vehicles is just one of those. We have also helped the equipment of more than 70 km of hiking and biking trails throughout Montenegro, as well as the introduction of environmentally-friendly vehicles for the transportation of tourists in protected areas and touristic complexes.

EP ***UNDP in Serbia mostly develops projects for the utilisation of biomass. Which type of the renewable source in principle has UNDP decided to support in Montenegro?***

Tomica Paovic Renewable energy sources are one of the

HOW WILL URBAN MOBILITY DEVELOP

It is expected that the electrification of transport will play a key role in meeting goals on global climate change. Limiting global warming to below 2 °C, ideally to 1.5 °C compared to pre-industrial levels is a set goal of international climate policy. That goal can only be achieved if the emissions are significantly reduced in the long run. As the Montenegrin transportation sector currently accounts for one-fifth of national emissions, that makes it an area in which change is possible and needed. To accelerate the transition to sustainable alternatives, it is necessary to invest in infrastructure and to adopt incentive measures as well as measures which will attract investors.

The results of the UNDP E-Mobility study have provided the basis for concrete action that will only have results if the public and private sector and the citizens unite in these efforts. We asked citizens, the economy and public, which key barriers for moving to e-vehicles are. We expected the study to show that it was a high price of e-vehicles. However, it turned out that the transition to e-vehicles requires adequate infrastructure above all. So far, we have supported the installation of 11 public charging stations across Montenegro, which allow users to charge their vehicles for free in the first year.

The polycentric sustainable urban mobility plan which was developed for the Bay of Kotor and Cetinje back in 2015, proposed measures for promoting of public transport, introducing new services and promoting non-motorized models of transport, such as bicycles and hiking. The plan also provided a shift to new technologies, cleaner and more efficient fuels, as well as the construction of new transport infrastructure. To our satisfaction, some of these measures have already been successfully launched, such as the introduction of eco-friendly public transport by boats in the Bay of Kotor.

Photograph: Milos Vujović, Dusko Miljanic

key tools for the reduction of greenhouse gas emissions. There is significant untapped potential in the field of renewable energy sources, especially in the field of solar energy, and more importantly in the sector of small producers, such as small and medium-sized enterprises, as well as individual households.

This year could be a significant milestone in the global effort for the reduction of greenhouse gas emissions in the energy sector. Namely, the signatory countries of the Paris Agreement, which are now updating their Nationally Determined Contributions (NDCs), could raise their previously targeted ambitious by increasing the production of electricity from renewable sources.

The decarbonisation of the electric power system itself is not enough to meet climate goals set out in this Agreement. Instead, the entire energy sector must undergo a profound transformation by moving to renewable sources and adopting energy efficiency measures, as well as increasing the level of electrification of end-users. In this context, part

We have helped the equipment of more than 70 km of hiking and biking trails throughout Montenegro, **as well as the introduction of environmentally-friendly vehicles** for the transportation of tourists in protected areas and touristic complexes

Photograph: UNDP

of our focus is to improve the investment and development environment for the installation of solar panels, especially for small and medium-sized enterprises and households.

EP ***A business incubator was launched in Cetinje. What kind of a support an investor can expect and does this project pay particular attention to elements that encourage environmental protection?***

Tomica Paovic Through Business Centre (incubator), support is given for launching a start-up business and realisation of ideas with the aim of further development of entrepreneurship in Cetinje and creating new jobs.

We intend to support business initiatives with low greenhouse gas emissions, which, in the final balance, lead to decarbonisation of the Montenegrin economy. The project envisages financing of public and private companies, local self-governments, research and scientific institutions, civil society organisation and individuals, to provide start-up capital for launching, developing and testing the most innovative project ideas, with the possibility of further co-financing of the most successful solutions.

Initiatives in the fields of energy efficiency, the use of renewable sources, tourism, information technology and agriculture are supported. The future tenants of the Business Centre at their disposal have special business units such as open space, high-speed Internet, area for presentations and conferences, as well as the appropriate equipment, parking, support in establishing and registration of a new innovative business, as well as promotion, consulting and education services. Selected tenants can use the resources on preferential terms for a maximum of three years.

EP ***How does UNDP help to increase state-protected territories, such as national and nature parks? How do such institutionally implemented procedures reflect on the conservation of plant and animal species fund in reality?***

Tomica Paovic It is important to emphasise that the current network of protected areas in the mainland of Montenegro covers around 13.52 per cent of the territory, with a total of 74 protected areas of 186,732.49 ha. The largest part of the area under protection are 5 national parks (around 100,427.00 ha) and six nature parks (70,785.90 ha). About 10 per cent of protected areas are put under the lower level of protection.

In terms of natural resources management, UNDP provides significant support to national and local partners. Recently, with this support, the territory of the protected area has been enlarged by proclaiming Komovi for a nature park at the territory of Kolasin municipality, which brought to an end the process of designating protected areas at the territory of mountain Komovi.

Some previous UNDP projects funded by GEF, enabled the designation of the nature parks at the territories of municipalities Andrijevica, Podgorica and Pluzine, with a total area of 55,000 ha. That has increased the area under protection from 9 per cent to 12 per cent.

UNDP also supported solving of critical issues that are related to State's obligations to MAB program, in the context of the protection of Tara as a MA B Reserve, which resulted in conclusions of UNESCO in 2019 that the site meets criteria of the statutory framework of the World Biosphere Reserve Network.

Interview by: Nevena Djukic

EBRD AND DONORS BOOST GREEN FINANCING IN THE REGION

The Western Balkans is a key region for, and partner in, the EBRD's green work. South-eastern Europe has huge potential for developing green energy, with its rivers providing hydroelectric power, its mountains and plains enabling wind power, its underdeveloped solar energy, and the inhabitants of its many cities keen for sustainable development.

Yet a lot remains to be done: the Western Balkans countries are still heavily dependent on ageing coal-fired thermal power plants and suffer from high levels of air pollution. Carbon intensity in Kosovo, Bosnia and Herzegovina and Serbia is more than six times higher than the European Union (EU) average. Achieving energy efficiency remains a key challenge in a region where energy usage is up to 2.5 times higher than the average for OECD countries in Europe.

So much for the bad news; because there is also some good news and hard work from the EBRD – and increasingly so.

Photograph: Unsplash/Charles Deluvio

Since 2006, the EBRD has invested more than €3 billion in the "greening" of the region. Together with providing funding, the Bank is also very active in engaging with national governments to reform legal and policy frameworks to create an environment in which individual projects can succeed, and wider impact is possible.

In Albania, the EBRD financed the modernisation of Korporata Elektroenergjitike Shqiptare (KESH), the largest generator of electricity in the country, supporting the company with a restructuring and reform package.

The Bank financed the first two large-scale wind farms in Kosovo: Kitka and Bajgora wind farms, providing a concrete way forward to address the challenge of power cuts and pollution caused by the lignite coal powering Kosovo's two main electricity plants.

In Montenegro, following an extended policy dialogue on the bankability of the power purchase agreement, the EBRD was the first financial institution to structure a project finance loan for the Krnovo wind farm, the first private wind farm in the country and at the time of financial close also the first private wind farm in the Western Balkans region.

In North Macedonia, the EBRD financed ESM, the first large-scale solar power plant on the site of an exhausted lignite coal mine, representing a tangible example of how to implement some of the solutions of the EU Just Transition policy for coal mine regions in the Western Balkans.

In Serbia, the Bank backed the construction of the country's two largest wind farms: the 158MW Cibuk wind farm in Dolovo; and the Kovacica wind farm with a capacity of 104 MW.

Ten cities around the region have joined EBRD Green Cities, the Bank's successful urban sustainability programme. The €1 billion programme with currently 39 participant cities recognises that 80 per cent of greenhouse gas emissions come from cities and are therefore a key location for addressing climate change.

In the Western Balkans currently Banja Luka, Belgrade, Kumanovo, Novi Sad, Podgorica, Pristina, Sarajevo, Skopje, Tirana and Zenica have joined the initiative.

Supporting residential energy efficiency, the Bank has reached more than 3,500 families across the six countries of the Western Balkans through the Bank's Green Economy Financing Facility (GEFF). The programme provides financing to local banks for on-lending to households to invest in green technologies and solutions such as improving home insulation and installing efficient boilers.

Source: EBRD in Serbia

THE WARMEST WINTER ON RECORD IN EUROPE

The past winter was by far the warmest on record for Europe, according to the Copernicus Climate Change Service/ECMWF. It was the second warmest February, both globally and for Europe.

From December 2019 to February 2020, there was persistent mild weather over Europe, particularly in the north and east. The average temperature was almost 1.4°C higher than that of the previous warmest winter, 2015/16 (when there was a strong El Niño) and 3.4°C above the 1981-2010 norm.

February temperatures were mostly above average over a vast region covering much of Europe, Siberia and Central Asia, and over West Antarctica, while they were most below average over northern Alaska. The month was 0.8°C warmer than the average February from 1981-2010, making it the second warmest February in this data record, about 0.1°C cooler than February 2016 and 0.1°C warmer than February 2017.

European-average temperature anomalies are generally more substantial and more variable than global anomalies, especially in winter, when they can change by several degrees from one month to the next. The European-average temperature for February 2020 was unusually high. The month was: 3.9°C warmer than the average February in the period 1981-2010.

In addition to the underlying long-term signal from climate change, natural climate variability also played a role. The North Atlantic Oscillation, which refers to variations in the large-scale surface pressure gradient in the North Atlantic region, has been predominantly "positive" during winter 2019/20. A positive NAO during winter is usually associated with wetter-than-normal conditions across northern Europe and drier-than-average conditions for southern Europe and the Mediterranean region.

It was the warmest January on record, both in Europe and globally.

Details are available here.

Source: WMO

Photographs: (top right) Unsplash/Galina N; (bottom left) Unsplash/Zane Lee

FLASH FLOOD GUIDANCE SYSTEM SAVES LIVES

Flash floods cause more than 5,000 deaths worldwide annually, exceeding any other flood-related event. They have enough power to change the course of rivers, bury houses in mud, and sweep away or destroy whatever is on their path.

They are among the world's deadliest disasters and result in significant social, economic and environmental impacts. Accounting for approximately 85 per cent of the flooding cases, flash floods also have the highest mortality rate. As the global population increases, especially in urban areas, and societies continue to encroach upon floodplains, the need for flash flood early warning systems becomes more paramount.

In response to this need, the World Meteorological Organization, the U.S. National Weather Service, the Office of U.S. Foreign Disaster Assistance, and the Hydrologic Research Center formed a partnership in 2007 to develop and implement an early warning flash flood forecasting system (Flash Flood Guidance System – FFGS) for global application.

The Flash Flood Guidance System (or shortly – FFGS) is a forecaster's tool designed to provide hydrological and meteorological forecasters with readily and accessible quality controlled precipitation estimates from weather radars and satellites, precipitation measurements, forecast data from Numerical Weather Prediction models, and other information to produce timely and accurate flash flood warnings worldwide.

By the end of 2019, over 3 billion people in 67 countries are being provided early warnings of potential flash flooding through their National Meteorological and Hydrological Services working in concert with their National Disaster Management Agencies.

WMO has produced an animation explaining the challenges of flash floods and the benefits of the Flash Flood Guidance system as an important disaster management tool to save lives.

