

# CLIMATE CHANGE AND GLOBAL ECONOMIC CONSEQUENCES

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## *Abstract*

Climate change is perhaps one of the greatest global challenges of the 21st century since it could threaten and change the structure of biodiversity of an entire ecosystem. All the above-mentioned is mainly caused by human activities and adapting nature to human needs. Humans want to live as comfortably as possible, which means that the roots of the problems are economic in their essence, or more precisely it could be said that they are related to the manner of production and striving for faster economic growth. Paradoxically, climate change will have the greatest impact on the economy, in addition to the deterioration of overall well-being. Although the largest greenhouse gas (GHG) emissions mainly originate from the richest countries, the poorer ones will be the most affected by these changes, as they have less adaptability. However, climate change is a global problem and these changes do not distinguish national or administrative boundaries. Not all countries are equally threatened, and climate reactions will not occur equally everywhere, but no single country could solve this problem on its own. Global issues can only be solved through a global strategy involving both rich and poor people's united efforts.

**Keywords:** climate change, global warming, economic growth, EKC

## INTRODUCTION

The increasing scope of production, which represents the economic reality of post-industrial society, necessarily causes more intensive usage of natural resources. A traditional anthropological approach to economics cannot address the issues of overusing natural resources, so there is a need for moving from an anthropological to a holistic approach in business management and economic development.

In a contemporary context, climate change becomes intensive after the industrial revolution of the 18th century. They represent the consequences of predominantly anthropogenic forms of pollution. The consequences of climate change cannot be fully understood, but it is obvious that they include various problems, such as threatened population health, changes in global temperature, damage of the ozone layer, changes in the environment, and similar problems. All the above-mentioned problems affect the

economic development directly or indirectly, as they affect the raw material base, the state of flora and fauna, the health status of the working contingent and customers, the forms of production and consumption, the relocation of the capital, which ultimately affects height and structure of social wealth.

The relation between climate change, as a very broad concept on the one hand, and the economy, on the other, is two-sided and interdependent. The entire nature, understood in its broadest sense, was always the basis for survival and, later, for economic development. Primary economic activities, such as agriculture, forestry, hunting, and fishing, are involved in creating social wealth and mostly depend on the state and changes in climate. Secondary activities, including mining, industry (which cannot survive without a raw material base from nature), manufacturing, and construction, are also directly dependent on climat-

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ic characteristics of the area where they are operating. Tourism, catering, and other service or tertiary activities are also (in)directly dependent on climate (Bakić & Hrabovski Tomić, 2010).

Scope and the quality of production and consumption directly depend on nature, as it is the source of the raw material base, but also the agent of absorbing the produced waste and pollution (water, air, soil, noise...). For these reasons, when certain localities became over-polluted or the raw material base became depleted, production (of the capital) moves into a new area, which becomes a new object of economic exploitation. The dependence of the economy and its further development on the state of the natural environment is rather obvious. Economic dependence on nature is a global characteristic of both developed and underdeveloped countries. However, developed countries cope with these problems more easily, by moving their capital to underdeveloped countries where envi-

ronmental regulations are minimal or even non-existent (Munitlak Ivanović & Mitić, 2018).

As already mentioned, the economy draws the resources from nature, but it also emits residues of production, all kinds of waste, and it mainly causes negative externalities for nature itself (Mitić, Munitlak Ivanović & Zdravković, 2017). Attempts to reduce the effects of pollution are usually related to superficial changes. Proponents of the pessimistic view find the arguments in the fact that there is still no adequate solution for the most environmental problems caused by the accelerated development of the economy. Most technical solutions resulted in transferring pollution from one medium to another. For example, the paper industry might set water filters to solve the problem of water pollution, which produces large quantities of toxic sludge that must be burned in special stoves or disposed of in special places. Thereby, the problem of water pollution is transformed into the problem of air or soil pollution (Jost, 1996).

## CLIMATE CHANGES AND GLOBAL WARMING

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There are different ways in which climate changes could be defined, depending on what is being emphasized and what is being analyzed. For this paper, related to climate change and economic development, climate change will be defined as a long-term following of statistics on the movement of the climate system, depending on the sources causing the changes (Theodore, 2001). A statistical measurement of the climate system should cover all available data (depending on the cause of climate changes). Climate change occurrence that is less than a few decades old is not considered climate change per se. This paper considers the impact of humans on the climate and the event of global warming. Some general characteristics would be related to the rise of the global temperature and changes in long-term weather conditions, scarcity of clean drinking water, but also the groundwater, more frequent occurrence of large forest fires, warming of large water surfaces and raising the sea level, an extension of the cold season, amount of snowfall and snow cover, etc. All the aforesaid problems affect the life of flora and fauna worldwide.

