

Pero Petrović ⁴⁸

College of Management and Economics, Kragujevac/Serbia

Daut Kalač ⁴⁹

Vocational School of Business, „Biznis“, Niš/Serbia

Husnija Tahirović ⁵⁰

College of Security and Criminology, Niš/Serbia

CLIMATE CHANGE AND ENERGY POLICY AS AN IMPORTANT FACTOR IN THE HEALTH OF THE POPULATION

DOI: 10.5937/PIM25195P

Abstract:

Climate changes, continuously, more and more intensively and negatively, affect the health of the population. The growing impact on the environment and human health is becoming more extensive not only due to the immediate impact of climate change, but also due to various aspects of the implementation of energy policies. This process of energy production is directly related to the increasingly intense climate changes, and above all to rising temperatures and air pollution, caused by various factors. Mortality, as a consequence of the worsening of numerous chronic diseases, can be associated with long-term duration of elevated air temperatures, in summer periods, and increased air pollution due to the use of fossil fuels. For heating apartments and industry, during the winter months. The results of the HEAL survey indicate that air pollution in Serbia is a very serious problem, and that Serbia ranks second to last in terms of air quality in Europe. From that point of view, it is necessary to change the energy policy (the disastrous impact of coal as a dominant energy source under the influence of pollution and climate change) and measures that have a very negative impact on the health of the entire population, but also on the sustainable development of the economy and society.

Keywords: Climate change, Renewable sources energy, Economic costs, Environmental protection

Introduction

The study of climate change represents an engineering challenge and any other professional and scientific challenge. Sudden climate changes are fueling both growing urbanization and other human activities that are mostly insufficiently controlled. This long-term process changes the composition of the atmosphere. Heat waves and

⁴⁸ pbp954@gmail.com, ORCID: 0000-0002-8908-6431

⁴⁹ dautkalac113@gmail.com, ORCID: 0009-0004-3292-5187

⁵⁰ seidt@t-com.me, ORCID: 0009-0006-6379-7135

air pollution are constantly increasing the number of deaths. These are chronic non-communicable diseases, primarily of the cardiovascular and respiratory systems. At the same time, increasing air temperature and pollution can affect the expansion of vectors and infectious diseases due to changes in allergic patterns. Heat stress and poor air quality can have a bad effect on the health of the elderly, babies, small children, sensitive people with chronic diseases, but also athletes who perform their activities in open spaces.

Heat stress and poor air quality can have a bad effect on the health of the elderly, babies, small children, sensitive people with chronic diseases, but also athletes who perform their activities in open spaces. Apart from the economic (financial) and health (pandemic) crises at the global level, energy crises are also becoming more intense. Heat stress and poor air quality can have a bad effect on the health of the elderly, babies, small children, sensitive people with chronic diseases, but also athletes who perform their activities in open spaces.

Apart from the economic (financial) and health (pandemic) crises at the global level, energy crises are also becoming more intense. It is a matter of creating a long-term strategy for confronting the growing and long-term problems brought about by climate change. It is precisely the issue of energy policy on a global scale that represents a big challenge for small countries. For example, Serbia's energy sector is extremely vulnerable in terms of energy sources, because it is predominantly based on lignite. In the coming period, the level of renouncing fossil fuels, for Serbia, will increase at the pace that conditions membership in the European Union, because harmonization with European climate requirements and directives is necessary. Serbia needs to create a new National Energy and Climate Plan (NECP). In particular, health economic (financial) costs should be looked at and analyzed - the negative effects of energy decisions (policies) on the health of the population of Serbia.

Increasing health economic costs (along with decreasing productivity levels) negatively affect the effects of accelerated economic growth and development of the economy as a whole.

Material and methods

Climate change, based on energy decisions, causes negative consequences for public health. The reduction of chronic diseases can be achieved by reducing the exploitation of fossil fuels, and this causes restructuring of the energy sector in the long term. Integrated and "climate" plans should cover the following domains: energy efficiency, decarbonization of the economy, renewable energy sources, energy security, the internal market, the area of development, research, and the level of competitiveness. According to the report of the World Health Organization, it is expected that between 2030-2050, about 350,000 people will lose their lives due to the consequences of climate change [1]. The impact of climate change on human health can be reduced by reducing the greenhouse effect and increasing the use of clean energy and food. Only two EPS thermal power plants in Serbia during 2019 emitted more CO_2 than all French, Bulgarian, Polish, and Czech thermal power plants combined. Serbia's energy sector is particularly vulnerable in this regard. More than 90 percent of CO_2 emissions in Serbia come from the energy sector, and the cost of its restructuring is an more importance [2].