Source: WMO

SIEMENS GAMESA IN DEAL TO PROVIDE CLEAN ELECTRICITY TO 240,000 PEOPLE IN VIETNAM

Vietnam has some of the best wind resources in Southeast Asia. To tap the country's potential and provide more clean energy to the country, Siemens Gamesa Renewable Energy will supply 25 SG 4.5-145 for one of the nation's largest wind farms. With a total capacity of 113 MW, the Hoa Thang 1.2 wind farm will generate enough electricity to meet the demands of over 240,000 Vietnamese following its commissioning in 2021.

The deal also marks the largest order in the country for Siemens Gamesa. Additionally, the company has secured a long-term 10-year service contract.

The project, located in the Bac Binh district, Binh Thuan province, on the South-Central coast of Vietnam, is developed by Hoa Thang Energy Joint Stock Company, a special-purpose vehicle of Vietnam's construction group Trading Construction Works Organization (WTO) which has close to 60 years construction experience.

Hoa Thang Energy is a pioneer of renewable energy in Vietnam, where the fast-growing economy has seen electricity demand rise by around 10% annually. The Vietnamese government estimates that total power generating capacity will reach 125-130 GW by 2030, up from 46 GW in 2018. To mitigate climate concerns, the government also aims for renewable energy to account for 15-20% of its total energy output by 2030. It has established a target of developing 6 GW of wind power capacity by 2030.

"With an accumulated installation of 101 GW, Siemens Gamesa can leverage its global expertise and footprint to partner with Hoa Thang Energy to develop one of the largest wind farms in Vietnam. As the market scale and financing are helping to unlock potential in Vietnam, we are committed to supporting our Vietnamese customers to accelerate the penetration of renewable energy and bring clean power for generations to come," said Richard Paul Luijendijk, CEO of Siemens Gamesa's Onshore business unit in APAC.

"With deep rooting in Vietnam, we are pleased to partner with Siemens Gamesa and leverage its industry-leading experience and reputation to develop renewable energy in the country. We selected Siemens Gamesa as the most appropriate supplier for our first wind farm project. This first-ever cooperation between the two companies will lay a good foundation for us to further explore the wind market in Vietnam," said Nguyen Thanh Oai, CEO of Trading Construction Works Organization.

Siemens Gamesa has been expanding in the Asia Pacific markets since the 1980s and has installed more than 8.4 GW of onshore turbines in China, Pakistan, Japan, South Korea, Indonesia, the Philippines, Thailand, Australia and New Zealand. In the offshore segment, the company completed the installation of Taiwan's first offshore wind power project in 2019 (128 MW) and also reached close to 2 GW of firm orders. The company also signed preferred supplier agreements for an additional 755 MW combined volume in Japan and Taiwan.

Source: Siemens Gamesa

Photograph: Unsplash/Suganth

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Teknoxgroup CAT

SMALL SOLAR SYSTEMS SAVE YOUR MONEY AND NERVES!

As electricity prices in Serbia have increased several times since 2000, and future potential price increases have been announced, partial energy independence for consumers is becoming more and more attractive. They most often put their trust in the sun – as an unlimited, renewable energy source

SMALL SOLAR POWER PLANTS

Solar power plants generate carbon-neutral electricity. They are located on the roof of a building or free land. "Solar kilowatts" can be used to meet their owners' energy consumption, which is most often the case with solar systems of a lower installed power. In this way, their users reduce the amount of energy they receive from the electricity grid and consequently their bills. Solar panels cover up to 70 per cent of their energy needs, which largely depends on the choice of equipment and how the panels are installed – MT-Komex is there to provide the most efficient solution.

In order to fulfill their wishes for lower electricity bills, citizens need the help of reliable constructors to build a small solar power plant and, at times, bank to back them up. MT-Komex and ProCredit Bank have provided them with just what they need, through a special offer to buy solar systems with the most financially advantageous conditions on the domestic market – interest-free loans without an origination fee.

Interest-free loans are intended for citizens and all interested companies. Besides, agricultural holdings also have the opportunity to receive funding.

The experience of the owner of a property in Dec, a small village in the Srem district in Vojvodina, on whose object a

small solar power plant was installed, shows that it is also very profitable for farmers to use clean energy from solar panels. He wanted his products to be worthy of the Ecolabel, increasingly valued among consumers. He, therefore, contacted MT-Komex workers with years of experience in the fields of renewable energy and energy efficiency. They are fully trained and certified for the installation of photovoltaic modules with associated equipment, as well as voltage converters and inverters, and they have once again proven their expertise with this unique project – and in the future, they will demonstrate it on the projects of ProCredit Bank clients.

The average price of electricity in our country has increased nine times since the beginning of the century but is still much lower than in other European countries, which makes its further growth more certain. The amount in your monthly electricity bill could, therefore, be more than double. You have the opportunity to prevent this by using solar energy. Don't miss it!

In addition to economic reasons, small solar power plants have environmental justification as well. When deciding between generating electricity from a thermal power plant and a solar power plant, it is clear which one is more environmentally friendly. Also, the latter could be much closer than the former – literally above your head. It reduces technical losses in the transmission of electricity from the thermal power plant to consumers by almost 20 per cent.

Prepared by: Jelena Kozbasic

Photographs: (top) Pixabay; (middle right) Marko Berkesh

ABOUT THE COMPANY

MT-Komex provides its customers with expertise, safety and reliability based on more than 25 years of business. The company will create solutions according to your needs and ideas. Along with numerous technological changes in the market, MT-Komex employees have acquired new knowledge and skills, and today their portfolio includes, among other things, more than 4,000 kW of built small solar power plants in Serbia. Their name is also present in the electromobility sector, so one day you may charge your EV on an electric charger installed by MT-Komex.

Rambo Amadeus' Boka sailboat is a vehicle that combines both of the endeavours mentioned above of this company, renewables and electromobility. MT-Komex was responsible for the setting-up of electrical installations and the installation of solar power for the vessel.

OPINION

OBVERSE AND REVERSE OF ELECTRIC POWER SECTOR

When it comes to fossil fuels, Serbia is a rather poor country. The main, available energy source is low-quality coal, namely lignite. Oil and gas reserves are relatively moderate, and their exploitation is about to come to an end in the coming decades. The energy potential of oil shale is beyond any question. Still, not enough researches have been made, while the existing technologies for the use of this source aren't commercially and ecologically acceptable. At the moment, the importance of lignite for the Serbian energy sector is immeasurable. The development of the electricity sector of the Republic of Serbia has been relying, ever since the sixties, upon the available coal reserves. The coal-based thermal power stations, which generate 70 per cent of national electricity production, are the backbone of the electricity sector in Serbia. The problem with coal firing is the emission of air pollutants and carbon dioxide in the atmosphere. The installation of electro filter and denitrification and desulfurization unit reduce the emissions significantly, raising the price of electricity as a result. So it doesn't make sense to install them on old power plants with lower capacity. However, the solution for carbon-dioxide emission from coal-based power plants doesn't exist. Having in mind the emissions of this gas, coal is the least favourable of all the fossil fuels, and technologies for carbon dioxide capture and storage are still in an early developmental stage. According to the Energy sector development strategy, in the coming decade, we can have the phasing out of 1,000 MW of the oldest and the most inefficient thermal power plants. Those remaining in use (along with Kostolac B3 in construction and potentially one more power plant of the similar capacity) should meet the strictest environmental regulations.

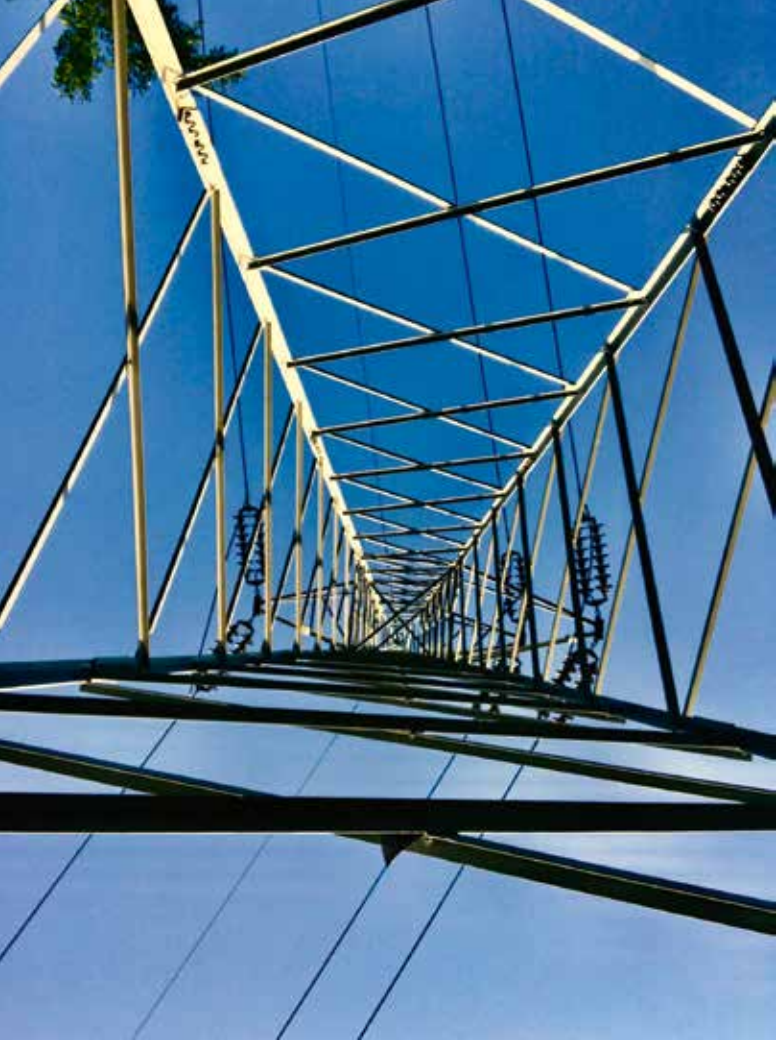
This scenario of the electricity sector progress could be, from the perspective of coal usage, taken as pretty optimistic. In essence, coal would be exploited and used for electricity generation over the next few decades. Its share in electricity generation would probably remain more than 50 per cent.

PROFESSOR DEJAN IVEZIC, PhD, is Head of the Department of General Mechanical Engineering and Thermodynamics and Head of the Centre for Energy at the Faculty of Mining and Geology in Belgrade. His field of work encompasses the problems of energy development, modelling and process management in energy production and use, etc. He has published more than 100 scientific articles in magazines and formal communications at conferences in the country and abroad. He was a member and head of many national research projects, as well as the project within FP-6, FP-7 and HORIZON 2020 programmes. He was in charge of making the Draft of The Energy Sector Development Strategy for the period by 2025, with projection by 2030.