Meteorological term - climate, as a system of meteorological factors that represent the average characteristics of the atmosphere over a period of time knows no national or administrative boundaries. Any climate problem will not only economically affect a narrow geographical area. Specific problematic climate phenomena will not respect international agreements and national borders; they will expand depending on non-anthropogenic factors. For example, a

forest fire occurring in a border area of one country could easily cover the other countries, without considering political and economic relations between those countries. There is a synergy in nature, which is also one of the main characteristics of the effects of natural phenomena, including climate change. For this reason, approaching climate changes from a global perspective and considering this phenomenon as a significant global problem might produce concrete and long-term results.

Inevitable trend accompanying the climate change and global warming in our part of the world is hitting the Danube-Carpathian basin the fastest. It has simultaneously affected all countries covered by the basin, including Serbia, where climate changes became clear.

It could be said that global warming is an increase in the average temperature of the Earth's atmosphere and oceans in the observed period, but it could also be considered by a projected increase in average temperature in the future (NASA, 2018). It is a change in the Earth's climate system resulting from a long-term rise in average temperature. From the abovementioned facts it is evident that, in this context, the terms climate change and global warming are used almost synonymously (NASA, 2018). However, these are not synonyms, as climate change represents a much broader term encompassing global warming and its negative consequences (melting the huge ice masses such as glaciers, lack of water rainfall, or excessive water rainfall). 'Global warming is one of the symptoms of

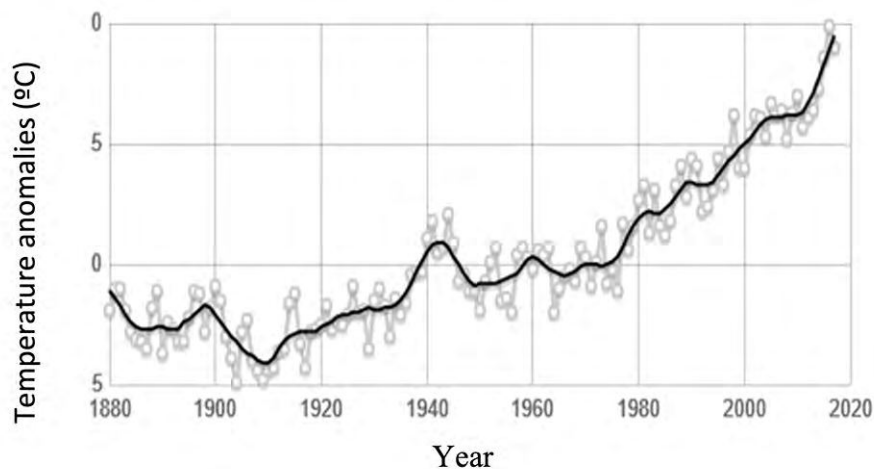
a much larger problem of climate changes caused by human activities' (NOAA Climate, 2015).

The following Figure 1 is indicating the temperature anomalies and deviations from the average, measured by degrees Celsius, which clearly shows an increase in global temperature throughout the observed period. Previous research showed that over the last 100 years, Earth's temperature increased, slowly but steadily. Nowadays, temperatures are 0.74 degrees

into the atmosphere. Secondary economic activities, such as mining and certain industrial processes, release the stored carbon from the Earth into the atmosphere. It is a process of extraction of fossil fuels that affect global warming (Lerche, 2001).

No matter what causes global warming, the most significant negative consequences are:

1. *Intense melting* of large ice surfaces on the Earth's



**Figure 1.** Temperature anomalies and deviations from the average measured by °C

Source: Global surface temperature. (03.05.2018). Global surface temperature | NASA Global Climate Change. Retrieved 15/11/2019: <https://climate.nasa.gov/vital-signs/global-temperature/>

Celsius higher than 150 years ago (Global surface temperature, 2018).

