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Managing the energy transition - the road to a green economy without losers

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***Abstract**: The transition towards a low-carbon economy over the next few decades poses a global challenge, including for Serbia. In regions whose economic development relies on mining (exploitation of non-renewable sources of energy and raw materials), there is a crucial need for investments in new sources of clean energy, the development of new industries, and the creation of new green jobs. Anticipating these trends and their impact on existing mine workers is essential for effectively managing the energy transition and creating a green economy where they won't be left behind. The authors of this paper focus on analyzing the attitudes of mine workers in Serbia regarding this issue and their readiness to embrace changes, aiming to contribute to the promotion of the need for an accelerated and fair energy transition. To ensure the relevance of the conclusions, field research was conducted during November and December 2023, coupled with an analysis of available literature and officially accessible public documents related to this field. Efficient management of the energy transition requires aligning strategies for reindustrialization, innovation, the adoption of clean technologies, and investments in green infrastructure. Simultaneously, measures ensuring a smooth transition are necessary, including social protection, training for acquiring new knowledge and skills, labor market policies, as well as community development and renewal.*

***Keywords**: just energy transition, green economy, renewable sources.*

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Upravljanje energetskom tranzicijom - put ka zelenoj ekonomiji bez gubitnika

Apstrakt: *Tranzicija ka niskougljeničnoj ekonomiji u narednim decenijama postavlja globalni izazov, uključujući i Srbiju. U regionima čiji se ekonomski razvoj oslanja na rudarstvo (eksploataciju neobnovljivih izvora energije i sirovina), ključna je potreba za investicijama u nove izvore čiste energije, razvoj novih industrija i stvaranje novih zelenih radnih mesta. Predviđanje ovih trendova i njihovog uticaja na postojeće radnike u rudnicima od suštinskog je značaja za efikasno upravljanje energetskom tranzicijom i stvaranje zelene ekonomije u kojoj neće biti zapostavljeni. Autori ovog rada fokusiraju se na analizu stavova rudara u Srbiji u vezi sa ovim pitanjem i njihovom spremnošću da prihvate promene, s ciljem doprinosa promociji potrebe za ubrzanom i pravednom energetskom tranzicijom. Kako bi osigurali relevantnost zaključaka, terenska istraživanja su sprovedena tokom novembra i decembra 2023. godine, uz analizu dostupne literature i zvanično dostupnih javnih dokumenata u vezi sa ovom oblašću. Efikasno upravljanje energetskom tranzicijom zahteva usklađivanje strategija za reindustrijalizaciju, inovacije, usvajanje čistih tehnologija i investicije u zelenu infrastrukturu. Istovremeno, neophodne su mere koje obezbeđuju glatku tranziciju, uključujući socijalnu zaštitu, obuku za sticanje novih znanja i veština, politike na tržištu rada, kao i razvoj i obnovu zajednica.*

Ključne reči: *pravedna energetska tranzicija, zelena ekonomija, obnovljivi izvori.*

1. Introduction

The concept of a just transition first emerged in the 1970s when employees in the American oil, chemical and nuclear industries faced the risk of job loss due to new environmental protection legislation. At that time, this concept was understood as a comprehensive program to support workers whose jobs were threatened by new legal regulations.

Two key characteristics of this interpretation of a just transition remain relevant today. The first is that it is not about social assistance, but rather a comprehensive plan that would provide displaced workers not only with financial compensation and security but also, equally importantly, a change in the work environment and the opportunity for adequate retraining.

The second characteristic is that a just transition involves more than a simple replacement of energy sources, given today's interpretation that emphasizes

the need for integrated social adaptation, economic reorientation, the formulation of appropriate policies, and the fair distribution of resources (Galgóczi, 2018).

The idea of energy transition has been incorporated into international agreements and accords, such as the United Nations Framework Convention on Climate Change and the Paris Agreement within the framework of the UN Convention, which came into effect in 2016 and was signed by 196 countries (Petovar, 2021).

