

SCIENTIFIC HORIZONS

Journal homepage: <https://sciencehorizon.com.ua>

Scientific Horizons, 26(4), 136-145



UDC 504

DOI: 10.48077/scihor4.2023.136

The economic effect of the measures provided for by the Kyoto Protocol by region (as of the 2020s)

Antony Miller*

PhD in Educational Leadership, Educational Advisor - Guest Lecturer

Otgontenger University

13370, 51 Jukov Str., Ulaanbaatar, Mongolia

<https://orcid.org/0000-0001-7827-9716>

Avazbek Atakhanov

Doctoral Student

Kyrgyz National University named after J. Balasagyn

720033, 547 Frunze Str., Bishkek, Kyrgyz Republic

Mushfig Guliyev

Doctor of Economics, Professor

Azerbaijan State University of Economics

AZ1001, 6 Istiglaliyyat Str, Baku, Republic of Azerbaijan

<https://orcid.org/0000-0002-1104-5402>

Tarlan Azizov

Doctoral Student

Azerbaijan State University of Economics

AZ1001, 6 Istiglaliyyat Str, Baku, Republic of Azerbaijan

<https://orcid.org/0000-0001-6848-7968>

Khatira Huseynova

Doctor of Economics, Professor

Academy of Public Administration under the President of the Republic of Azerbaijan

AZ1001, 74 Lermontov Str., Baku, Republic of Azerbaijan

<https://orcid.org/0000-0001-8590-1091>

Article's History:

Received: 27.01.2023

Revised: 27.03.2023

Accepted: 10.04.2023

Suggested Citation:

Miller, A., Atakhanov, A., Guliyev, M., Azizov, T., & Huseynova, Kh. (2023).

The economic effect of the measures provided for by the Kyoto Protocol by region (as of the 2020s). *Scientific Horizons*, 26(4), 136-145.

Abstract. The Kyoto Protocol has become a promising component for solving one of the most urgent and discussed problems by scientists – air pollution. Therefore, it remains important to consider what has actually been achieved over the 17 years of the treaty; what effects (environmental or economic) prevail as a result of its action. In this research, special emphasis is placed on the impact of the Kyoto Protocol on certain regions, such as Europe, Asia, America and others. Thus, the purpose of the work is to demonstrate how this agreement influenced the development of countries in certain regions, what consequences it led to and how effective it turned out to be. The following research methods were used in the work: statistical, graphic, historical, modelling and forecasting. While writing the work, it was demonstrated what advantages and disadvantages the Kyoto Protocol has as a document for protecting the external environment. In addition, the



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

*Corresponding author

authors described the main environmental benefits and economic losses from this agreement. The research has demonstrated that the Kyoto Protocol does reduce CO₂ emissions in some regions and likely reduces the rate of growth in others. However, a general decline in industrial development was observed in the countries participating in the agreement. The authors conclude that it is currently impossible to say with certainty how effective this agreement will be, but its adverse political and economic consequences will be far less than the environmental benefits. In addition, regional features of the impact of the Kyoto Protocol on the development of local countries were considered. The work allows for a new perspective on the effectiveness of the Kyoto Protocol and provides new answers to questions about the usefulness of this document and the rationality of implementing its terms

Keywords: sustainable development; regional development; international relationships; external environment; air pollution

INTRODUCTION

In modern conditions of human development, the problems of protecting the external environment remain relevant. It is especially true for air pollution problems, which are considered one of the most discussed among scientists. One of the components for their solution was the Kyoto Protocol, which was signed by most countries of the world to reduce greenhouse gas emissions into the atmosphere. Therefore, it is crucial to reflect on what has been accomplished as a result of its action.

Extreme weather events in the past few decades have sparked discussion about significant future global warming caused by human economic activity (Sorokhtin, 2007). For the first time, this problem began to be discussed by scientists as early as the 19th century (Arrhenius, 1896), and it began to rise more actively in the 70s-90s of the 20th century. During the discussion among scientists, there were both adherents of the idea that it is worth fighting greenhouse gases, and those who were against it. However, in the end, over time, the Kyoto Protocol was adopted, which, in fact, delivered an ultimatum: either a general catastrophe in the future, or a reduction in industrial emissions (Vladimirov & Churakov, 2014; Scotese et al., 2021).