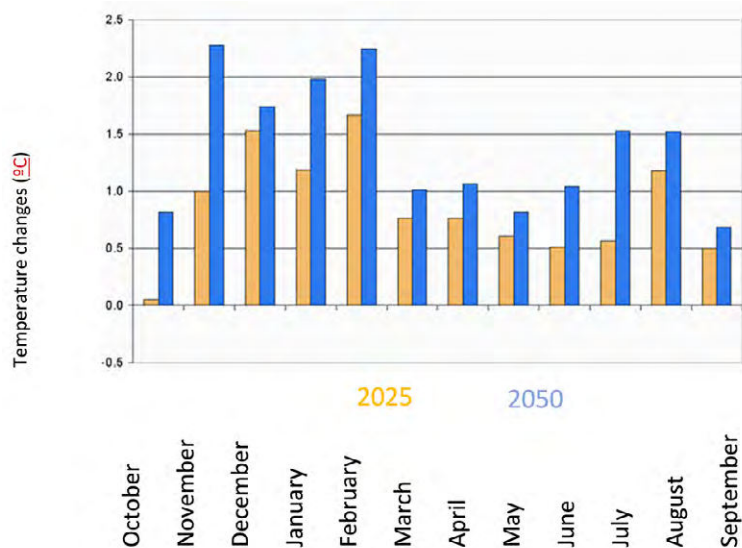
An analysis of global warming indicated that there are several main causes:

1. Deforestation of the forests, which, on the one hand, produces the oxygen necessary for life and on the other hand absorbs a significant amount of carbon from the atmosphere. Therefore, the global temperature is rising, as deforestation affects carbon absorption, which has a direct effect on the rise in global temperature.
2. Creating the greenhouse effect that reflects radiation emitted by the Earth and prevents it from leaving the atmosphere. On the one hand, without greenhouse gases, the Earth's temperature would be extremely low for most species, but on the other hand, economic activities that add large amounts of greenhouse gases to the atmosphere are contributing to an increase in the Earth's temperature.
3. Through their activities, people release carbon dioxide (CO<sub>2</sub>) into the atmosphere. It could be released through the combustion of fossil fuels (oil, coal, or natural gas). The intensification of livestock production increases the emission of methane (CO<sub>4</sub>)

poles, but also in the Andes, Himalayas, Alaska, Alps, etc.

2. *Sea level rise* because of melting the large ice surfaces whose water affects the growth of its quantity in the oceans. On the other hand, increased average temperatures affect the thermal expansion of these waters.
3. *Desertification* of semi-arid and arid regions, which are further drying up because of global warming, thereby altering the patterns of rainfall, are leading to the undesirable occurrence of water shortages.
4. Frequent *occurrence of severe and devastating hurricanes and cyclones*.
5. Expansion of disease, due to rising pollution levels, increased pollen production (allergies and asthma), and other conditions suitable for expansion of various pathogens (Lee & Roland-Holst, 1997).

Based on the current knowledge of temperature developments for the reason of global warming, it is possible to predict future temperature movements, for 2025 and 2050. Figure 2 is a prediction of temperature changes, based on a recognized trend of extrapolation.



**Figure 2.** Prediction of temperature changes: a comparison of 2025 and 2050

Source: International Research Institute, ENSO, Columbia University, Forecast, adapted by authors <https://iri.columbia.edu/our-expertise/climate/forecasts/ensocurrent/>

## IMPACT OF ECONOMIC ACTIVITIES ON ENVIRONMENTAL DEGRADATION

Relations between different indicators of environmental degradation and incomes per capita were established in the mid-twentieth century. This resulted in the creation of the environmental Kuznets curve (Munitlak Ivanović, 2017).

Table 1 is indicating relations between CO<sub>2</sub> emissions and the country's wealth, measured by its share in global GDP. A higher level of participation in the

global GDP usually means higher GDP of society, or more precisely, it could be said that such a society is richer. According to data represented within Table 1, it could be noticed how the amount of CO<sub>2</sub> emissions, as a consequence of economic activities, affects the climate change caused by the observed country. Looking at the share of individual countries in the world's wealth, as a percentage share in global GDP, it is ev-

**Table 1.** Key data for 10 countries, the highest emitters of CO<sub>2</sub>

Source: Climate Change Performance Index, (01/04/2019), adapted by authors <https://www.climate-change-performance-index.org/>. Retrieved: 18/11/2019