For many years, Serbia has engaged in discussions about the necessity of transitioning to renewable energy sources and moving away from coal-based energy production. Concurrently, over the past three decades, coal-fired power plants in the European Union have faced increasing regulatory pressures to reduce air pollution (Nikolić, Filipović, 2020). However, ensuring a just transition often seems to be overlooked. It is essential to consider the interests of all stakeholders during the energy transformation, particularly those who are losing their current jobs and undergoing retraining for new positions.

The transition to a low-carbon economy in Serbia, where fossil fuels play a predominant role, necessitates substantial shifts in technology, industry practices, the exploration of novel energy production and consumption methods, the embrace of innovative business models, and a heightened emphasis on circularity in production and consumption processes. Yet, merely substituting non-renewable energy sources with renewables and enhancing energy efficiency might fall short. Studies indicate that while transitioning to renewable energy sources can contribute to a reduction of about 55% in global greenhouse gas emissions, the remaining 45% stems from production methods and product usage. The energy transition requires acquiring new skills that differ from traditional industrial expertise. Therefore, it is crucial to focus on training and a proactive approach to developing new skills resilient to anticipated changes in the future to effectively implement the energy transition.

Leading the fourth industrial revolution (Filipović, Ignjatović, 2021), the green transition offers European industry the opportunity to create markets for clean technologies and products, impacting value chains in energy, transport, and construction. The electrification of the sustainable economy and increased use of renewable energy may result in higher employment rates in these sectors. Enhancing the energy efficiency of buildings is expected to create jobs in construction, with a demand for local labor (Ignjatović et al., 2024).

Rapid economic and technological progress has necessitated significant energy production, but over time, increasingly evident consequences have emerged, presenting today's generations with the significant challenge of addressing climate change issues. Achieving comprehensive success in the

energy transition necessitates a simultaneous focus on ecological, social, and energy-related aspects. Only through such a holistic approach can we truly speak of a successful closure of the loop and the establishment of a sustainable system (Spasojević, 2021). In the era of electronics and informatization, the world is undergoing profound changes, and modern technologies and the imperative to achieve sustainable development, where meeting current needs will not jeopardize meeting the needs of future generations, become a life necessity (Ristić et al., 2020).

For the purpose of preparing this paper and providing answers based on primary quantitative data to several key questions in the process of implementing a just energy transition, a survey was conducted with a sample of 110 respondents employed in 5 selected mines in Serbia (RB "Kolubara", "TE-KO Kostolac", Lead and Zinc Mine "Grot", Serbia Zijin Copper, Lece Mine).

The results of this research will be presented in the following text, following a brief theoretical overview of the impact of energy transition on employees in this sector and the effective management of key segments of this process, ensuring there are no "losers" in the transition.

The energy transition will have to happen sooner or later because the amount of exploitable fossil fuels is a limited resource. Additionally, to mitigate climate change even to a small extent, it is necessary not to extract all the oil from the ground and not to burn all the coal that has formed in the Earth's crust over millions of years. When the energy transition occurs, the question is whether it will be just and socially sensitive or if, like an economic transition, it will produce a few winners and a majority of losers. This is a matter of strategic determination and political will (Milosavljević, 2023). Therefore, this paper aims to deliver scientifically grounded insights into the implementation of the energy transition and assess the political readiness for its execution. The research focuses on determining whether employees in the Serbian energy sector perceive an existing political will and preparedness for a fair energy transition to a green economy, or if they believe that such readiness has yet to materialize.

2. The energy transition and its impact on employees

The global course towards low-carbon development is poised for acceleration on a worldwide scale, with heightened emphasis evident within the European Union (EU) and among nations aspiring to EU accession. This momentum is underscored by the imperative for these countries to align with the EU's regulatory climate framework, as outlined by Gonçalo (2020). Against this backdrop, Serbia finds itself grappling with the intricate challenges stemming

from the direct impacts of low-carbon development on its mining sector, workforce, mining regions, and the communities linked to these areas.