A large number of scientists are currently working on exploring environmental problems. In particular, notably, V.A. Vladimirov and Y.I. Churakov (2014), who in their work analysed in great detail the current and past trends in the study of climate change issues. In addition, the author used a significant number of studies that consider empirical data on the effectiveness of the Kyoto Protocol as such. Thus, R. Najarzadeh et al. (2021) demonstrated the impact of the treaty in terms of trade and changes in competitive advantage between countries. In fact, it is a much more important indicator than it might seem since it affects both the well-being of countries and their political and economic role in the world.

The research (Dogan et al., 2022) explores the impacts of technology and Kyoto Protocol in addition to several control variables to energy transition by applying the novel econometric method of Sigmund and Ferstl. The empirical results confirm the positive and significant link between technology and energy transition. Similarly, the authors confirmed that the Kyoto Protocol has a significantly positive impact on energy transition.

The research (Kim et al., 2020) explores the environmental and economic impacts of the Kyoto Protocol on Annex I parties. The authors claim that participating as an Annex I party has a significant positive impact on CO₂ emission reductions, but an adverse impact on the gross domestic product of the participants in the long run. This research is valuable as it provides a recommendation for developing countries to focus future global climate change frameworks on balancing the impact on economic and environmental performance to ensure sustainable development.

The authors (Nguyen & Phan, 2020) analysed the effect of carbon risk on firm capital structure associated with Australia's ratification of the Kyoto Protocol. Interestingly, as a result, it was found that increased carbon risk leads to higher financial distress risk, which motivates firms to decrease financial leverage. In a study (Kanie, 2020), the authors consider the importance of country leadership in negotiations before the ratification of the Kyoto Protocol. Thus, the authors traced the relationship between the state's economic positions and the benefits of the terms it agrees to under this protocol. In addition, the study (He et al., 2022) is very useful for the chosen research subject. The author highlights future research opportunities to improve carbon accounting, which is an important clause of the Kyoto Protocol.

In addition, notably, the scientists who examined the features of the functioning of the treaty in certain regions. Thus, J. Cifuentes-Faura (2022) examined approaches in Western Europe, and R. Radovanovic (2022) demonstrated the specifics of the situation in Eastern Europe and neighbouring countries. F. Ahmed et al. (2022) demonstrated the features of the impact of the treaty on the development of Asian countries, a region characterised by a significant number of developing countries and high levels of pollution, and J. Hovi et al. (2014) attempted to demonstrate the most likely reasons why the United States of America is still not a member of the Kyoto Protocol.

Thus, the purpose of this work was to present and describe the positive and adverse effects of the Kyoto Protocol associated with its impact on the environmental, political and economic components of the development of countries.

GENERAL FEATURES OF THE PHENOMENON OF GLOBAL WARMING

Global warming (or global climate change) is a phenomenon associated with a relatively rapid increase in the temperature of the surface of the Earth and oceans. The high relevance of this phenomenon is due to the fact that it has huge adverse consequences for both wildlife and humans in general. The high rate of temperature change on the planet does not allow animals to have time to adapt to it, which can lead to a reduction in the number of species or their complete extinction. In addition, it applies to people who, due to climate change, will have to migrate from territories that have become inconvenient for living to other, more viable ones. However, it is simply impossible to transfer entire cities and states. In addition, warming will lead to an increase in the number of various kinds of natural disasters, such as floods, hurricanes, tornadoes and others, which will result in a large number of victims. In addition, the area under crops and forests will decrease; the destruction of the infrastructure of cities will begin, especially in coastal areas. Another influence is possible, more unusual, for example, a change in the configuration of the Gulf Stream, which can lead to unpredictable consequences.

Among all the scientists who participate in the discussion about the problem of global warming, four groups can be distinguished. The first is the uncompromising supporters of global warming, who believe that it is human activity that makes the greatest contribution to it; the second group are specialists who acknowledge the fact of global warming but consider the statement about its predominantly anthropogenic origin to be difficult to prove; the third – those who doubt the validity of the establishment of the very fact of global warming; the fourth one is supporters of the opinion, according to which global cooling, not warming, will occur in the coming decades (Vladimirov & Churakov, 2014; Menton *et al.*, 2020; Degroot *et al.*, 2021).