Country	CCPI Rank 2015	CCPI Rank 2014	Share of Global GDP	Share of World Population	Share of Global CO <sub>2</sub> Emissions*	Share of Global Primary Energy Supply
Germany	22	22	3.44%	1.16%	2.23%	2.34%
Indonesia	23	26	2.35%	3.51%	2.31%	1.60%
India	31	36	6.72%	17.57%	5.70%	5.89%
United States	44	44	17.17%	4.47%	14.69%	16.01%
China	45	46	16.03%	19.30%	23.43%	21.76%
Brazil	49	35	3.05%	2.82%	4.17%	2.11%
Japan	53	52	4.82%	1.81%	3.61%	3.38%
Korea	55	55	1.69%	0.71%	1.75%	1.97%
Russian Federation	56	56	2.63%	2.04%	4.87%	5.66%
Canada	58	58	1.56%	0.50%	1.57%	1.88%
Total			59.45%	53.89%	64.32%	62.59%

\*energy-related emissions and emissions from deforestation © Germanwatch 2024

Performance ■ Very good ■ Good ■ Moderate ■ Poor ■ Very poor

ident that throughout two observed years (2017 and 2018), United States (17.17%) and China (16.03%) have the highest share, but both of these countries are in the zone of intense CO<sub>2</sub> emissions. This level of CO<sub>2</sub> emissions has a very harsh impact on climate change. It is also interesting that both countries did not change their CCPI rank throughout the observed years with such economic behaviour. Such a position is marked in orange and it represents a poor ranking. It could be noticed that neither one of the observed countries is marked by any shade of green, whose characteristics are a very good or good influence of economic activities on climate changes. The impact of medium in-

tensity on climate changes is characteristic for three countries whose share in global GDP is not particularly high. Those countries are Germany with a share of 3.44% in total GDP and rank 22, Indonesia with a share of 2.35% in global GDP and rank 23 (or 26 in 2018), and overpopulated India (17.25% of the world population) with a share of 6.72% in global GDP and declining rank from 31st to 36th place.

Lower CCPI rank is indicating to more environmentally responsible country, because its economic activity, regardless of its intensity, is less affected by climate changes. Kuznets environmental curve deals with this legality.

## SIGNIFICANCE OF THE ENVIRONMENTAL KUZNETS CURVE

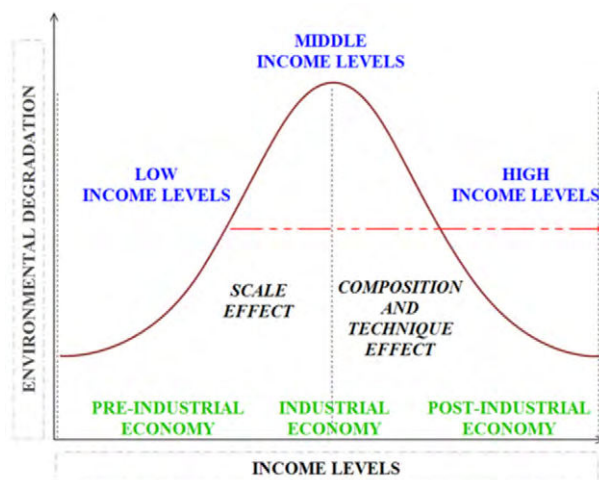
‘Environmental Kuznets curve represents a hypothetical link between different indicators of environmental degradation and incomes per capita’ (Stern, 2004). The original version of the author himself (Kuznets, 1955) dealt with different relations. Simon Kuznets was interested in changing relations between income and inequality *per capita*. By establishing this relation, he established a curve with the form of inverted Latin letter ‘U’, just as the environmental Kuznets curve looks like (authored by Panayotou, 1993).

However, the Kuznets curve gained a new point of view in the early 1990s. The empirical studies of Grossman and Kruger (1991) and Shafik and Bandyopadhyay (1992) proved the existence of a curve in the form of an inverted Latin letter ‘U’.

The original empirically tested environmental Kuznets curve analyzed the impact of income growth on levels of pollution. Grossman and Kruger (1991) pointed out that the concentration of environmental pollution (smoke and SO<sub>2</sub>) rises with the increase in income *per capita* as a consequence of economic growth, and then pollution begins to decline with further increase in income. This confirmed the hypothesis that, in this case, there is an inverted curve ‘U’. This happens because over time companies are beginning to invest in technology that could be termed as a green technology, or “environmentally friendly” (Munitlak Ivanović, & Mitić, 2017). Thus, the environmental Kuznets curve became a tool for defining relations between the quality of the whole environment and climate changes caused by increasingly intensive economic activities on a global scale (Dinda, 2002).