Within this evolving landscape, the concept of a fair energy transition assumes heightened relevance and complexity. The multifaceted nature of this transition introduces new dimensions, as elucidated by Đukić (2022). These evolving aspects not only necessitate a comprehensive understanding, but also prompt a proactive approach to address the ensuing challenges. As the discourse on a just energy transition gains prominence, it becomes a catalyst for expediting transformative changes and encouraging a systematic exploration of sustainable solutions.

In navigating this complex terrain, stakeholders must consider not only the economic implications, but also the social and environmental dimensions of the transition. This holistic perspective is imperative for shaping policies and strategies that foster resilience, inclusivity, and sustainability within the mining sector and the communities it sustains. The challenges posed by the transition towards low-carbon development thus present an opportunity to recalibrate existing paradigms and forge a path towards a more equitable and environmentally sustainable future.

The International Labour Organization issued guidelines for a just transition towards environmentally sustainable economies and societies for all (ILO, 2015). These guidelines emphasize the crucial concept of a „well-managed transition“, which can become a powerful driver for job creation, job improvement, social justice, and poverty eradication. By implementing these guidelines, individual countries can achieve a well-managed transition to a low-carbon economy that leaves no one behind and creates a better future for all. They underscore that the joint and simultaneous creation of new jobs and the protection of the environment and climate are not optional but a necessity.

A just energy transition is based on the principle that no one should be its victim. The energy transition will not happen spontaneously; it requires stable policies, careful and efficient planning, and appropriate investments. Employees and communities dependent on fossil fuels will not immediately find alternative sources of income. Therefore, the transformation involves not only a gradual phase-out of the most polluting sectors, but also working towards creating new jobs, investing in new industries, acquiring new skills, and providing opportunities to build a more equitable and resilient economy.

Key to this is the development of robust, stable, and coherent industrial policies that support emerging sectors while simultaneously assisting traditional industries that can be crucial drivers for implementing more efficient and sustainable production processes.

Ensuring a "just transition" for workers is crucial, simultaneously creating decent and quality jobs. Energy diversification and reliance on renewable energy sources are also a path to achieving greater energy stability, independence, and security, making the economy more resilient to potential regional or global conflicts. On the other hand, energy security is equivalent to national security, giving this issue a priority in political importance.

Serbia is among the countries that, as part of the implementation of energy transition policies, the achievement of climate neutrality, and decarbonization (reducing greenhouse gas emissions), have accepted a series of international agreements, contracts, and other acts. Within these commitments, it has also taken responsibility for developing the Integrated National and Climate Plan (INECP). This document serves as a vital strategic plan outlining objectives for the period leading up to 2030, with a forward-looking vision reaching to 2050, concerning renewable energy sources and energy efficiency. It includes specific policies aimed at realizing these objectives.

Consistent with these efforts, Serbia introduced a series of laws in 2021 related to energy and mining. These legislative measures encompass the Law on the Use of Renewable Energy Sources, the Law on Energy Efficiency and Rational Use of Energy, amendments to the Law on Mining and Geological Exploration, and the Energy Law. Notably, the Energy Law mandates the formulation of the Integrated National and Climate Plan (INECP).The process of creating the INECP was initiated following the adoption of the aforementioned law.

Integrated National and Climate Plan (INECP) consists of two sections - A and B. Section A defines national goals, policies, and measures, while Section B contains an analytical basis describing reference and advanced scenarios and their outcomes. This document provides an overview of the current state of key policies and corresponding measures through five dimensions:

1) Decarbonization (greenhouse gas emissions and renewable energy),

2) Energy efficiency,

3) Energy security,

4) Internal energy market, and

5) Research, innovation, and competitiveness (EU Regulation 2018/1999).