Photographs: (Dejan Ivezic) courtesy of Dejan Ivezic; Aleksandar Borovic

The shift in the energy sector strategy and the adoption of EU policy in the field of climate protection would undoubtedly result in a gradual reduction and, eventually, termination of the coal-based electricity production in Serbia. In order to make this scenario economically and socially sustainable, this process must be followed up by the adequate measures of economic and social policies. The price of this transition is very high, and Serbia alone can hardly pay for it. This scenario is probable only with Serbia's full integration into the EU or at least with access to the transitional funds in the same way it is provided for the EU member

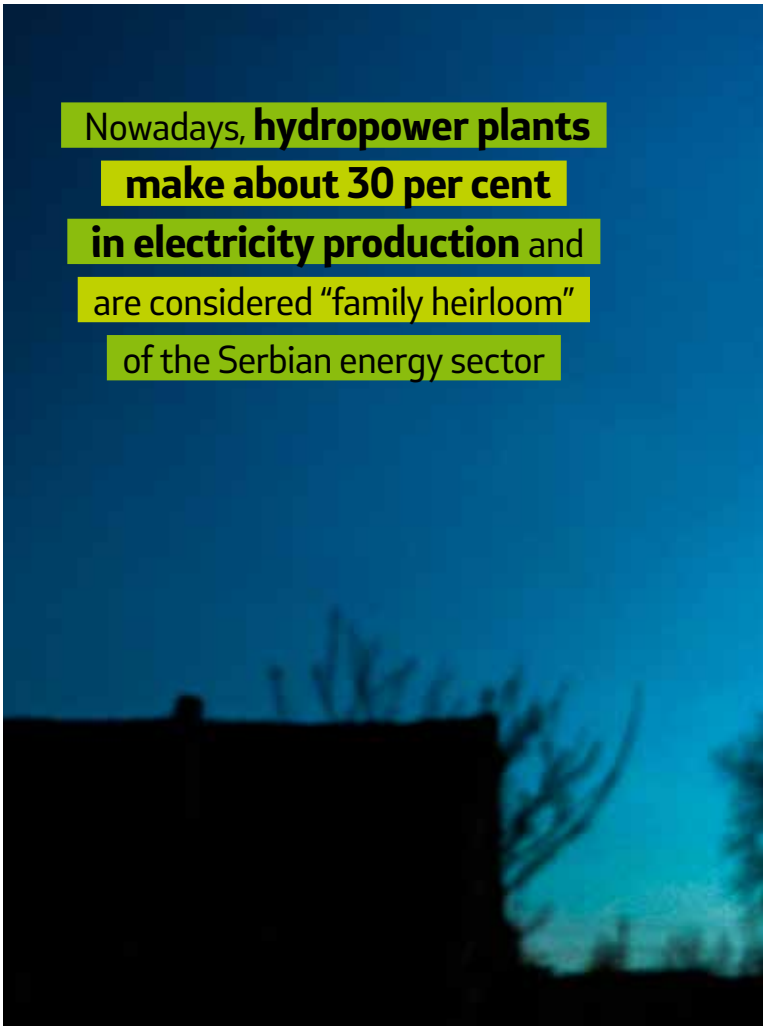
The price of electricity at the national level doesn't serve a stimulus for investors, and **without official subsidy policy, it will be hardly possible to keep up the existing trend of construction** even when it comes to wind power plants

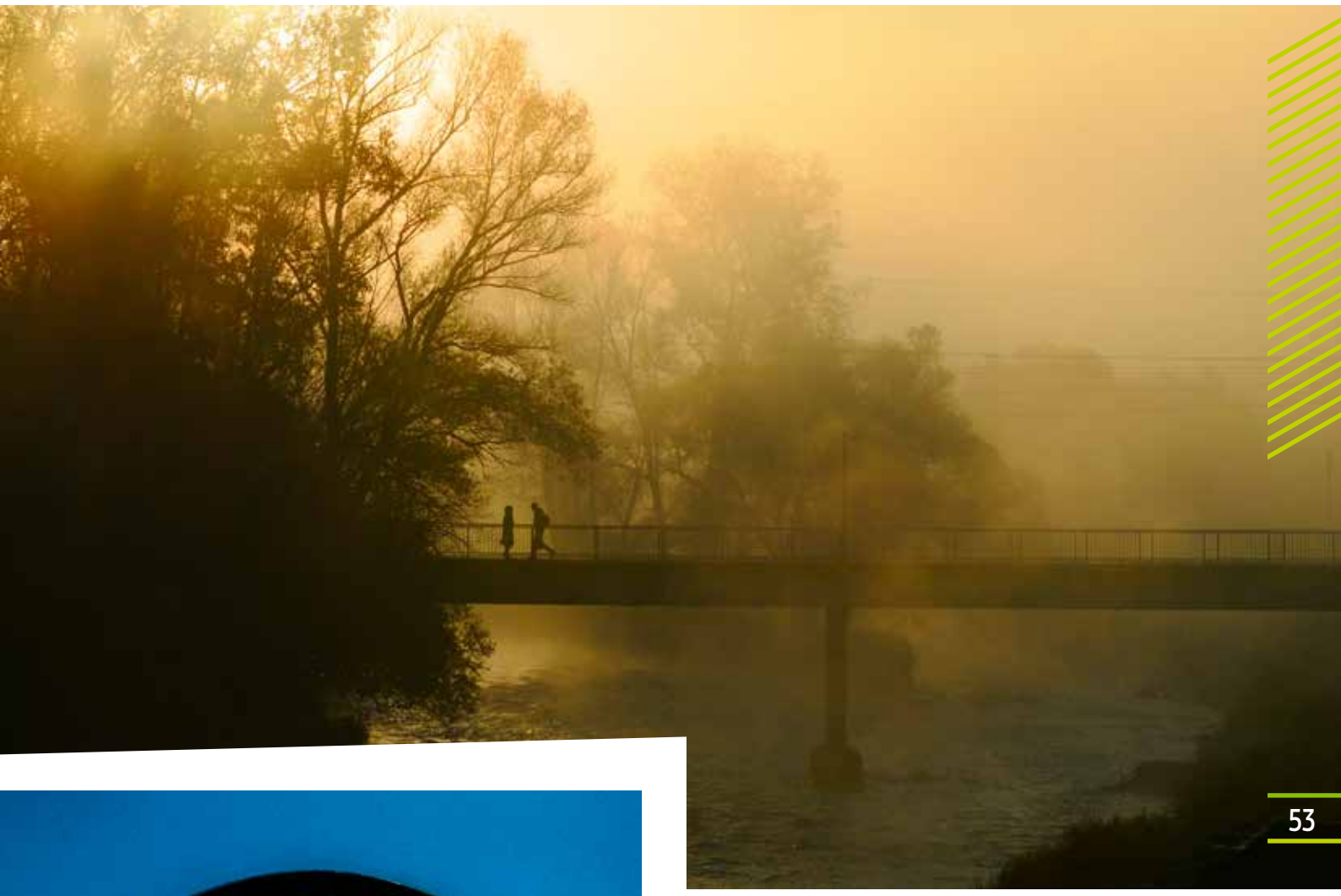


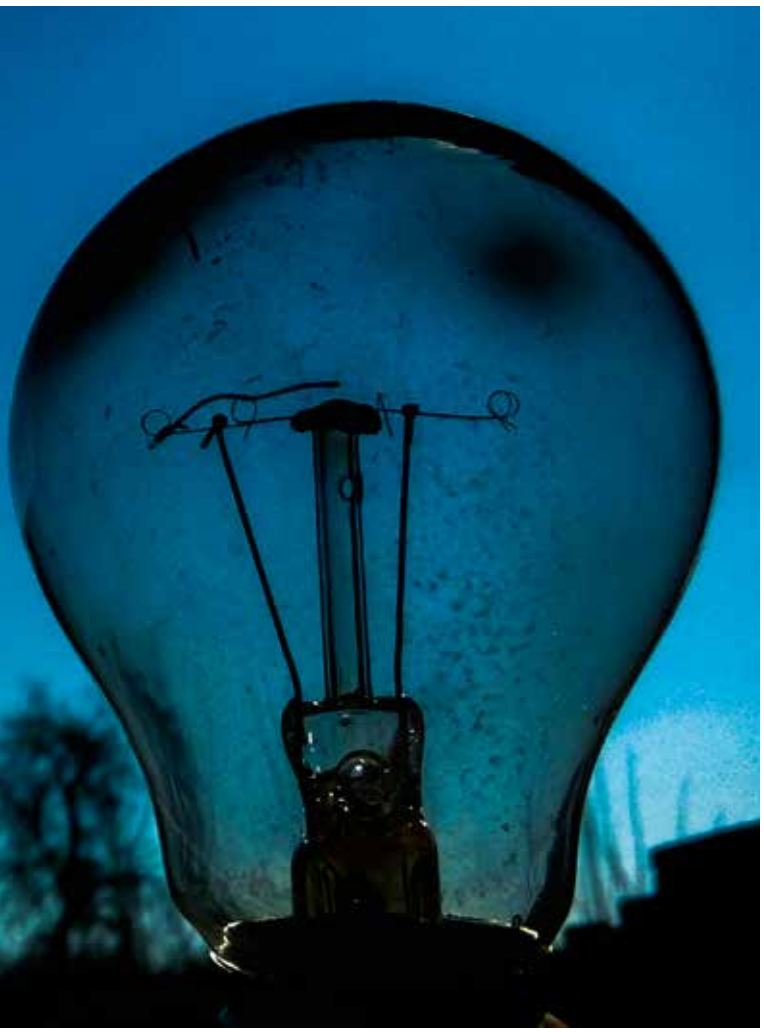
states. Renewable energy sources (RES), which would completely replace coal in electricity production, considering current technology development, just don't exist. Nowadays, hydropower plants make about 30 per cent in electricity production and are considered "family heirloom" of the Serbian energy sector. There are plans for new hydropower plants on bigger watercourses (Morava, Drina, Ibar, Lim etc.), but due to many reasons, their construction is not likely. One of the reasons is pubic odium against the construction of small hydropower plants, which is something that shouldn't have happened. It is difficult to estimate the potentials for the usage of solar and wind power. "Feed-in" tariff was effective, first when it comes to the growth of installed capacity which uses wind, whereas there has been a limitation of capacity in the solar energy field. Nevertheless, having summed up the share of electricity produced in these power plants, it won't surpass 5 per cent of the total electricity production. It's beyond doubt that it is technically possible to install in Serbia a few times bigger capacity in wind power plants, and tens of times bigger capacity in solar power plants, than we already have. The construction of reversible hydropower plant Bistrica, and there has been a lot of talk about it before, might additionally increase the technical potential of these sources. The price of electricity at the national level doesn't serve a stimulus for investors, and without official subsidy policy, it will be hardly possible to keep up the existing trend of construction even when it comes to wind power plants.