Figure 3 is indicating that environmental pollution is significantly and rapidly increasing in the first stages of industrialization. People are not so interested in the state of the environment, but in increasing material production and maximizing their income as a result of growth (Dasgupta et al. 2002). Therefore, in

this phase, there are positive linear relations between economic growth and pollution to achieve rapid economic growth, and natural resources are intensively drawn and negative externalities are occurring. This results in increased pressure on environmental quality. In the early stages of economic growth, people are poor to invest in the ecologically friendly mode of production and, therefore, ignore environmental problems (Sarkodie & Strezov, 2019). Along with the progress of industrialization, pollution starts to reduce. This is mainly because new technical and technological processes and other improvements in the production process are being developed while the service sector is also growing (Panayotou, 1993). This means that pressure on the environment in the early stages increases faster than incomes and then slows down with GDP growth at higher levels of income.



**Figure 3.** Kuznets environmental curve

Source: Sarkodie, S. A., & Strezov, V. (2019). A review on Kuznets Environmental Curve hypothesis using bibliometric and meta-analysis. *Science of the total environment*. 649, 128-145. <https://doi.org/10.1016/j.scitotenv.2018.08.276>



Reduction of environmental degradation occurs in later stages of economic development. Increased levels of income, strengthen institutions, developed en-

vironmental awareness and technology are leading to a reduction in environmental pollution (Sarkodie & Strezov, 2019).

## GLOBAL ECONOMIC IMPACTS AND CONSEQUENCES

The environmental Kuznets curve had a significant impact on economic policymaking in both developed and developing countries. Developing countries want to strengthen economically as soon as possible without too much consideration of environmental protection. Initially, both the World Bank and the IMF prioritized economic growth. The technology they use is usually outdated, which in other words means that it is most often “dirty”. That is why they are pleased to accept the capital from developed countries that carries “dirty” technologies.

High environmental standards and developed environmental awareness are more elevated in developed countries. They achieved an adequate level of economic development that they could think of high environmental standards and high environmental taxes and penalties for those who do not adhere to these standards. That is why they move their “dirty” technologies and often export the waste to developing countries. On the other hand, developing countries have neither high environmental standards nor high penalties.

For example, *Cap and trade* system is a form of organizing the trade in harmful emissions that have a bad impact on climate change. It is about trading in emissions allowances. The right on pollution is an amount of pollution emissions from a particular polluter, at the state or organizational level. In this way, an economic instrument, namely the market, is trying to influence the level of pollution. More precisely, any right on pollution is a permit in physical units, which is determined by the state authorities for the enterprises based on the presumption of pollution and damage that particular enterprises could cause by their production. It is a market-based approach to pollution control (Stavins, 2003). In addition to portable emissions permits, there are two other instruments to reduce the economic impact of climate change: environmental regulations and environmental taxes.

When it comes to transferable permits, the state determines the total number of permits to be granted and decides how it will allocate the original pollution permits. That decision should be based on the society as a whole, by considering pollution damage and the cost of control from the society’s point of view. Specific public authority allocates or sells a limited number of pollution permits that are transferable in terms of their sale. Those who are granted or purchased for

a specific quantity of a pollution permit, expressed in the amount of permissible emission of pollutants, must purchase more pollution permits, according to the scope of production to operate within the specialized market. The role of the seller of pollution permits includes pollutants that do not need permits to that extent because their scope of production is not so intensive. Therefore, it could be said that this is an economic instrument that requires good organization of a specific market. The total amount of pollution at the level of society must remain the same. This means that if the producer increases pollution due to the increased scope of production, at the same time, it must be accompanied by a reduction of pollution. In the first case, it is about the buyer of permits and in the second it is about the seller of pollution permits (Munitlak Ivanović, Raspopović & Mitić, 2014). The purpose of this economic instrument is to define an acceptable level of pollution at the level of society then, through permits, to distribute the right to pollution among known pollutants.

The largest pollution trading system is the European Union Emissions Trading Scheme (EU ETS). The functioning of this Scheme could be monitored since 1992. That year, 180 UN members signed the United Nations Framework Convention on Climate Change (UNFCCC). In 1997, the Kyoto Protocol was adopted as a more specific document defining the activities that should be taken to reduce pollution and global emissions. This document established two principles on which functioning of the EU ETS is based:

1. Emission targets were set for highly developed countries.
2. A set of variable mechanisms was created that enabled the exchange of licenses, or more precisely cross-country emission units.