Concentration of greenhouse gases

In every debate about climate change, the greenhouse effect is, increasingly, the most important cause of atmospheric warming. Greenhouse gases in the atmosphere (water vapor, carbon dioxide, methane, etc.) constantly heat the atmosphere. A greater amount of heat remains trapped and the temperature constantly rises. Therefore, uncontrolled human activities (combustion of fossil fuels, industrial processes, agricultural activities) lead to the release of greenhouse gases and increase their concentration in the atmosphere, and this leads to the main cause of climate change. The concentration of carbon dioxide (CO_2), one of the most abundant GHGs, is in the lead and is 31% in the atmosphere (2019), next in the series of important GHGs is methane (CH_4), which is responsible for about 30% of the increase in global temperature. The largest emitters of methane are agriculture (the most significant of which is animal husbandry) with about 24.20% of the total annual emission, followed by energy (oil, gas sources, and coal mines) with about 23.31% of the total annual methane emission. A good part of anthropogenic methane emissions also comes from the

decomposition of organic matter in waste landfills, and it amounts to about 12.58%. The other 40% are natural sources of methane (ponds, swamps...) in the period 2019-2024 [1]. The increase in the concentration of GHG in the atmosphere leads to an increasing increase in air temperature, and drastic climate changes lead to natural disasters (floods, droughts, torrents, activation of landslides, etc.) that endanger human lives and property. The economic indicators of the reached levels of damages are at an increasingly higher level from year to year. For example, in the period 2022-2024, they amounted to over 950 billion dollars [2]. The SWIS RE Institute has designed an important analysis that if there is no policy change in the area of climate change, the global total economic damage caused by climate change will amount to 11-14% of global economic production in 2050, and will amount to about 23 trillion dollars [3]. Responses to the risks of climate change can be broadly grouped into 2 categories: mitigation measures and measures, i.e. superficial and one-dimensional or comprehensive and aimed at multiple systemic changes [2].

An additional intervention directly aimed at reducing air pollution could be:

- 1) Reducing the use of low-quality coal and solid fuels in the energy sector,
- 2) Increasing the use of low-emission fuels and renewable energy sources,
- 3) Reducing emissions from industrial sites by applying new technologies,
- 4) Increasing the energy efficiency of buildings,
- 5) Stimulating sustainable urban mobility,
- 6) Improving the air quality system so that pollution data is more accurate, accessible, personalized and applicable to citizens,
- 7) Improving general awareness of health risks from air pollution [11].

The impact of climate change on human health and consequences of air pollution

The occurrence of increasingly frequent heatstroke's and heat waves, malaria, poor nutrition, and diarrhea are identified as the main culprits, all due to climate change, which is increasingly and dramatically

endangering our air, food, water, and health, as well as our homes. The cost of health damage is estimated to be between 3 and 5 billion dollars [1]. Increasingly frequent storms, floods, and extreme heat are disrupting ecological and food systems, leading to the spread of water-, wind- and food-borne diseases. An increasingly intense health problem affects the cardiovascular, respiratory, and gastrointestinal systems and especially mental health. Environmental events that are becoming more extreme result in injuries, emergency hospital visits, longer hospital stays, and premature deaths. Analyzes of various aspects of climate change lead to numerous problems that are expected in the future [1].

Several important aspects are the result of climate change, namely global warming, which results in poor air quality. In addition, elevated temperatures lead to the extension and continuity of allergic periods. A higher level of air temperature and an increase in the concentration of pollution are directly related to respiratory problems and worsening of asthma, chronic obstructive pulmonary diseases and emphysema. It is believed that the change in the ozone layer by 2030 will lead to a significant increase in acute respiratory diseases. Cardiovascular and cerebrovascular problems are also a consequence of worsening air quality. For example, the risks of heart attack and stroke, in conditions of extreme heat, are increased by pollutant particles, while toxic particles lead to inflammatory processes that further cause even greater heart problems.

Climate change and environmental degradation should be understood as an important factor of (future) depopulation in Serbia - either through direct impact on quality of life, mortality, birth rate, and migration, or indirectly through economic decline and loss of important natural resources. Therefore, improvements in terms of climate change mitigation, climate change adaptation, and pollution reduction should have multiple positive effects on all three aspects of population change: fertility, mortality, and migration. Exposure to air pollution, especially PM particles in the air, is associated with increased mortality and morbidity, mainly from cardiovascular and respiratory diseases. The World Health Organization (WHO) estimated that exposure to air pollution caused 4.2 million premature deaths worldwide in 2016, including half a million in the WHO European Region (WHO, 2019). These particles are recognized as a major risk factor associated with air pollution. About 83% of all deaths related to air pollution in Europe in

2015 can be attributed to them [9]. The constant and constant increase in polluted air causes dire and numerous consequences for the health of the population.