In general, the phenomenon of global climate change is confirmed by the facts. Now in the world, as the air temperature near the earth's surface is

increasing, there is a decrease in the area of sea ice near the Arctic Basin and snow cover on land, while, therewith, an increase in the average ocean level. In addition, the results of modern research indicate that the observed changes in climate with an extremely low probability (below 5%) occur without external intervention, therewith, with a high degree of probability (about 90%) it can be argued that it is the concentration of anthropogenic gases is the main cause of global warming (Vladimirov & Churakov, 2014; Pascolini-Campbell *et al.*, 2021). These data were obtained when assessing the rates and the approximate moment of the beginning of the increase in the general air temperature on Earth with an increase in industrial production by people. And although such statistics are quite convincing, they still do not give unequivocal confidence in the existence of global warming and human involvement in it. Therewith, according to other models, it makes no sense to reduce greenhouse gas emissions since the effect of this will be zero or very low, but the socio-economic consequences may appear to be adverse and very long-term.

From time to time there are assertions in scientific circles about the high role of other factors in climate change. Among these, the most frequent are increased solar activity and natural long-term trends in climate change. However, both of these theories are not proven; moreover, there is ample evidence that they are false. Another theory suggests that the current warming will be offset by subsequent cooling due to the onset of the Ice Age due to changes in the Earth's orbit. However, most likely the next cooling should be expected only in a few thousand years. Due to this, there is no way that warming can be offset by subsequent cooling in the near future (although there is still a probability that it can be expected a cooling in this millennium, it is extremely low). The rates of pollution of the Earth's atmosphere are depicted. Note that the data in the Figure 1 is displayed with an accumulation condition: thus, the actual amount of pollution produced by a region is found by finding the difference between the value of the region on the graph and the value of the previous region.

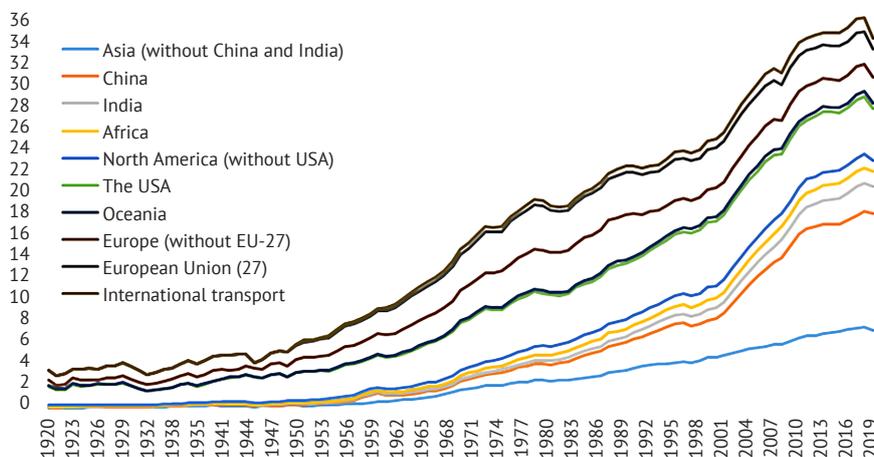


Figure 1. The amount of CO₂ emitted into the atmosphere from 1920 to 2020, billion tons

Source: compiled by the authors based on Our World in Data (2022)

Figure 1 presents that the amount of CO₂ emitted into the air is increasing from year to year. Moreover, the average growth rate of emissions over 100 years was 2.29%, while since the beginning of the 21st century it was 1.49%, and since 2005 – 1.1%, which generally indicates the effectiveness of countries' policies to reduce CO₂ emissions into the atmosphere (including the effectiveness of the Kyoto Protocol).