Theoretically, the biggest unused potential of RES in Serbia rests in biomass and particularly in agriculture biomass. Yet, it is very demanding to determine what part of that potential is truly usable for energy production, having in mind that residues from agriculture production are used for many different purposes. Biogas plants (combined with livestock production) with the capacity of several tens of megawatts are already in operation, and there we can expect, with appropriate subsidy policy (at the moment, "feed-in tariff" is in use) further growth, since this is the way to also solve the waste problem. As for wood biomass, it is mostly used for heating, and it is least expected to have a significant change there. Its use for electricity production is possible, but not in that extent as to become a genuine replacement for ongoing lignite usage. Even organized cultivating of the fast-growing woods couldn't provide more than a few hundred MW of new capacity for electricity production. It is important to say about wood biomass that it is CO_2 neutral, only if tree cutting is followed by adequate forestation. Otherwise, from a perspective of CO_2 emission, biomass is more unfavourable energy source than coal. Also, biomass firing is accompanied by the significant particle and another pollutant emission, which can be dealt with successfully only in bigger power plants. The air

Photographs: (top left) Ljubica Stivic; (bottom) Jelena Spurga; (on the next page top) Olja Simovic







The air pollution problem in Serbian cities throughout the winter of 2019/2020 **is mainly caused by firing biomass in households**

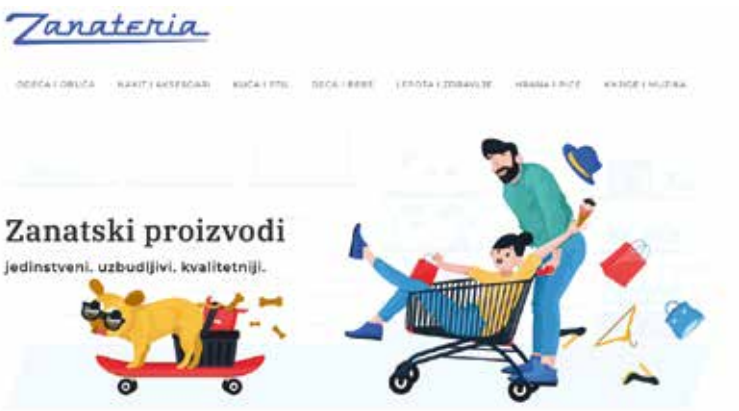
pollution problem in Serbian cities throughout the winter of 2019/2020 is mainly caused by firing biomass in households. So, whatever progress of Serbian energy sector might be, maximum valorization of renewable energy sources should have priority. Essentially, those are our only, sustainable on a long term, energy sources. With the extensive implementation of energy efficiency measures, it would be possible to ensure that a certain portion of required energy comes from our sources. It is necessary to bear in mind that entirely clean energy sources don't exist, and that usage of renewables doesn't come cheap. The technical potential of RES depends on available technologies, but the level of RES usage depends on how much consumers are willing to pay for such energy.

Dejan Ivezic


Zanateria
KRAFT BOBNA KUĆA

ABOUT CREATORS AND OTHER CUSTOMERS

From Vermont to Belgrade, from wedding bands to over a thousand products, from piling up identical items on shop shelves to unique pieces made with love and care, from goods no one buys to care for the environment, customers and to artists - this is how Zanateria was created, the first online department store with products handmade in Serbia



Zanateria is all about healthy products, natural and environmental materials that retail shopping allows. Environmental care and ecological approach in the process of creating and packaging of product is very important for the community that Zanateria brings together

Married couple Milica Stankovic Scepanovic and Aleksandar Scepanovic, aided by knowledge of their friend Ivan Gacesa, an IT entrepreneur, they designed something completely new in Serbian market - a virtual department store where small producers have the opportunity to show the result of their skill and customers have the privilege of getting a product that is unique, carefully designed and completely meeting their wish. As they are users of handmade pieces themselves, and while waiting for the opportunity to the numerous independent manufacturers to also show up in Serbia, they decided to take the charge and set up a craft store Zanateria.

Milica, Aleksandar and Ivan were previously drawn by hand-made products. Realising how difficult it is for people of modern times to get to craftsmen, as well as it is for the latter to get to the market, they decided that they themselves would be the bearers of change. The idea came up during Aleksandar and Milicaćs trip to the United States and visit to the craft department store that left a strong impression. Even wedding bands were ordered online. "When the wedding bands arrived with personal dedication from the masters who made them, it clicked. We decided to make a virtual craft department store online upon our return to Serbia," Aleksandar explains. Ivan joined them and so this story began, a story of a trade where everyone gains profit - both creators, buyers and nature.

In addition to being a resource-saving virtual store, while being deprived of all the infrastructure needed for mass production and consumption, Zanateria provides even one more convenience for both customers and the planet. Namely, the products can be tested and ordered, so there is no risk of accumulation and destruction of unsold goods, which is often the case with large companies due to the lack of discounts for fear of "damaging" the brand. "That manner that makes the brands more important than the common good and natural resources, is very dangerous, but we get the impression that more and more people are 'waking up' and realise that rapid and big changes are necessary in production, but also in the way of spending, if we want to save ourselves. And just the example of small manufacturers shows us that brands can also be built by caring for the environment", says Aleksandar.

Considering the rhythm of life, which is becoming faster globally, and being aware that most people are familiar with

ZANATERIA

Zanateria is the first virtual craft department store in Serbia, which brings together small producers, saves natural resources, is oriented towards the circular economy, healthy materials and retail shopping. In it's supply you can find clothes, shoes, jewelry, fashion accessories, furniture, dishes, souvenirs, decorations, food, juices, craft beers, wines, spirits, spices, products for babies, children and pets as well independent editions of books, comics and music.

Photographs: (on the previous page) Zanateria

the problems of mass production but without enough time or will to look for alternative options, from the beginning, they have designated this as one of the most important missions of their business - to offer shortcuts in that pursuit.

Zanateria is focused on healthy products made of natural and eco-friendly materials, which retail shopping allows. Environmental care and ecological approach in the process of making and packaging products is very important for the community that Zanateria brings together. Plus, complete bypassing consumerism, offering products that are not consumed quickly, but are cherished and loved, often whole life, and encouraging manufacturers to make market changes, Zanateria upholds the principles of circular economy.

The development of the industry has hindered the former popularity of small local craftsmen and vendors. Now, it is a big challenge for small manufacturers to compete with huge companies. Mass production and global economy, on the other hand, do not allow much care about harmful effects on the environment. In doing so, the question of labor exploitation and workers' rights imposes itself. "Zanaterians" are very shaky when it comes to this sensitive topic. As Aleksandar says, every responsible man must know that by buying cheap 'garbage' he becomes an accomplice to the big exploitative corporations and bears a part of the responsibility for the exploitation of children and the workforce in general, for inhumane working conditions, poverty in third-world countries and for the dire environmental consequences which product surpluses, their composition, shorter life span and mode of production they cause.

The so-called small producers do not enter distribution chains due to the small volume of production and the high cost of entry, as well as the necessity of compromise quality that they nurture and low prices in the market. This is why Zanateria offers them the opportunity to make their goods accessible and representative for a large number of people.

"An economy with a human face", by which the Zanateria platform is trying to enhance the Serbian market, offers an opportunity to buy the product from the man who made it by himself and therefore he personally guarantees for its quality, as well as making sure that the money goes directly to the creator.

Guided by Dusko Radovic's message that "the one who wants change the world should start from his dripping/leaking TAP", they decided to start a change in their microcosmos. So they have come up with a platform that empowers a healthy approach to economy and consumption, saves resources, opposes domination of "harsh transitional capitalism" and at the same time allows that everything is just a click away from buyers.

The first phase of this work involves bringing together relevant vendors as well as third-party publishers, with a tendency to continually expand and then stabilise the platform offering, evaluate, as well as provide educational series. The plan is "coming-out" to a foreign market.

"At the moment, Zanateria offers more than 1,000 products and that number is growing daily"

Customers are given an insight into the current offer in the craft products market, as products from workshops, studios and shelves are on the platform that they might not have met on another occasion. That's especially important for interested buyers from smaller towns, who do not have the opportunity to visit night markets and bazaars of handcrafts.

"At the moment, Zanateria offers more than 1,000 products and that number is growing daily. Before we developed this idea, we "scanned" the market and it seemed to us that we were able to map most of the manufacturers. When we made the public invitation to cooperate, we were completely surprised by the response. Not only were there manufacturers we had never heard of or products we never knew are made in Serbia, but we came to know products that we didn't know they existed at all."

You can find more about the offer in Zanateria at the link: www.zanateria.com.

Prepared by: Jelena Cvetic

Photographs: (left) Unsplash/Dominik Scythe; (right) Unsplash/Kelly Sikkema

* Technical values are a result of calculation models from the international standards EN ISO 12567-2, EN 13363-2 and ISO 15099.

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THERE'S NO PLACE LIKE... CONTAINER

Containers have long stopped being used as temporary accommodation and started a new life – ecological, smart, functional and affordable. Goran Ergic from *Avala Container Homes* managed to create a modern, sustainable and simple solution for a house, holiday home, and office space. He managed to achieve that by reconstructing abandoned and empty containers and by implementing smart systems and usage of ecological materials.

EP ***Smart buildings and houses are becoming more popular when we talk about sustainability; therefore, the architecture has a new 'task'. How did you come up with the idea to start up a business that involves reconstructing shipping containers to achieve smart construction goals?***

Goran Ergic I have always been interested in different types of architecture and construction. It all started one day on my property by the sea. I realised that it would be great to use the potential that we possess most efficiently. I knew that the construction of brand new objects is quite expensive and that the carbon footprint of those objects is high. Because I spend a lot of time in nature riding a bicycle, I wanted to build an object that is easy to transport and won't harm environment. That is how I came up with the idea to recycle shipping containers, and that way give them a new purpose. Not long after that, I decided to buy a container and to start with reconstruction. It lasted longer than I thought mainly because this is still not my principal occupation.

The most important thing is to choose appropriate materials to save the resources, and that is the reason why I have decided to implement *Smart Home* Systems. Bearing in mind the fact that most container houses are being used during winter or summer seasons, this type of technology enables the security and easier control of the houses.

EP ***The fact that there are millions of containers worldwide that are being rarely used and that take up too much space is quite interesting. What are some of the advantages in comparison to other ways of construction?***

Goran Ergic Instead to end up in one of the smelters and that way produce more carbon dioxide emissions, containers that have served their purpose can now get a new one. Depending on the way they are reconstructed, they can now be in harmony with nature. Not only can you move them numerous times, but you can also change their purpose. Worldwide, they are used as holiday homes, residential and office space. Nowadays, they are very popular in the catering industry because of their fast and affordable construction and attractive appearance. A standard 40 ft container can be

The most important thing is **to choose appropriate materials to save the resources**, and that is the reason why I have decided to implement *Smart Home* Systems

GORAN ERGIC was born in 1988 in Sibenik. He lived in Belgrade for 20 years, since the beginning of the 1990s, and for the last seven years, he has been living abroad. He is an information systems engineer and has continued his education in graphic design and marketing. He currently works as a graphic designer at an Italian company. He has a keen interest in architecture and modern design. As a great lover of nature who strives to spend as much time as possible in nature while being engaged in physical activity, he is aware of the importance of protecting the environment. The fusion of love for modern industrial architecture and nature led to the Avala Container Homes.

fully functional in about 15 days. Containers are made according to certain standards so that they can be easily attached together.

Containers are very resilient and can withstand all weather conditions, and they are very safe during earthquakes. There are more and more people in the USA that choose these types of buildings because of security and their ability to resist hurricanes and storms.

Even though I mentioned this a few times, I would like to stress a significant fact that they are very affordable. If they are used in developed countries, why wouldn't we start using them here?

EP ***Considering the fact that you live abroad, why did you decide to start your business in Serbia? Are you thinking about applying for one of the grants for the development of entrepreneurship, innovation and the concept of sustainability in our country?***

Goran Ergic I moved with my family to Serbia during the 1990s, and I spent my childhood here. I spent the last seven years abroad, but I always longed to come back to Serbia and start my business here. Besides being nostalgic, I believe that Serbia is the best country for developing a business like this.

When it comes to grants, I might apply for them at one point. At the moment, it is not possible because I still spend a lot of time abroad.