Discussion

The adverse effects of climate change particularly affect the poorest, rural areas in Serbia, which accelerates the depopulation process. This is especially the case with the most underdeveloped region of Southern and Eastern Serbia, which covers a third of the country's territory and is facing increasingly pronounced these processes. One of the biggest challenges will be to decide on the future use of lignite (the main energy source at the moment) since the reliance on low-quality lignite requires advanced technological systems to overcome the industry's low productivity and its huge environmental externalities [7]. In Serbia, the level of air pollution is extremely high because 72.4% of energy is produced from coal, usually of very poor quality. As many as 32 million tons of that coal are burned annually in Serbia [8]. The increased use of tailings for heating (instead of coal) further increases the already high level of pollution in Serbia (BGEN). It should also be noted that the countries of the Western Balkans are home to the most polluting plants in Europe. Annual emissions from 16 coal-fired thermal power plants in the Western Balkans are almost the same as from the 296 existing thermal power plants in the EU-28. Coal-fired power plants in the Western Balkans emit 13 times more SO₂ and 30 times more PM 2.5 per installed megawatt than the average European power plant. The countries of the W. Balkans were supposed, starting on January 1, 2018, to start reducing the emissions of large combustion plants and align their national laws and regulations with EU laws. This process stems from Energy Community rules, which require coal-fired power plants currently operating in the Western Balkans to gradually reduce their emissions by the end of 2027. However, it is already clear that operators are struggling to maintain emission limits [9]. The most recent estimates of premature deaths attributable to PM 2.5 exceedances (the WHO air quality guideline of 10 µg/m³) are summarized. According to the WHO estimate, 3,585 premature deaths in 11 cities are attributable to exposure to PM_{2.5} exceedances. The estimated share of all deaths attributable to PM 2.5 is highest in Užice and Valjevo (almost 19%), where mean PM 2.5 concentrations are four

times higher than recommended. In absolute terms, air pollution has by far the greatest impact in Belgrade. However, when estimated per 100,000 inhabitants, the existing concentration of PM 2.5 is associated with the highest relative impact [7]. The analysis of the impact of air pollution in Serbia on the health, morbidity, and mortality of the population is based on information on the levels of primary pollutant emissions from different scenarios for Serbia: the reference scenario from 2015 (REF), which is the basic scenario compared to the year 2030, which represents the projected scenario of the situation with the application of existing regulations (SPM 2030), and three mitigation scenarios, and each scenario implies additional efforts compared to the previous one. [7].

Data show that every year, due to air pollution, a population the size of a small city disappears, plants, which means that improvements in this sector are largely dependent on the government's willingness to address the issue. It should also be noted that most of the European laws related to air protection have been transposed into domestic legislation and that their implementation would save 2,400 lives every year and save up to 4 billion euros in health care costs.

Conclusion

The experts' recommendations for the new strategy are: meeting national goals in the field of renewable energy, energy efficiency, and reducing greenhouse gas emissions. Serbia needs to create a new National Energy and Climate Plan (NECP). It is necessary to define the correlation between the NECP and the Energy Development Strategy to avoid overlapping with other relevant energy and climate processes. In particular, it is necessary to analyze the health-economic costs - the impact of energy decisions on the health of the population of Serbia. Controlling air pollution from coal-fired power plants represents a huge opportunity to save lives and save millions of euros in healthcare costs over the next decade.

REFERENCES

- [1] www.greennews.rs/zdravstveni alarm-klimatske promene.
- [2] <https://www.iea.org/reports/global-methane-tracker-2022/methane-andclimate-change>.

- [3] Balkan Green Energy News, 2024, Western Balkan countries on the way to finalizing their National Energy and Climate Plans,
- [4] Jasminka Young, Aleksandar Macura. December 2020, Energy transition in Serbia is., Fridrih Ekherbg Fondation.
- [5] Carvalho Peedro, 2019, Dynamics and functions of lipid droplets, Nat rev Mol Cell Biol, 20(3).
- [6] Matković, J., 20118, Air Pollution taven by health professionals – Coll for practical and level policy changes to cut pollution, New Review.
- [7] Petrović Jelisaveta, 2022, Životna sredina, klimatske promene i depopulizacija u Srbiji, Nacionalni izveštaj o ljudskom razvoju Srbije; <https://hdr.undp.org.rs>