THE IMPACT OF THE KYOTO PROTOCOL ON THE DEVELOPMENT OF INDIVIDUAL REGIONS

It was mentioned above that the nations of Europe, its western part, more than others adhere to the principles of the Kyoto Protocol. They have made it their purpose to reduce emissions by 55% by 2030 compared to 1990, and to become the first climate-neutral continent by 2050. As can be seen from Figure 1, they really succeed: the rate of reduction of CO₂ emissions in the EU countries is the highest. Politicians in these countries seriously want to implement a circular economy model within their economies to maintain the value of products, materials and resources in the economy for as long as possible and minimise waste generation (Cifuentes-Faura, 2022; Sikora, 2021). The situation with the countries of Eastern Europe is somewhat different from the countries of its western part. Here Russia, which has huge reserves of natural gas (which is the most environmentally friendly raw material), was

able to use the rules of the Kyoto Protocol for its own purposes, putting many countries on the “gas needle”; note that this applies both to resource-poor and far too dependent on imported energy neighbouring countries (such as Georgia, Armenia and others), and to highly developed countries in Europe (Radovanovic, 2022). In general, in these countries, since the collapse of the Union of Soviet Socialist Republics, the level of CO₂ emissions has decreased, and Russia has opened access to obtaining special economic and political privileges from drawing up this protocol.

A feature of the development of the Asian region in recent years has been rapid economic growth. It has led to significant growth rates in the industrial sectors of these countries, and hence to an increase in CO₂ emissions into the atmosphere. Moreover, in most countries the situation is only getting worse, as demonstrated in the data in Figure 1. Continued expansion of industrial production in Asian countries, especially China and India, is likely to lead to subsequent serious threats to the health of the local population and the environment, since the national policies of these countries pay little attention to environmental issues, and much more to economic or geopolitical influence (Usman & Hammar, 2021; Ahmed *et al.*, 2022). This approach does not correspond to modern principles of sustainable economic development. The following data are noteworthy in terms of the impact on economic development (Fig. 2).

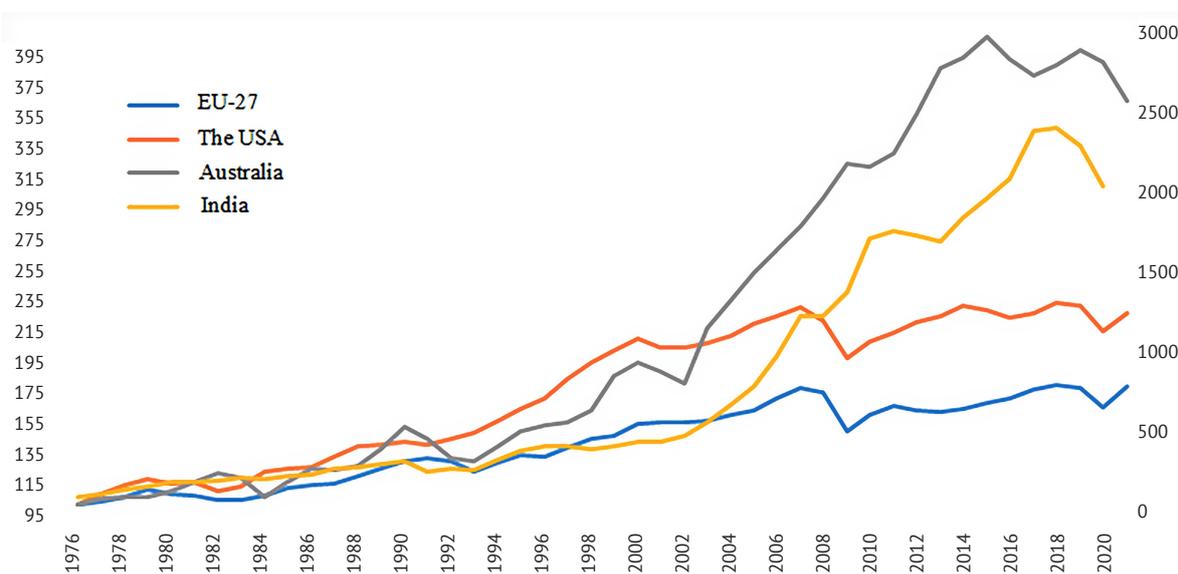


Figure 2. Dynamics of changes in the development of the industrial sector in the USA, EU-27, India and Australia in 1976–2020, indicators for 1976 are taken as 100