EP ***Can you tell us more about the smart home concept and why it is important? What exactly does it entail?***

Goran Ergic I believe that this concept is relatively new and my aim is to develop this innovation and bring it to this part of Europe. Besides being mobile, we implement smart systems into these objects. Smart systems enable the control of the entire object even when you are not physically there. For instance, you can turn on/off heating; open/close shutters; turn on/off lights, etc. So far, smart systems have been considered a luxury, but I would like to make it available for everybody.

EP ***Do you think that there is a future for this concept in Serbia? How would you describe a typical customer of the modular home or office space?***

Goran Ergic Even though I had a different opinion at first, I think people in Serbia are ready for innovations. We are behind when it comes to requests since most of them are from the western countries, but recently there have been many inquires from Serbia asking about the advantages of these buildings. Interested people are usually people who are environmentally conscious and follow modern trends in construction and architecture. These people understand the contemporary style of life and changes that are happening. Climate change has a huge impact on nature, and it was especially felt during the last year. We need to take care of nature, and to save the resources and this concept perfectly fits into this idea.

EP ***When we talk about container houses, are your clients using them as temporary accommodation, office space, holiday home or home?***

Goran Ergic As this business is being still developed, so far the main demand is for holiday homes and residential hou-

Instead to end up in one of the smelters and that way produce more carbon dioxide emissions, **containers that have served their purpose can now get a new one**

Photographs: Avala

Avala is one of the most beautiful natural parks in Belgrade and a mountain where I would love to place a few containers and create an ecological oasis

ses made out of multiple containers. As the business keeps expanding and customers coming up with new ideas, the purpose will change as well.

EP ***When it comes to real estate, what do people consider as the most important thing? Why are more and more people interested in fast construction, modular houses, and residential container homes? Is it because of the affordable price?***

Goran Ergic There are a few reasons why people choose container homes. Besides modern design, price is one of the key factors. The pace of construction cannot be compared to conventional construction. Also, the quality is much better compared to other types of prefabricated houses. When it comes to the environmental aspect, there are two main reasons. First of all, forests are not being destroyed as they are for other prefabricated houses. Secondly, something that is abandoned and not being used anymore gets a new purpose and contributes to the protection of the environment.

EP ***What kind of materials do you use when reconstructing containers and how much time is needed?***

Goran Ergic I always use the best quality materials to achieve the best possible durability and quality. All the materials that I use need to have eco-labels. Protecting the environment is one of the main motives why I decided to invest in this business. Besides that, eco-labels are a norm and standard that needs to be respected in the European Union. Energy efficiency is accomplished by triple glazed

Photographs: Avala

01

windows and polyurethane foam, which enables sound and heat isolation and which is at the moment the best on the market.

EP ***Is it possible to rent your container buildings?***
Goran Ergic At the moment, we don't offer that service, but I hope that we will have that option in the near future.

EP ***What is one of the greatest challenges in this job?***
Goran Ergic Even though that there are always going to be new challenges in this job, so far the biggest one was the research that I had to do before even starting this adventure to get an ecological building of high quality. I believe that other challenges will appear, for example, delivering the object on time.

EP ***Why did you decide to name your company – Avala Container Homes? Is it because of the association with Belgrade?***
Goran Ergic Belgrade is my city, and I go back to it very often, and that is why I wanted the name to be associated with it. Avala is one of the most beautiful natural parks in Belgrade and a mountain where I would love to place a few containers and create an ecological oasis. Personally, mountains are the best place for vacation and finding your inner peace.

Interview by: Jelena Cvetic

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FROM FARM TO STREET

- Animal Health and Welfare at the Heart of the European Union Policies

We are still getting used to the absence of the purple cow from the packaging of popular chocolates and the faces of Gerda, Muccha and Marisa, wondering if their predecessor went on vacation to Hawaii, hiked the Himalayas, or is being trained for space travel. As part of a campaign to move from Milka to the real deal – Milka cows, alpine farms are presented as pretty idyllic places, so much that the negative connotation of "milking someone for something" is erased from my mind. However, the health and well-being of animals on many farms are not in a great state. All the more...

The European Union is financing the project "Reinforcement of Animal Health and Welfare" in Serbia with the aim of "recasting" our legislation based on the rules and standards of the European Union. The positive impact of its implementation will not only be felt by chickens, sheep and other farm animals, but also by the economy and the environment. "Economy will benefit from the fact that the consumption of AW friendly products is generally growing all over the world, even though they cost more than the standard products. Yet again, this is just one of the confrontations of intensive versus extensive farming. Raising animals humanely can reduce the use of feed, fuel and water compared to intensive farming, therefore reducing costs and pollution. So, the benefits are both economic and environmental," project leader Petras Maciulskis explained at the beginning of our conversation.

Animal welfare is a complex area that, in addition to the those mentioned above economic and environmental, includes a scientific, ethical, cultural, social, religious and political dimension, based on the belief that animals are sentient beings. Caring for them involves considering the conditions that they are kept in - whether on a farm, as a pet, in zoos or circuses, slaughtered and used in research, and how people's activities affect species' well-being and survival. Animal welfare involves the physical and mental state of an individual animal concerning the conditions in which it lives and dies.

Animal welfare in our country is legally defined as pro-

Photographs: Unsplash/Matteo Di Iorio; on the next page: (bottom left) Unsplash/Evan Clark, (right) Unsplahs/Brett Jordan

viding the conditions in which an animal can fulfil its physiological and other needs inherent in its species, such as feeding and drinking water, accommodation, physical, psychological and thermal comfort, safety, the manifestation of behaviour patterns, social contact with animals of the same species and the absence of unpleasant experiences, such as pain, suffering, fear, stress, illness and injury.

In order to get scientific knowledge on whether the situation on the ground meets the prescribed ideal - but also how to bring the Serbian prescribed ideal closer to the European one - the plan is to involve all stakeholders. If there is any need for corrective action, they will be implemented if resources are sufficient, announced Maciulskis.

The European Union project will not neglect those animals that we, as a society, but also as individuals have neglected - stray dogs. Many countries have successfully solved this problem, and a particularly glaring example comes from the Netherlands, which has homed all of its street dogs. The moment you step out of the house you hear barking and that will infallibly tell you that you are far away from Amsterdam, and I asked my interlocutor if we will ever be closer to it and how. "In general, we could say that southern Europe and countries in the Balkans have more problems than northern European countries and Scandinavia. Stray, or more correctly free-roaming dogs, is then, above all, a matter of cultural habits and to change them it takes time and investments. The key elements are responsible ownership of dogs and the promotion of adoption from kennels," he said, emphasising the importance of a comprehensive approach.

Prepared by: Jelena Kozbasic

PLANNED PROJECT RESULTS

The Project has two components: component 1 – animal welfare and component 2 – animal health. The experts have planned five main results to be achieved during the implementation of the Project.

As part of animal welfare, they will focus on the following:

1. **Reinforced animal welfare standards in line with EU legislation, EU Animal Welfare Platform, OIE Regional Animal Welfare Platform for Europe, OIE Global Animal Welfare Strategy, and European best practices;**
2. **Enhanced capacities for appropriate stray dog management;**
3. **Strengthened administrative and structural capacities for animal welfare.**

When it comes to animal health, they want to achieve:

1. **Reinforced animal disease control policy, aligned with EU legislation, EU Animal Health Strategy, OIE Sixth Strategic Plan (2016 - 2020), and European best practices;**
2. **Further improvement on biosecurity on animal holdings and support for sustainable animal health and welfare policy.**

Photographs: Unsplash/Patrick Fore; on the next page: (bottom right) *Fresh Agriculture Technologies*

AN APP MADE IN HEAVEN

Fresh Agriculture Technologies is developing software solutions to assist in fruit production. A team of seven people of different professions, from agronomists through developers to economists, contributed to the digitisation of agriculture by designing the MapMyApple application, which even Delta Agrar has included in its production

One of the members of Fresh Agriculture Technologies, Jovana Djordjic, announced that she and her colleagues would not stop at apples, but would also help those who cultivate peaches, cherries and pears, Coming from their computers to the Android and Apple app stores and then our gadgets, in the future we can also expect MapMyPeach, MapMyCherry and MapMyPear to arrive. But let's first get to the core of their "firstborn"!

"Since the founding of the company, we want to implement the agronomic knowledge of apple growing experts into one simple application. We live in an era when every person has a phone at hand at all times, so our starting idea was to provide every fruit grower with the information they need to do the orchard work as effectively and accurately as possible with just one click on a mobile device," she explained. She added that MapMyApple creates daily recommendations for the implementation of basic agricultural measures such as irrigation, nutrition and protection. An additional feature it offers to its users is the early identification of disease and the presence of pests based on photography.

Their first "virtual agronomist" was intended for apple growers because it is by far the most popular fruit in the world. As many as 5 million hectares planted, an average yield of 30 tonnes per hectare and about 2.5 million people involved in apple cultivation – those are just some of the figures that pushed them to make MapMyApple their initial step in linking agriculture and information technology.

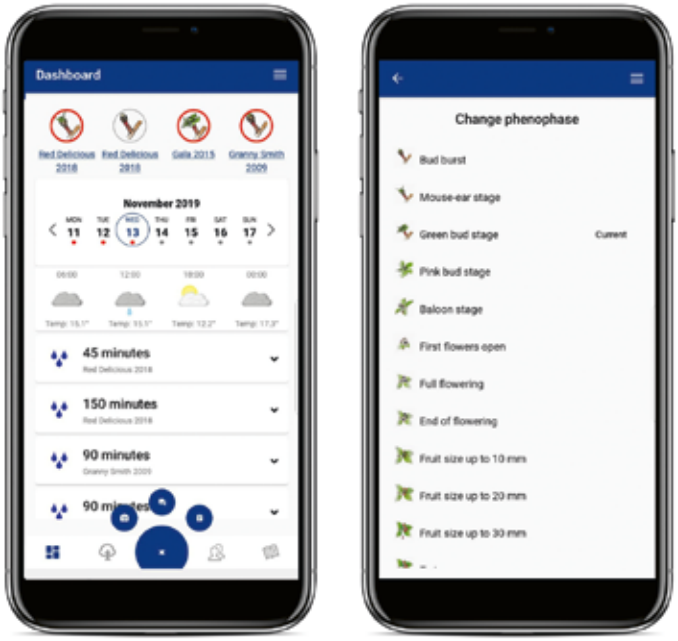
"From the discussions with the fruit growers we have concluded that the knowledge of agronomists and environmental protection experts is expensive for many them, and at the same time, it is important if they are striving for responsible and serious business. For this reason, our application is affordable for small and medium-sized agricultural holdings and monitors the situation in the orchard 24/7.

VIRTUAL AGRONOMIST AMONG APPLES

Even though Delta Agrar is known for investing in innovations and keeping pace with more developed global competitors, for years the so-called field books were kept in various volumes. In essence, employees did orchard work and then sat at a computer to enter a log of activities performed. "The MapMyApple app has enabled their orchard workers to save time and increase efficiency by as much as 25 per cent, following agricultural plans. One click instantly creates an electronic book for the field," Jovana Djordjic praised.

MappMyApple takes into account parameters that people without the help of computers are unable to simultaneously follow and coordinate, such as apple variety, planting year, weather, orchard location, satellite plot monitoring, soil analysis, chemical and mechanical characteristics of soil and so on. After processing all of the above, the application defines a plan for optimal production, which ultimately aims to increase yields and reduce the consumption of fertilisers, water, chemicals, as well as human power, in parts where the biological potential of the soil and plants is weaker," the interviewee revealed, adding that the app is available for download on the Google Play Store and the App Store. The trial period is 30 days after registration, and after that, the usage is charged monthly.