These two principles form the basis for the international emissions trading system (Climate Policy Info Hub, 2019). The importance of the Kyoto Protocol and the European Union Emissions Trading Scheme is that it is the first global system for emissions trading and pollution. It started with operating on 1st January in 2005. Implementation in practice was unequal across countries due to the different time it took for the EU Member States to distribute transferable emission permits and to install the electronic trading platform (Golušin, Munitlak Ivanović

& Vučenov, 2012). It is important to note that this was the first time of installing a quantitative restriction of environmental pollution in any form. Since then, CO<sub>2</sub> emissions have been paid a market price by all potential pollutants (Ellerman & Buchner, 2007). The EU ETS is an irreplaceable part of the European climate change policy. This is the primary instrument by which EU member states fulfil their obligations under the Kyoto Protocol. The EU ETS is a significant part of EU law, so important that its implementation is independent of the Kyoto protocol (Ellerman & Buchner, 2007). Countries committed to reducing pollution, by the time the Kyoto Protocol was signed, emitted about two-thirds of GHG emissions globally. All of the abovementioned provided an excellent starting point for improving the climate through the application of the protocol (Golušin & Ivanović, 2011).

Under the Kyoto Protocol, the states were divided into two groups. Developed countries committed to reducing GHG emissions by about 5% less than 1990, in the period between 2008 and 2012. The second group consisted of the poorest countries and developing countries, which were not obliged to take on any obligations. This should have encouraged them to intensify economic development and reduce the gap between developed and underdeveloped countries.

At that moment, the largest polluter is the United States, which never ratified the agreement, while Canada abandoned the protocol in late 2011. At the same time, GHG emissions from developing countries increased, leading to a situation that, at the end of the protocol in 2012, countries that were obliged to reduce emissions were responsible for just over one-fifth of the world's annual emissions. This is too small a reduction for slowing down the climate changes.

The Kyoto Protocol did not provide desired results for several reasons. One of the serious reasons lies in the fact that too many signatories of the protocol did not take over essential obligation. Short deadlines for fulfilling commitments to prescribed goals are also a significant reason for failure in implementation. Adequate sanctions in case of protocol breach were not defined, which posed another problem. Although it was a legally binding document, the abandonment of the protocol by Canada was not accompanied by any sanction. On the other hand, examples of successful protocol implementation are the United Kingdom and Germany, countries that adopted such environmental macro policies, that reduced their GHG emissions in the long term. These two countries achieved the best results in the observed period.

Although there were negotiations on the further functioning of the protocol and the possibility of sign-

ing a new agreement that would be an upgrade to cover the largest emitters, the Kyoto Protocol stopped operating upon its expiry in 2012 (Rosen, 2015). At the global level, the looking for solutions through collective responsibility and joint activities was continued. These attempts resulted in the Paris Agreement on Climate Changes, which was created in December of 2015 (United Nations, 2015).

The Paris Agreement has a different starting point and it is based on a different principle - voluntary accession to agreement, which does not define the deadlines and the validity period, and there is no legal sanction since this did not provide results in the case of the Kyoto Protocol. After a quarter of a century, this was a significant change, and this agreement on climate change was accepted globally by all countries. The Paris agreement was also accepted by the least developed countries because they were given more time to reduce GHG emissions. Developed countries are given the time (as short as possible) to start reducing emissions in a few years, using the latest scientific advances, to set the aim of lower GHG emissions in the meantime. The global goal of the agreement is to keep the average temperature rise below 2°C as compared to the pre-industrial period.

The logical question is that if there are no binding rules or specific goals, how could this globally important result be achieved? Previous experience was related to the fact that hard rules did not provide adequate results. In respect to that, this new agreement is, therefore, based on the principle of voluntariness and the promise of reducing emissions, while the main instrument is peer pressure to deliver promised results. States included in this agreement are required to draw up five-year national plans for GHG emissions consistent with other plans and capabilities. These countries should submit a regular report on the realization of the promise, keeping track of the results (Obergasel et al., 2016).