The opening of new solar, wind, or hydroelectric power plants leads to the creation of new jobs. However, when thermal power plants are closed, special attention must be paid to workers, especially miners, given their size and qualifications, as well as all those crucial to the operation of these facilities. This primarily involves ensuring the respect of rights and obligations towards these workers. These conditions encompass issues related to early retirement,

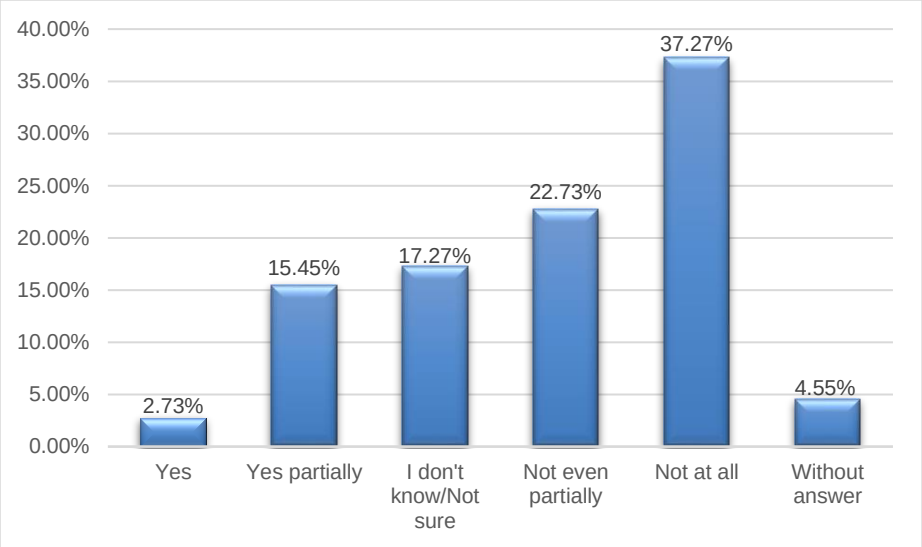
compensation and allowances payouts, support for starting private businesses, but particularly emphasize the importance of retraining this workforce (Spasojević, 2021).

2.1. Analysis of attitudes among employees in the energy sector

One of the important questions related to the implementation of energy transition is the existence of political readiness for its execution. Therefore, the first question in the survey was posed with the aim of gaining insight into whether employees in energy sector companies in Serbia believe that there is political readiness for the energy transition towards a new green economy, or if that readiness still does not exist.

The responses obtained indicate that the majority of respondents believe that such readiness does not exist or exists only partially (60.00%), as shown in Graph 1.:

Figure 1. Existence of political readiness for energy transition

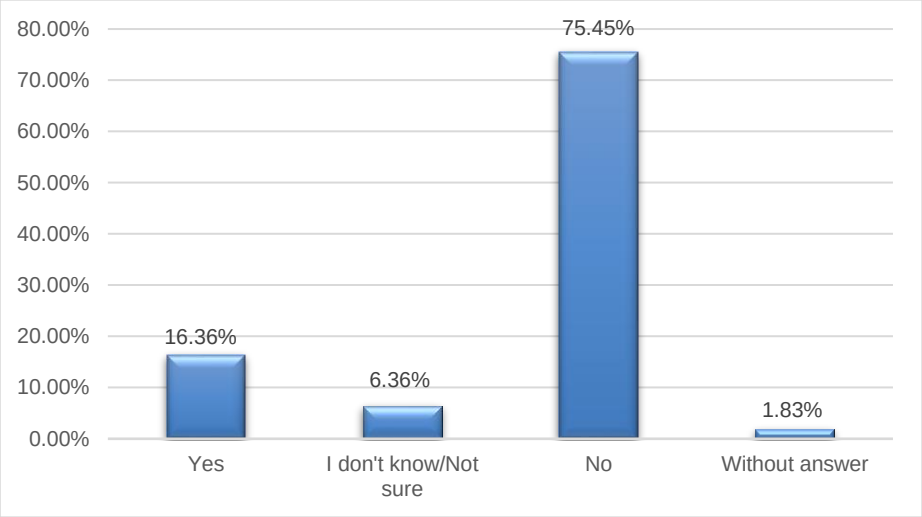


Source: Analysis by the author

The obtained responses to the second question posed in the conducted research confirm that there is still much work to be done in promoting and familiarizing employees with the content of the Integrated National Energy and Climate Plan in Serbia.