Why should a fruit grower trust this network of algorithms instead of the word of an expert in real life? "The advantage to the virtual agronomist is that the machine-based application simultaneously collects and processes a



Photographs: *Fresh Agriculture Technologies*

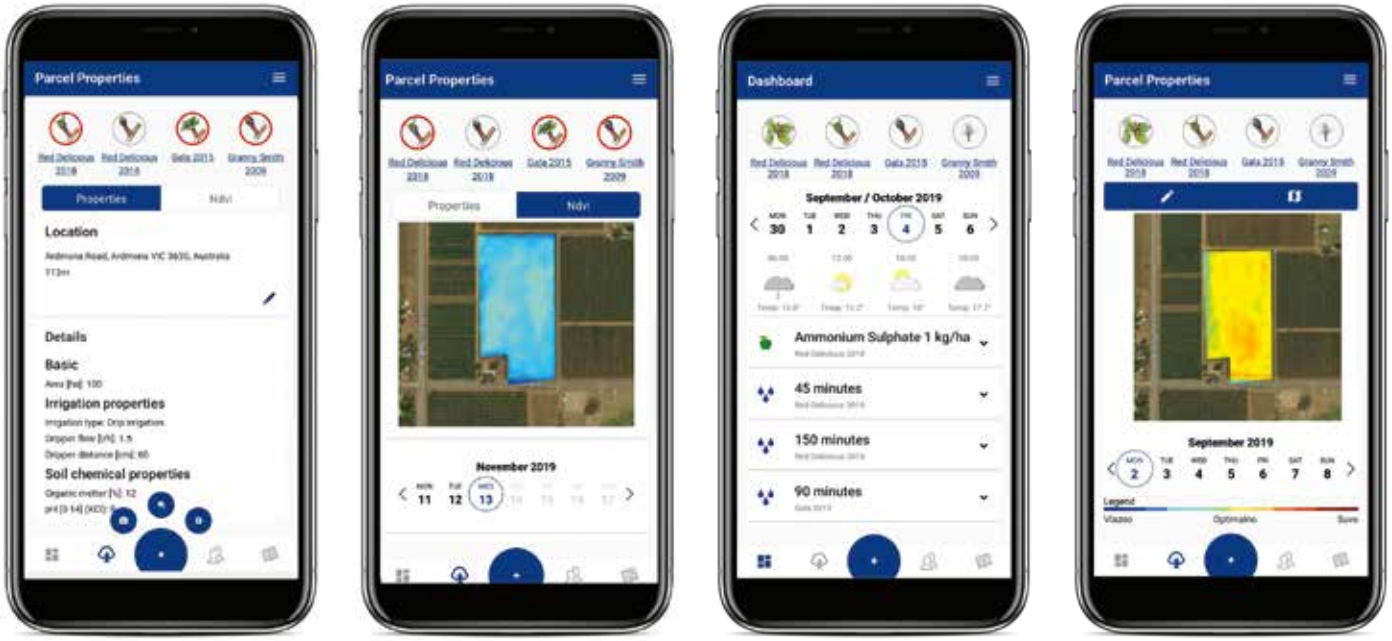
large amount of information from orchards and their environment that affect the agricultural activities. The next important point is accessibility, both when it comes to its affordable price and the continuous support - a MapMyApple user can ask questions or report a problem through an app and receive an agronomist's response immediately, without waiting. However, not all farmers are ready to switch to using the application completely and lose contact with the person who will tell them on the phone what, when and how to do in the orchard. That's what the real agronomists benefit from! The trend of technology adoption is on the rise, and I believe that every farmer will transition to using it in the very near future because of the speed, precision and timeliness of the data," Jovana said.

She also outlined the differences that she noticed between local and other markets. "The cult of precision agriculture is being cultivated much more abroad, and people can educate themselves in many more places, such as international fairs, webinars and conferences. With that in mind, we strive to provide our users with education and to convey to them the atmosphere and novelties from the events we participate in, as well as to organise meetings with them and to enrich their knowledge through blog texts and other marketing channels," she emphasised and stated that their breakthrough into the "digital" world, despite the partial backlash of Serbian farmers, still started in our country. "So far, we have targeted Serbia the most. The reason is, first of all, the closeness of the users. The whole team is here, so it's easy to get around. We also had a lot of users from North Macedonia, more precisely the Resen region, where a lot of apples, are grown," Jovana concluded, pointing out that the next targets of Fresh Agriculture Technologies are America and Turkey.

FROM SERBIA TO NEW YORK

"Last year, we joined the US Apple Association. That is how we paved the path to conquering a new market," said a Fresh Agriculture Technologies spokeswoman. She also noted that the conquest continued with the collaboration with Cornell University from New York, whose agronomists will start to test the algorithms and prepare the product for their climate in March.

Prepared by: Jelena Kozbasic



Photographs: (top right) Unsplash/Charlotte Noelle; all others *Fresh Agriculture Technologies*

SOLAR POWER PLANT FOR POLLUTION REMOVAL

Photographs: Milos Djokic; (on the next page top) coutesy of Gordana Pucar Milidrag

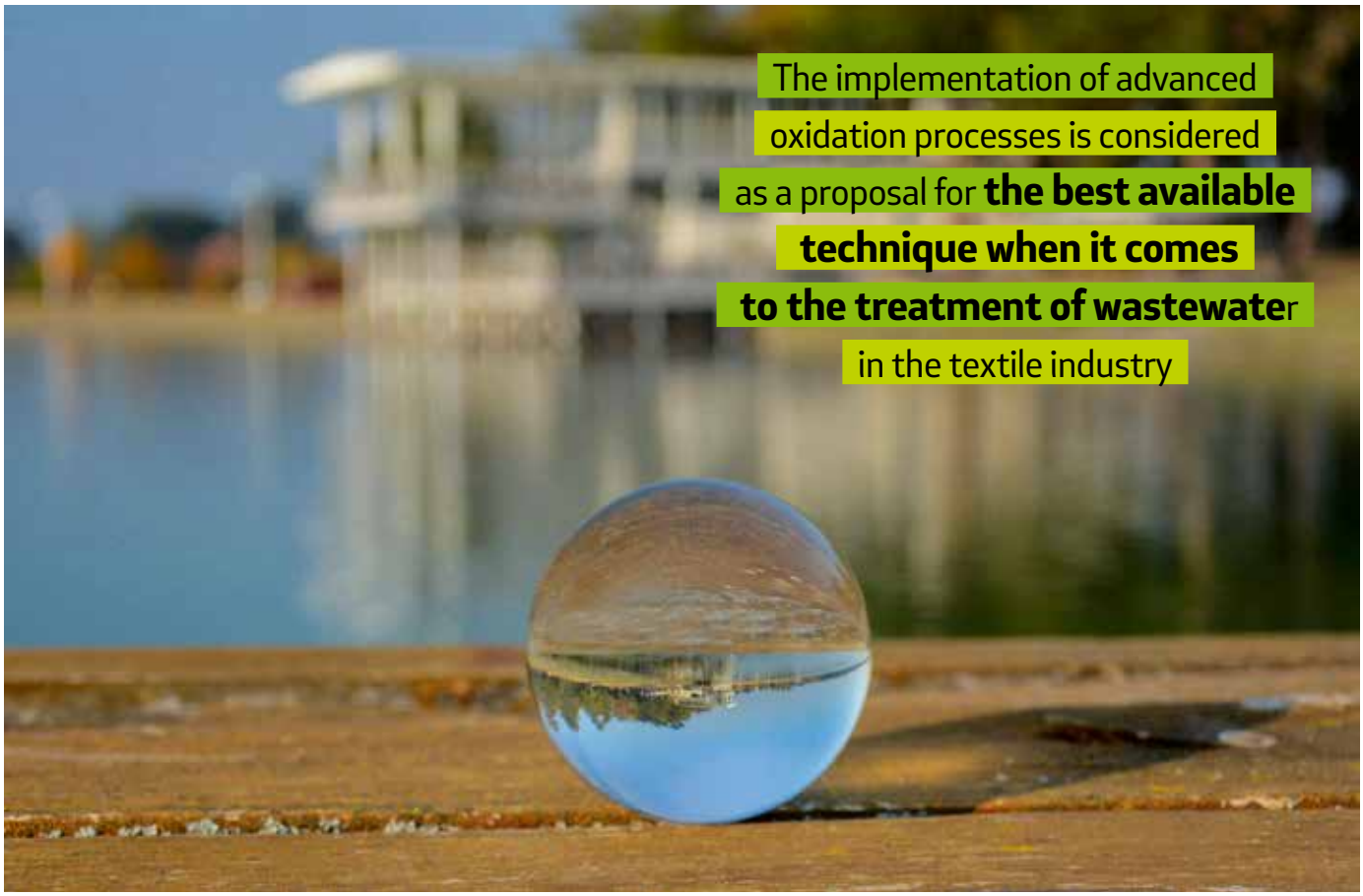
Gordana Pucar Milidrag,
Research Associate,
the Department of Chemistry, Biochemistry and Environmental Protection, the Faculty of Sciences (PMF) in Novi Sad

There is talk in the last few years about more intensive use of solar energy in our country's energy mix. With the desire that such projects come to life and become part of our everyday lives, various companies appear in the market which offer options for potential customers and future electricity producers. Therefore, it is not unusual that solar power plants are emerging, and their primary purpose and unfortunately, sometimes, their only use, is to produce electricity. Rather than this one, science also offers solutions for generating slightly different results.

At the Faculty of Sciences (PMF) in Novi Sad, at the Department of Chemistry, Biochemistry and Environmental Protection, a research is underway on the use of solar energy with the aim of eliminating hazardous substances from wastewater. Specifically, in this case, it is about removing synthetic dyes from wastewaters which originate from the textile industry. The research is being conducted as a part of Gordana Pucar Milidrag's PhD thesis.

The potential of solar energy represents 16.7 per cent of Serbia's total renewable energy potential. Taking into account that the energy potential of solar radiation is for around 40 per cent higher in Serbia than in Central Europe and that the intensity of solar radiation is among the highest in Europe, we come to conclustion that solar radiation is rather sufficient and that it can be used in many different ways. Gordana Pucar Milidrag states that the data show that the average duration of insulation is 2,071 hours, or about 270 days of sunshine, and more than 70 per cent of insulation is generated between April and September.

"When we take into consideration the average weather conditions, atmospheric pollution and humidity, in these areas the real average radiation is about 3.5 kWh/m2 per day. These are the values that provide a reliable massive and economical use of solar energy. It is logical for us, as environmentalists at the Faculty of Sciences, to examine the possibilities of removing pollution



by using this resource. We were most interested in removing pollution by applying so-called photo-Fenton process," says Gordana and lets us know that the process is part of the group of advanced oxidation processes and it is based on the creation of highly reactive hydroxyl radicals in the reaction of iron and hydrogen peroxide.

"Hydroxyl radicals oxidise everything they come across, both organic and inorganic components. By applying this process in the presence of radiation makes the essence of the photo-Fenton process, which is considered to be a good choice for removing of persistent contaminants (or pollution which is difficult to remove), due to the additional generation of hydroxyl radicals by photoreduction of iron and photolysis of hydrogen peroxide. This makes clear that solar energy has a concrete implementation in the process," explains Gordana.