The biggest challenge was to include the largest gas emitters in the agreement, or more precisely to coordinate attitudes regarding the promises of each country and the question of what is 'right'. The idea is that the global fight against climate change became a matter of ethical commitment, pride, and prestige that would affect individual countries to achieve the best results. This encourages international cooperation, which is the goal of any global agreement, although the success of the Paris Agreement cannot be predicted. The main progress comparing to other international agreements is people's awareness regarding the threatening global problems of climate change and joint agreement that something must be done.

## CONCLUSION

Climate change is a global problem that, like any other problem, must first be addressed locally. A significant number of natural disasters are related to climate change. Huge natural disasters are consequences of climate change. However, it took a long time for people to become aware of the fact that this problem could and must be solved. The authors outlined which countries are the largest emitters of pollution, explained the macro-level behaviour by using the environmental Kuznets curve and finally pointed to potential solutions through the Kyoto Protocol and the Paris Agreement, which again requires a global approach to the problem.

In its initial stages of development, each country gives preference to economic development over environmental protection and thus climate. The well-being of the population is a primary task, not taking into account the after-effects that became more than obvious and alarming. However, countries begin to think gradually about the environmental consequences of their accelerated development, but only when they reach a certain level of economic development. Then various economic and flat instruments are introduced

to solve the environmental problems. Introduction of environmental penalties, taxes, fees, and trading with pollution emissions are just some of them. However, these are all national attempts to tackle the global problem - climate change.

Acceptable solutions could be expected only by creating international instruments focused on global participation. However, countries raise the questions of fairness and rights for the amount of pollution relative to the degree of its economic development and the well-being of its residents. The implementation of the Kyoto Protocol, although well thought out, did not produce expected results, although it was legally binding for the signatories. The protocol was abandoned even before it was fully implemented. Announced as a major success of the global compact and awareness of climate changes in 2015, the Paris Agreement was accepted by all countries of the world. It is not legally binding and therefore falls under the "soft agreements". The question is, how much are we aware of enormous problems of climate change when economic wealth found a way to again be at an advantage over the survival of future generations.

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## References

- Bakić, O., Hrabovski Tomić, E. (2010). *Turizam: pojmovi, efekti, funkcionisanje*, Educons University, Sremska Kamenica.
- Climate Policy Info Hub. (2019). EU ETS: An instrument to reduce greenhouse gas emissions. Available at <https://climatepolicyinfohub.eu/node/30/pdf>
- Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the environmental Kuznets curve. *Journal of Economic Perspectives*, 16 (1), 147-168. <https://doi.org/10.1257/089533027157>
- Dinda, S. (2002). Environmental Kuznets curve hypothesis: a survey. *Ecological Economics*, 49(4), 441-455. <https://doi.org/10.1016/j.ecolecon.2004.01.011>
- Ellerman, A.D. & Buchner, B.K. (2007). The European Union Emissions trading scheme: origins, allocation, and early results. *Review of environmental economics and policy*, 1(1), 66-87. <https://doi.org/10.1093/j.rser.2014.07.113>
- Global surface temperature. (03.05.2018). Global surface temperature | NASA Global Climate Change. Available at <https://climate.nasa.gov/vital-signs/global-temperature/>
- Golušin, M. & Munitlak Ivanović, O. (2011). Kyoto Protocol implementation in Serbia as precognition of sustainable energetic and economic development. *Energy Policy*. 39 (5), 2800-2807. doi: 10.1016/j.enpol.2011.02.052.
- Golušin, M., Munitlak Ivanović, O. & Vučenov, S. (2012). Sustainable energy management - a prerequisite for the realization of the Kyoto Protocol. *Journal of Economic Development, Environment and People*, 1(2). 27-38. [http://jedep.spiruharet.ro/RePEc/sph/rjedep/Rev2\\_2SustainableEnergyManagement.pdf](http://jedep.spiruharet.ro/RePEc/sph/rjedep/Rev2_2SustainableEnergyManagement.pdf)