Specifically, as much as 75.45% of the respondents admit that they are not familiar with this document, with only 16.36% claiming to be familiar with it. The percentage of those who responded that they do not know or are not sure about the answer to this question was 6.36%, and 1.83% of the respondents did not answer the question. Among the respondents who confirmed being familiar with the Integrated National Energy and Climate Plan, only 44.44% provided more details on how they became acquainted with the plan, answering the question about who informed them about it. Although it was expected that the management would be the source of information of this kind for employees, none of the respondents provided such an answer. Instead, sources of information mentioned were the company's union and the media.

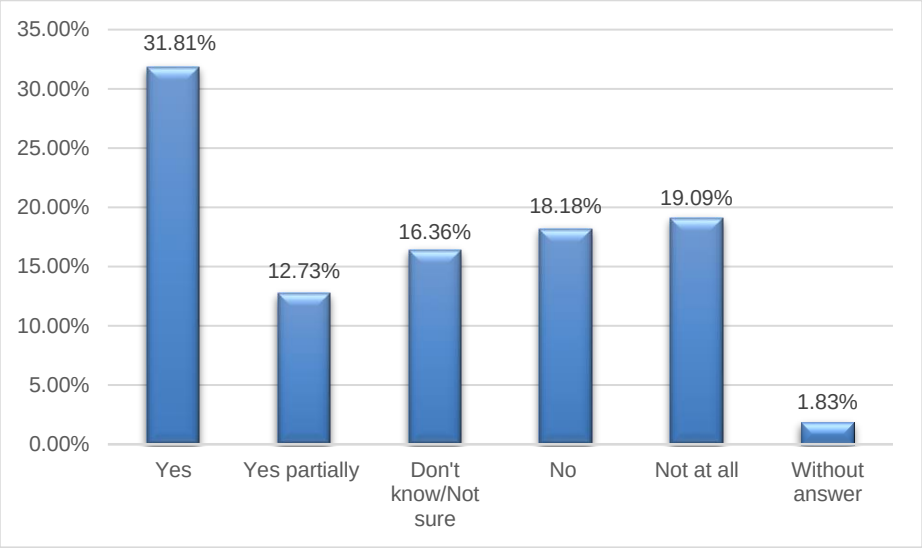
Figure 2. Awareness of the existence of the Integrated National Energy and Climate Plan



Source: Analysis by the author

That the process of digital transformation has been implemented in the company where they are employed was confirmed by 31.81% of the respondents, while 12.73% stated that the process has only been partially implemented. Among those who do not have this information or do not know whether the process of digital transformation has been implemented, 16.36% of the respondents fall into this category, and 37.27% of the respondents believe that the process of digital transformation has not been implemented or has not been implemented at all.

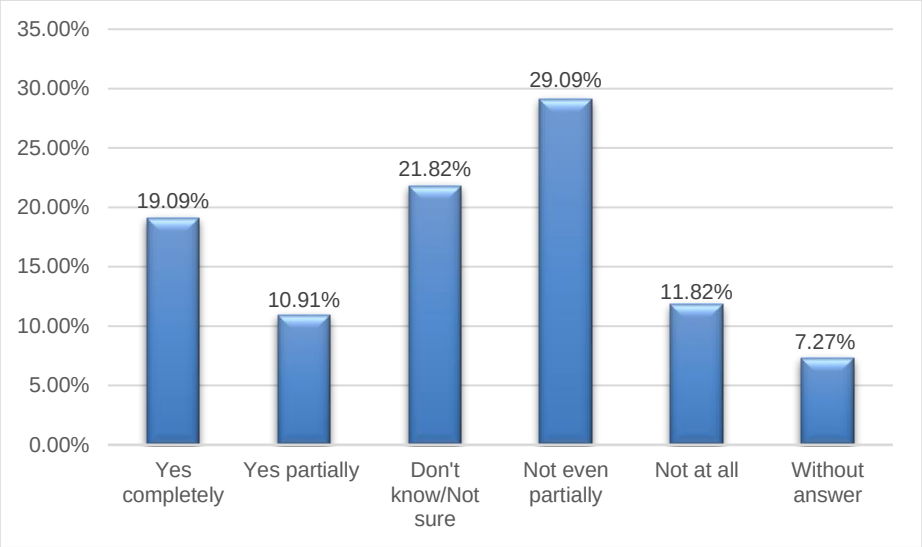
Figure 3. Implementation of the digital transformation process