In order to test the possibility of applying the photo-Fenton process, the experiment was performed in a parabolic trough collector (PTC), which is considered to be most appropriate when it comes to wastewater treatment. Such collectors use only direct solar radiation (the higher the amount of radiation is, the greater is the yield). The PTC is small and receives a large amount of energy per unit volume. Gordana says that the main drawbacks are that the collector uses only direct radiation (which means that it is not efficient when it is cloudy), it is expensive due to a tracking system and it has low optical and quantum efficiency.

"Through the implementation of these processes in the collector, a research for removing (degradation) of synthetic dyed molecules which is applied during the fabric dyeing process is carried out. Several different compounds have been successfully degraded by this collector: chromium (VI), dichloroacetic acid, phenols, 4-chlorophenol, dichlorophenol, pentachlorophenol, atrazine, industrial wastewater, etc. However, since the dye molecule itself is 'large' (that is, it has a large molar mass) and it is hardly degradable, we wanted to get an impression of how effective this process really is", Gordana states, adding that the results of the experiment showed that the efficiency of discolouration (removal) of colours was high, around 100 per cent. "Despite this, there is still no complete neutralisation of organic matter to carbon dioxide and water, given to the relatively short duration of the reaction. This is due to the presence of various salts and dicarboxylic acids, as well as additional reactions which involve hydroxyl radicals that interfere with the flow of the process. That is why such processes must be combined with some other processes and applied, for example, in the tertiary treatment of wastewater in the textile industry."

The goal they were aiming for was mostly met. Gordana says that the implementation of such processes allows the reaction to take place under neutral conditions, which reduces the cost of neutralisation in the first step. In addition, thermal energy collected during the radiation concentration can be used simultaneously for other appli-

Photograph: Kristina Sabo

cations. The fact that a catalyst synthesized from clay bentonite was used as the source of iron, which is a natural, widespread and inexpensive material, and solar radiation, as a renewable and alternative photon source, the results mentioned above should be taken into account when analysing the cost-effectiveness of the process applied. The analysis would include, according to Gordana, the land on which such collectors would be built, the chemicals that would be used during the treatments and the energy savings that would be provided by the use of these collectors, with the fact that the collectors could only be used during the sunny days, when radiation intensity is appropriate. "The construction of these collectors is not cheap, but it would also be possible to use construction materials that are not as expensive as reflective surfaces. On the other hand, the implementation of advanced oxidation processes is considered as a proposal for the best available technique when it comes to the treatment of wastewater in the textile industry, while photo-oxidations are being considered as additional new techniques and the possibility of their implementation in tertiary treatment of wastewaters on semi-industrial systems is being examined," Gordana presents possible solutions.

An important factor is the willingness of the state or the investor to support the development of such technologies. While the device is not positioned on the market, the information on its cost-effectiveness is not available. There are similar projects in Spain, Italy and the United States, which does not prevent them from continuous development of new processes for implementing such collectors.

Gordana believes that the continuation of this research should go towards the improvement of the process, including the collector itself, in order to ensure complete mineralization. "Like any scientist, I want my work to see the light of the day, not to be a stillborn, rather as something tangible, practical and purposeful. Especially because behind all that is such a strong motive to preserve the planet."

Prepared by: Mladen Rajic

Photograph: coutresy of Gordana Pucar Milidrag

An important factor is **the willingness of the state** or the investor **to support the development of such technologies**


DONORUM
HAS ECOLOGY AND
PHILANTHROPY
AT HEART

In 2016, France prescribed that it is compulsory for all supermarkets in its territory to donate excess food on a daily basis. Otherwise, they face fines of up to €75,000. Thus, solidarity among the French is encouraged by the letter of the law. On the other hand, due to the absence of the Law on Donations in Serbia, donor companies have to pay VAT of 25 per cent, revealed Gordana Jovanovic, manager of Donorum.

Together with Ilija Veselinovic, Zvezdana Mutapovic, Filip Krivokapic, Tomas Momcilovic and Stefan Zivic, Gordana launched Donorum intending to offer the response to the accumulation of food waste in Serbia. This non-profit, non-governmental association originated from the desire of youth to help socially disadvantaged people. Its name comes from the Latin word meaning gift - donum. Guided by the motto that food surpluses are not a problem solely of an ecological and agro-economic nature, but that they also affect people in our community, donors Gordan, Ilija, Zvezdana, Filip, Tomas and Stefan have designed the Public Kitchen Infrastructure application.

According to the United Nations, more than 250,000 tonnes of food is thrown away annually by Serbian households, which means that each country resident sends around €200 to the landfill. A not too nice and convenient place to invest money, we will agree! "Other countries view food

waste as a basic resource, while our companies and individuals continue to fail to realize its potential due to regulations and irresponsibility," said our interlocutor, who is by profession a geographer and an environmental engineer.

One of those countries Gordana is talking about is Ireland, which is where the Food Cloud app comes from. Food Cloud was an inspiration for her and her colleagues to make Public Kitchen Infrastructure. It brings together more than 4,000 charities with the largest retail chains out there, such as TESCO and ALDI. "We believe that a similar project is feasible for us, as we have proven by creating this app," she said.

We also received firsthand information about how Public Kitchen Infrastructure functions. "Donors and humanitarian organisations should register to our website donorum.org. Then we do the checking. Registered users then receive their profiles. Donors can post donations to our platform at any time after the process is completed and they become visible to all affiliated charities," Gordana, one of the original creators of Donorum, revealed to us. She adds that donors have the option to indicate the quantities of food that they have on disposal and the packaging those are in, as well as the option to check the donation as "an emergency" if necessary.

The application is free of charge, and the data is updated in real-time and is available to the public. It started working at the end of October 2019, when company Imlek donated milk for the rehabilitation centre Duga from Novi Sad and the charity organisation Carolija from Belgrade.

Gordan, Ilija, Zvezdana, Filip, Tomas and Stefan united their knowledge and skills in designing the website and promoting their association and application. The available resources were put into service by a noble cause. However, it requires collective action. Ecology and philanthropy seek the involvement of the state, industry and legislators, and Donorum delivered them a great meeting place.

Prepared by: Jelena Kozbasic

CAN WE USE THE APP?

Currently, individuals cannot make their contribution to the work of Donorum's public kitchen. Still, the team hopes to receive project funding soon to enable them to create an application for Android and Apple devices, Gordana explained.

By then, the association is inviting citizens to follow them on social networks, where they share tips for preventing food waste at home.

Ecology and philanthropy seek the involvement of the state, industry and legislators, and Donorum delivered them a great meeting place

Photographs: (on the previous page) Unsplash/Jonathan Borba; (on this page) Pixabay

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SUSTAINABLE ENERGY SOLUTIONS FOR THE THRIVING WORLD

The development of sustainable energy projects, including finance and advisory services, makes the core business of E3 International (E3I). Bonnie Norman, president of E3 International and well-known advisor on the creation of green banks, has more than two decades of experience in strategic consulting. We talked with Bonnie about use of renewable energy sources and energy efficiency, and she filled us in on new program that should enable creating of energy farms at abandoned land in Serbia.

EP ***What projects are in focus and how long has E3I been present in this region?***

Bonnie Norman E3 International collaborates with clients to create and scale up bankable sustainable energy solutions for a healthier and more resilient world. We offer sustainable energy project development, finance, and advisory services from offices in Belgrade, the European Union, and the United States, where we're headquartered. Our team has been working in Southeast Europe and the Western Balkans for the last twenty years. We are a motivated group of experts dedicated to making a difference locally, regionally, and beyond.

The E3I team began its regional involvement in 1999 as the implementing partner for the European Bank for Reconstruction and Development's (EBRD's) Municipal Energy Efficiency Program in Bulgaria. In 2010, E3I expanded its regional work, as implementing partner for EBRD's Western Balkans Sustainable Energy Finance Facility (WeBSEFF). Through WeBSEFF, E3I has supported over four hundred energy efficiency and renewable energy projects for commercial, industrial, and municipal enterprises and over EUR 200M in investment, and are developing new projects in Serbia for WeBSEFF financing. E3I is also pleased to serve as local implementing partner for the United States Agency for International Development's (USAID's) activity in Serbia to increase energy efficiency and the use of renewables in district heating.

BONNIE NORMAN, the president of E3 International, was formerly an executive with a leading international corporate real estate firm. She is a requested speaker and advisor on the creation of green banks to scale up low-carbon resilient investment. A LEED AP, she received her MBA from Harvard University.

EP ***What's your latest initiative?***

Bonnie Norman E3I recently kicked off its Sustainable Lands Initiative (SLI) for Serbia. The Serbia SLI puts government-owned abandoned and degraded agricultural land back in productive use, creating sustainable energy farms to support rural jobs and economic development and to improve the environment—air, soil and water quality, flood resilience, biodiversity, and native forest protection. Our goal is to catalyze EUR 3 billion in private investment—through the SLI's planned Sustainable Serbia Finance Facility—to improve tens of thousands of hectares of abandoned land and associated rural lives, with a positive return for investors projected in 5-6 years on a 20-year project life.

EP ***What's the driving forces behind the Sustainable Lands Initiative (SLI)?***

Bonnie Norman Several factors are contributing to why the time is right for the Serbia SLI. We're in a climate crisis—globally glaciers are melting, annual average temperatures are at record highs, extreme weather events are increasing, and locally air quality in Serbia this year has been a focal concern. We have only a short time to avert disaster, to keep global warming under the 2 degrees Celsius threshold by 2030.

Importantly, Serbia has 1. 6 million hectares of abandoned and degraded agricultural land no longer suitable for food production. This land could quickly help provide a natural capital solution to Serbia's climate challenge as locations for fast-growing wood biomass plantations for energy or for other renewable energy "farms", like solar, wind and geothermal. Use of cleaner fuels would improve air quality, and co-firing of wood biomass in coal boilers--which can be done right now--would dramatically reduce the contributors to smog in the near term.

The demand for wood pellets and chips regionally and globally is growing beyond the limits of what Serbian forests can sustain. Harvesting fast-growing willow or poplar after 3-4 years makes more sense than depleting forests of mature trees. Creating a stable and predictable biomass market through the creation of biomass centers, as in Lith-

Photographs: E3 International

uania, will protect individuals and businesses from price spikes due to supply constraints – price spikes which would affect the most vulnerable populations disproportionately.

At the Energy and Investment Days in Novi Sad, held in February, biomass expert Professor Glavonjic called fast-growing wood biomass plantations "Serbia's oil". Wood chips and pellets from these plantations can be used as a secure local energy source and for export.

Serbia has rural economic challenges which this initiative would address, including declining rural village populations with farmers needing additional sources of income and youth seeking more opportunities. Fast-growing wood biomass plantations are harvested in the winter, when the farmers do not have work, and use conventional farm equipment. Since these plantations (or coppices) will be grown on abandoned, degraded land, they will add to what is currently under cultivation. Adding solar PV, wind, or geothermal farms, where best suited on abandoned, degraded land tracts, will improve the overall investment opportunity and provide next generation local jobs.