- Grossman, G.M., Kruger, A.B. (1991). *Environmental impacts of a North American free trade agreement* (No. w3914). National Bureau of Economic Research. <https://doi.org/10.3386/w3914>
- International Research Institute, ENSO, Columbia University, Forecast (14.11.2019). Available at <https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>
- Jost, F. (1996). *Sustainable Developments: The Roles of Science and Ethics*, Edvard Elgar, London, pp. 78-89.
- Karl, T. R., Trenbeth, K. E. (2003). *Modern Global Climate Change*, Science, Vol 302, pp. 1719-1723. Available at <https://www.sciencemag.org/>
- Kuznets, S. (1955). Economic Growth and income inequality. *The American Economic Review*, 49, 1-28.
- Lee, H., Rolan-Holst, D. (1997). The environment and welfare implications of trade and tax policy. *Journal of Development Economics*, 52 (1), 65-82.
- Lerche, I. (2001). Natural and anthropogenic environmental problems. *Energy & Environment*, 12(1), 73-88.
- Mitić, P., Munitlak Ivanović, O., Zdravković, A. (2017). A Cointegration Analysis of Real GDP and CO<sub>2</sub> Emissions in Transitional Countries. *Sustainability*, 9(4), 1-18. doi:10.3390/su9040568.
- Munitlak Ivanović, O. (2017). Kuznetzova kriva i međunarodni protokoli – instrumenti smanjenja emisija CO<sub>2</sub>, *Ecologica*, 87(24) Beograd, 755-759.
- Munitlak Ivanović, O., Mitić, P. (2018) *The Role of Ecological taxes in Sustainable development and Sustainable economy*, Sustainable Growth and Development in Small open Economies, Institute of World Economics, Hungary, ISBN 978-963-301-3, pp. 159-168.
- Munitlak Ivanović, O., Mitić, P., *Sustainable Tourism and Ecotourism: an inquiry into theoretic ties with sustainable development*, June, Vrnjačka Banja Serbia, Tourism in Function of Development of the Republic of Serbia, Thematic proceedings, Vol. II, University of Kragujevac, Faculty of Hotel Management and Tourism in Vrnjačka Banja, 2017, pp 290-305.
- Munitlak Ivanović, O., Raspopović, N. & Mitić, P. (2014). Specifični oblici međunarodne trgovine „Cap and Trade“ sistem, *Poslovna ekonomija*, 2/2014, 115-126.
- NASA (18.12.2018). What's in name? Weather, global warming, climate change. Available at <https://climate.nasa.gov/resources/global-warming/>
- NOAA Climate. (17.06.2015). What's the difference between global warming and climate change? Available at <https://climate.gov/news-features/climate-qa/whats-difference-between-global-warming-and-climate-change/>
- Obergassel, W., Arens, C., Hermwille, L., Kreibich, F.M., Ott, H.E. & Wang-Helmreich, H. (2016), Phoenix from the Ashes — An Analysis of the Paris Agreement to the United Nations Framework, *Environmental Law & Management*, Lawtext Publishing Ltd. 3-12. [https://epub.wupperinst.org/frontdoor/deliver/index/docId/6374/file/6374\\_Obergassel.pdf](https://epub.wupperinst.org/frontdoor/deliver/index/docId/6374/file/6374_Obergassel.pdf)
- Panayotou, T. (1993). *Empirical tests and policy analysis of environmental degradation at different stages of economic development* (No. 992927783402676). International Labour Organization. Available at <http://www.ilo.org/public/libdoc/ilo/1993/93B09-31-engl.pdf>
- Rosen, A. (2015). The Wrong Solution at the Right Time: The Failure of the Kyoto Protocol on Climate Change. *Politics & Policy*. 43(1). 30-58. <https://doi.org/10.1111/polp.12105>
- Sarkodie, S. A., Strezov, V. (2019). A review on Environmental Kuznets Curve hypothesis using bibliometric and meta-analysis. *Science of the total environment*. 649, 128-145. <https://doi.org/10.1016/j.scitotenv.2018.08.276>
- Shafik, N., Bandyopadhyaya, S. (1992). Economic growth and environmental quality: time-series and cross-country evidence (Vol. 904). World Bank Publications.
- Stavins, R.N. (2003). Experience with market-based environmental policy instruments. In *Handbook of environmental economics* (Vol. 1 pp. 355-435). Elsevier. [https://doi.org/10.1016/S1574-0099\(03\)01014-3](https://doi.org/10.1016/S1574-0099(03)01014-3)
- Stern, D.I. (2004). The rise and fall of the environmental Kuznetz curve. *World Development*, 32(8) 1419-1439. doi:10.1016/S0140-9883(99)00028-6.
- Theodore, J., (2001). Appendix I “Glossary-Climate Change”, Education Center – Arctic Climatology and Meteorology
- United Nations. (2015). The Paris Agreement – Available at <http://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>