Source: Analysis by the author

The energy efficiency of the equipment on which employees in the surveyed companies work is at a relatively low level, as 41.91% of the respondents expressed the opinion that it is not at all, or not entirely energy-efficient. Only 19.09% of the respondents believe that the equipment they work on is entirely energy-efficient, and 10.91% claim that it is partially energy-efficient.

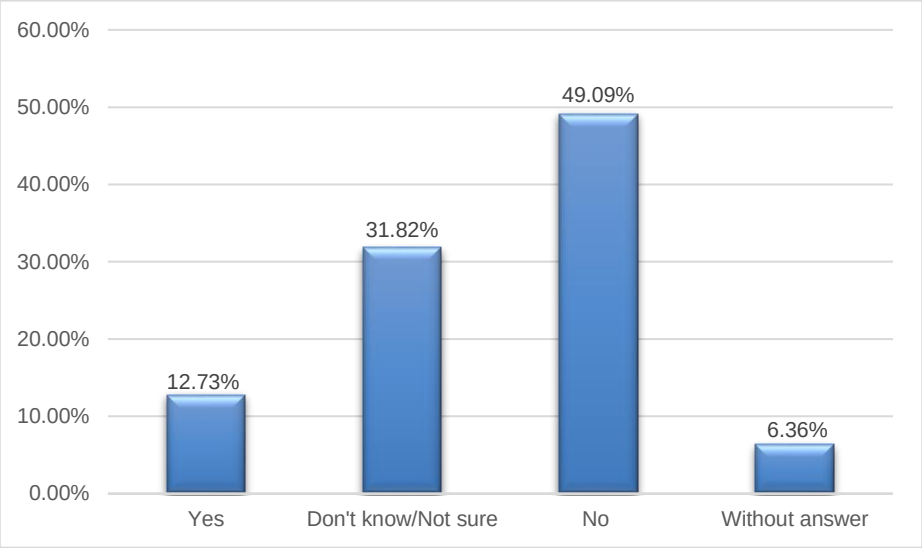
Figure 4. Energy efficiency of the equipment employees work on



Source: Analysis by the author

The next question in the conducted research was whether the employer implemented training measures for employees in line with the goals of sustainable development and the reduction of harmful gas emissions after the year 2020. The results indicate that only 12.73% of the respondents claim that the employer conducted such training, while 49.09% confirm that there were no such training sessions.

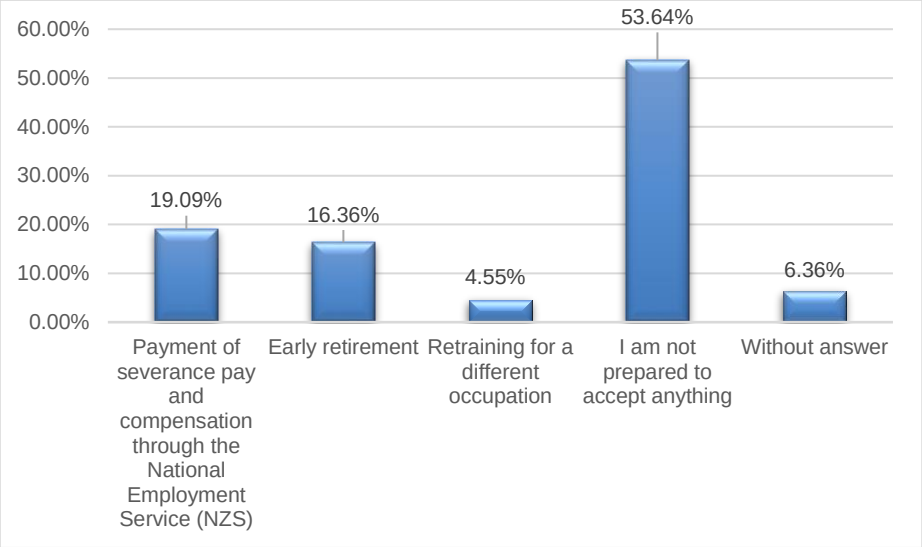
Figure 5. Implementation of training measures in line with the goals of sustainable development and the reduction of harmful gas emissions