EP ***What synergies support SLI's intended transformative results?***

Bonnie Norman The Serbia SLI has synergies with EU programs to support its advancement from donors and partners. It aligns with the objectives of the new European Green Deal, the EU Energy Barge initiative for the Danube, as well as the Dendromass4EU project, which highlights

bioeconomy innovation along with cultivation of short rotation wood biomass plantations for sustainable energy. Ikea is a partner in that ongoing effort, along with the European Commission, University experts, and others.

In addition, the Serbia SLI will adapt from the State University of New York (United States) its proven model for commercial short rotation wood biomass production. The SLI targets including Development Credit Authority guarantees currently available through USAID in Serbia for small farm enterprises.

Lastly, the SLI will be structured to spark much new private investment, by securing large credit worthy biomass supply off-takers such as electricity, district heating, or industrial companies. A blended finance approach through the SLI's planned Sustainable Serbia Finance Facility will result in flows of capital to achieve results at scale, leading to a green bond and further investment. We will build on the learnings of two similar successful (at scale) land recovery finance facilities created by now Assistant Secretary General of UNEP, Satya Tripathi, who has been an inspiration and SLI advisor from the start.

EP ***Who else is on board?***

Bonnie Norman E3I has received interest and support from the Republic of Serbia at the highest levels, an MOU with the Autonomous Province of Vojvodina, where much suitable abandoned land is located, industry partners, leading NGO partners, international and local development finan-

ce institutions, local associations, the Serbian Chamber of Commerce, the banking community, and a wide variety of other stakeholders. We welcome all partners to create impact at scale for the Serbia SLI as quickly as possible.

EP ***What's next?***

Bonnie Norman With donor support, we are completing our feasibility analysis on several key components ahead of project initiation and demonstration starting later this year. With the support of the United Nations in New York, we have targeted a formal launch at COP26, the United Nations' pre-eminent annual climate convening of which Serbia is a Vice President in 2020. The goal is for the SLI to highlight Serbia's innovation and leadership in addressing its climate change objectives at scale.

Sustainable Land Initiative

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ECO START PROJECT

Organic fruits, vegetables and herbs have become very popular on the market in recent years, so has the need for their production. Recognizing the importance of this trend, land potential in their environment, as well as the needs of their fellow citizens, the Women's Association "Vukovar" once again made good use of the support of European Union funds and implemented a project that will train forty-two citizens for organic farming, herbs cultivation and processing

The Women's Association "Vukovar" has been active within the local community for more than twenty years, intending to more engage vulnerable groups of citizens, such as elders and unemployed women, victims of domestic violence and members of national minorities, in social development and decision-making and contribute the better quality of life for them. They carry out their activities by implementing both national and EU programs and projects. One of them, currently underway, is the *Eco Start project*, with the aim to empower citizens who are interested in producing organic fruits, vegetables, and also in producing, growing and processing herbs. Like many other projects they have implemented so far, this one is supported by the EU Fund, whose competitions the Association monitors regularly and in which participates when they can be aligned with the needs and capabilities of the local community.

"Our activity is based on listening to the real needs of citizens and other community organisations, and by organising and implementing activities, we influence the information, education and empowerment of marginalised groups of society. We regularly monitor the announcements of the competition and report to those areas where

Photograph: Unsplash/Harald Arlander

our Association is active. Preparing a project is not a difficult job if it involves projects that follow our vision and mission and contribute to the achievement of our goals, as well as the goals of a particular competition. All of our projects are based on the protection of human rights, the development of the local community, improving the lives of old and infirm people, as well as encouraging the employment of vulnerable groups of society", says Jelena Jankovic, a member of the Association. "For the project to get funding from the EU funds and to be implemented, it is important to have the human capacities for its realisation, project partners, and the project activities themselves should be relevant to the target group which is involved in the project. Also the project must contributes to the achievement of the objectives set out in the relevant national and regional strategic documents in the area of the competition. The advantage is if the project has greater regional coverage."

The *Eco Start project* started a year ago was written in collaboration with an adult school and with them agreed to implement training for two programs - an ecological producer of vegetables, fruits and aromatic herbs and aromatic and spice herbs producer and processor. The City of Vukovar supported them by giving land for practical training.

"The response of the participants is good, which shows that the interest in organic agriculture has increased recently and that people started to take care of what they eat, where they buy food and if that food is really organic", our interlocutor said, adding that forty-two people were involved in the project, divided into two equal groups for each training program. The largest number of students were middle-aged women who have been unemployed for a long time. "The target group of this project is the unemployed, young people and women. We want to enable them to become more competitive in the labour market by acquiring new knowledge and skills and giving good support to those who want to start their own business in organic agriculture," emphasizes Jelena Jankovic.

Those who wish to embark on this type of work after completing the training can count on national and EU funds. "The importance of organic production in Croatia can be seen in the continued financial support for ecological production through grants under state and EU assistance. The state stimulates producers to decide to engage in organic production through constant finance and other forms of support", explains Jelena Jankovic. She also adds that the reason for the growing number of areas under

organic farming can be found in the realisation of support for organic agriculture, financed from the European Agricultural Fund for Rural Development, under measure 11 – "Organic farming". Besides, users involved in organic production can earn extra points in most public calls within the Rural Development Program. In this way, additional work and effort are rewarded.

What has further encouraged the realisation of this project is the fact that the environment of Vukovar is well suited for organic production and rich in arable land. In fact, our interlocutor points out, the whole of Croatia has quality, but underutilised land for organic farming, because such products are harder to grow, and they are much more expensive on the market. However, demand for organic products is increasing, and since 2010 records an increase in the number of organic producers in Croatia, which certainly has been contributed by incentives in organic farming.

The training program for producers and processors of aromatic and spicy herbs is conducted through two hundred and two hours of theory and practice, and the training program for organic producers of fruits, vegetables and aromatic herbs lasts one hundred and fifty hours. In addition to getting basic knowledge of plants, vegetables and fruits, production and processing technology, they also learn about occupational safety and health, fire protection and first aid. The training is not completed yet, the practical part of the course is currently underway, and after that, the participants will pass workshops "From field to table" and "How to get your job in agriculture". After that, the twenty most motivated will receive five career counselling hours and assistance in developing a business plan.

In addition to the *Eco Start project*, the Women's Association "Vukovar" is currently implementing two other EU projects - *Wish for Vuko*var. With this project, they employed ten women for helping the elderly at home and the *New Knowledge - New Opportunities* project, which offers the possibility of free training for designing and implementing projects from EU funds for the unemployed and the long-term unemployed. Beside EU projects, the Association also implements national projects whose aim is to improve the quality of life of people in their community and ensure better accessibility of social services.

"Within our association, there is a *Club of Third Age Persons*, where fifteen to twenty people gather every day in the afternoon. For the fourth year in a row, we have been conducting daily activities for the elderly, such as exercises with the help of a physiotherapist, measuring sugar and blood pressure, cultural and entertaining activities (creative workshops, natural cosmetics workshops, reading rooms, games for improving memory, etc). Also, we are authorised to provide free legal aid, we have an SOS line that operates every day from 8 am to 6 pm", says our interlocutor.

The Women's Association "Vukovar" cooperates with similar organisations in the region. Through a three-year *Empowerment to Better Integration* program, they carry out part of their activities in rural areas to contribute to the widening of alternative social services where they are not available, assisted by organisations operating in those areas. They also have good cooperation with local self-government, institutions and establishments. They are members of the Gender Commission, the County Team for Combating Violence against Women and Domestic Violence, the Mobile Trafficking Team, the Women's Network, the SOS Network and the PETRA Network.

Prepared by: Tamara Zjacic

Photographs: *Eko start*

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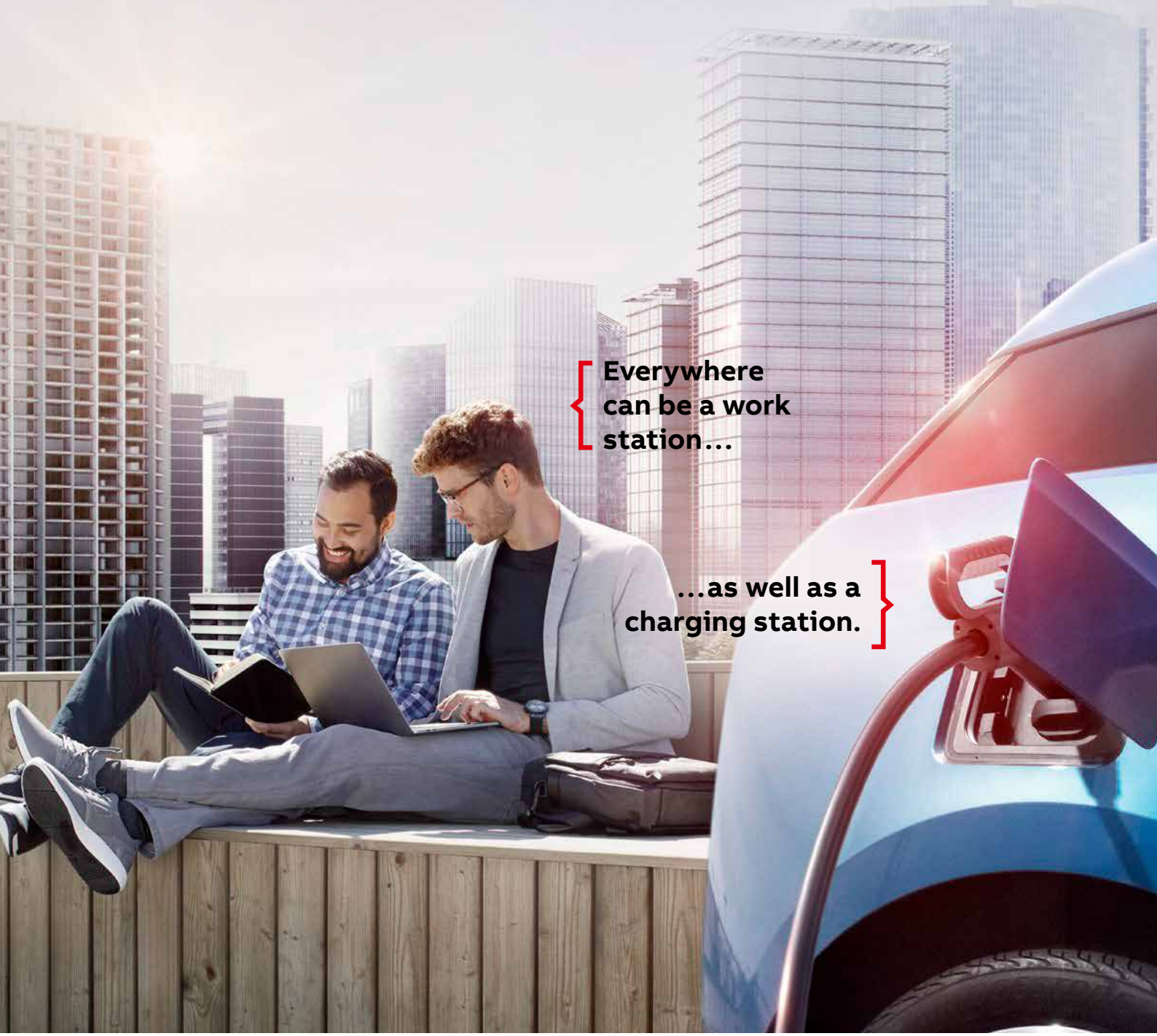

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