Source: Analysis by the author

The graph 6 shows the alternative solutions that employees are willing to accept for their employment status in case the energy transition involves the closure of their existing jobs. The majority of respondents, 53.64%, are not willing to accept any of the offered options for resolving their status. Only 4.55% of the respondents are willing to accept retraining for another profession as an active measure to address this potential problem, while 19.09% are willing to accept a one-time severance payment and compensation through the National Employment Service. Additionally, 16.36% are willing to accept early retirement (passive measures).

Figure 6. Readiness for alternative resolution of employment status



Source: Analysis by the author

2.2. The key areas of managing energy transition

Activities related to achieving a just energy transition in Serbia can be grouped into the following four areas:

1. Economic diversification and promotion of appropriate industrial policies

- Encouraging the adoption of integrated industrial policies aligned with sustainable development goals aims to provide clear and predictable strategic objectives for industrial sectors. By ensuring a stable regulatory, financial, fiscal, and legal framework, these policies are tasked with creating conditions for the creation of new green and decent jobs.

- Favoring policies that support technological innovations and investments in research and development of clean energy, energy-saving technologies, as well as improving "greener" and more efficient industrial processes, especially in energy-intensive sectors.

- Encouraging international and national public and private investments in green technologies, with a particular focus on supporting projects from European research and development programs available to Serbia.

Additionally, utilizing funds from national innovation funds. Encouraging the creation of technological platforms dedicated to low-carbon technologies.

- In regions and industries likely to be most affected by the energy transition, active efforts are needed for economic diversification. It is also crucial to adopt policies and measures that enable a just transition for workers, support investments in growing sectors, promote technological innovations, and provide resources, whether financial or social support, to ensure a fair transition.

2. Strengthening capacities, education, and acquiring new skills for employees

- The initiative to actively develop national training strategies, taking into account successful European practices in low-carbon industrial policies, can be crucial for the efficient implementation of energy transition. Calling for early adaptation of education and vocational training systems aims to promote the creation of new jobs and the optimal utilization of opportunities created by the process.

- At the sectoral and company levels, initiating activities to define scenarios for future changes in skill requirements and promoting continuous professional development becomes crucial. This is particularly important in sectors that will be most affected by the impact of energy transition. In this context, the formation of sectoral councils to enhance knowledge and skills in the conditions of low-carbon transition plays a significant role.

- Developing and publishing appropriate information and consultation mechanisms at the company level to anticipate strategic, economic, and technological challenges and their impact on the competencies and skills of employees is essential. This includes monitoring training or requalification policies related to climate and energy policies within the company. Additionally, it is important to integrate these issues into corporate social responsibility reporting for companies that compile them.

3. Management and industrial relations, social dialogue

- Advocate for the integration of the concept of a just transition into national plans and policies aimed at achieving sustainable development, as well as into national action plans for the environment and climate change. Actively support the organization of cross-sectoral discussions at the national level on the development and implementation of low-carbon strategies, policies, and other national and regional strategies. Advocate for the establishment of an institutional framework that allows the participation of all relevant stakeholders in all phases and at all levels of these processes, including the definition of strategies, their implementation, as well as monitoring and evaluation. Encourage the establishment of permanent advisory bodies on low-carbon

policy at the national and regional levels to institutionalize consultations on environmental issues.

- Encourage dialogue both at the sectoral and national levels, including the formation of technical expert groups and other initiatives, with the aim of identifying the social impacts of industrial and environmental policies and managing them appropriately.

- Expand the scope of collective bargaining at the sectoral level to include issues related to the transition to low-carbon development. This involves considering the impact of decarbonization processes on employment and wages, as well as the need for retraining, occupational safety, and health.

4. Social protection and safety, and health at work

- Advocate for the establishment of appropriate social protection systems based on the principles of universality, equal treatment, and continuity, with a special emphasis on employees in sectors dependent on natural resources or undergoing significant structural changes. Participate in existing and initiate new activities to assess energy poverty and identify vulnerable consumers, and advocate for the implementation of incentive measures for low-income households that spend a significant portion of their income on energy and energy-intensive products and services.

- Promote appropriate training in the field of occupational health and safety for new "green" jobs. Develop and implement assessments of increased or new risks arising from changes, resource limitations, or other threats to human health and the environment. Identify appropriate preventive measures to ensure occupational safety and health.

3. Conclusions

In conclusion, while Serbia has established a foundational framework in legal and strategic terms for energy transition and air pollution reduction, the pace of implementing innovative solutions remains slow-moving. Urgent attention is required to expedite and enhance this process, particularly at the local level, and through increased citizen engagement. Despite improved laws, programs, and strategies, the efficiency of these efforts will be limited without systematic work on a socially acceptable system for the structural transformation of the energy sector.

Recognizing the imperative to treat the transition to a low-carbon economy as a perpetual economic and political priority, it is crucial to raise awareness among employees and citizens about the consequences of climate change and the impact of climate-related policies. Specialized awareness campaigns, the dissemination of informative guides and studies, and the organization of diverse

events are essential components. However, the results of conducted research underscore the need for more comprehensive efforts in Serbia across these domains to establish an effectively implemented and equitable energy transition that leads to sustainable economic development.

A common strategy for achieving a just transition, particularly in the context of economic diversification, requires selecting a specific area of specialization that enhances regional competitiveness. This specialization, framed within a vision for a fair transition, may be effectively implemented through a strategy known as smart specialization. Establishing appropriate institutional arrangements is imperative to facilitate an efficient energy transition at the national, regional, sectoral, and local levels, with a specific focus on local environments expected to play a central role in the transition processes.

Recognizing the proven social, economic, and environmental benefits of energy transition, it is acknowledged that these benefits may not be evenly distributed across society. Lessons from professional literature and international experience emphasize the importance of initiating just transition efforts early, as delays can make the transition more expensive and less likely to succeed. Economic diversification emerges as a crucial factor, irrespective of the planned or ongoing transition to low-carbon development.

Implementing a just energy transition is not a one-size-fits-all endeavor, given the significant differences in regions shaped by their unique social, political, economic, and cultural factors. A just transition, grounded in social dialogue, ensures the future of employees in the energy sector and local communities undergoing the shift to a low-carbon economy. It encompasses enhanced and dignified jobs, social protection, increased training opportunities, and greater job security for those affected by policies addressing global warming and climate change. In a broader context, this concept addresses global challenges of inequality and environmental concerns, emphasizing key terms such as future generations, sustainable development, and solidarity between countries.

As the global population faces the inevitable condition of energy transition, posing challenges for future generations, it is imperative that Serbia invest significant efforts and resources in the coming years to successfully transition to renewable energy sources. This simultaneous achievement of significant social gains will protect the rights and interests of various groups of workers most affected by the transition process. The completeness of the transition centers not only on its environmental aspects, but also on its inherent justice, making it a crucial priority for Serbia's sustained development. Therefore, based on these findings, we have compiled recommendations for further research aimed at achieving a just energy transition, fostering a green economy, and promoting the utilization of renewable sources.

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