Source: compiled by the authors based on Organisation for Economic Co-operation and Development (2022)

Figure 2 presents the growth rates of industrial sectors in the US, EU-27, India and Australia over a period of time (left scale for US, EU-27 and Australia, right scale for India). According to the authors, data on the

dynamics of the development of industrial sectors in these countries will be able to describe quite well how the Kyoto Protocol has affected the development of economies in the regions. In the context of this study,

several time periods are important, namely: 1976-1997 and 1997-2019, 1976-2005 and 2005-2019. Data on changes in the development of the industrial sector in these years are demonstrated in Table 1.

Table 1. Growth values of the industrial sector in certain hourly intervals, %

Period*	I	II	III	IV
Years**	1976-1997	1997-2019	1976-2005	2005-2019
EU-27	1.5378	1.0540	1.6828	0.6318
The USA	2.9033	0.9836	2.7321	0.3883
Australia	2.0964	4.0181	3.2418	3.3106
India	6.9639	7.7516	7.3600	7.9532

Notes: * – to simplify the perception of information, the gaps were numbered with Latin numerals from 1 to 4 (from I to IV); ** – the reason for using data only up to 2019 is that using data for 2020 would distort the data, since 2020 was a year of significant economic development in all countries and in all sectors, and would not reflect the impact of the Kyoto Protocol on the development of the industrial sector these countries

Source: compiled by the authors based on Organisation for Economic Co-operation and Development (2022); Macrotrends (2022)

It can be compared the values of the columns for these regions by years. From Table 1, an interesting trend can be seen: the values for the EU and the USA in the interval I are higher than in the interval II, and in the interval III are higher than in the IV. The reason for this is that these countries were among the first to implement a policy to reduce CO₂ emissions. When analysing Figure 1, it was noted that it was in the countries of Europe and the USA that a decrease in emissions of gases into the atmosphere was noticed. As evident, this affects the level of development of the industrial sector, and hence the economic well-being.

In Australia and India, growth rates are higher for period II than I, and for period IV than period III. However, differences in trends in these two countries are still inherent. Thus, compare the values for II and IV periods: for India – IV > II, and for Australia – IV < II. It may indicate that the implementation of the Kyoto Protocol still had an adverse impact on the level of industrial development in Australia (although not as significantly as in the EU or the USA). It would be important to compare trends in China, however, unfortunately, there is not a large enough list of data on the development of the industrial sector in the public domain to even draw such conclusions. However, they are likely to coincide with the trends observed in India, since the two countries are quite similar in the areas of economic and environmental policies.

An interesting situation arose with the countries of North America. Thus, the United States signed the treaty, but did not ratify it. The reason why the United States did not become a party to the Kyoto Protocol is still not completely known: several explanations can be given for this, but they all have their flaws and shortcomings (Hovi *et al.*, 2010). In turn, Canada formally withdrew from the treaty in 2012. The official reason for the withdrawal is that the protocol is not in the

interests of Canada's future development: the country has not been able to sufficiently reduce its emissions into the atmosphere, as it would have to pay fines (Canada announced its..., 2011). And although both of these countries are not parties to the protocol, nevertheless, their CO₂ emission value is declining from year to year, which seems paradoxical. It is probably due to serious rules and restrictions within the country, and the attitude of society towards the protection of nature in terms of ecology. It indicates that there are other options for reducing greenhouse gas emissions into the atmosphere, which will be less radical than the Kyoto Protocol and will cause less harm to the atmosphere.

THE MAIN ENVIRONMENTAL BENEFITS AND ECONOMIC LOSSES FROM THE KYOTO PROTOCOL

At the initial stage, only developed countries were responsible for achieving the purposes set by the protocol. However, since 2015, 196 parties have accepted the Paris Agreement (2015), a new legally binding international treaty on climate change; it proposed a purpose of reducing greenhouse gases to limit global warming and proposed a new direction for combating climate change, which "brings all countries together in a common cause to perform large-scale efforts to combat climate change". The parties to these agreements faced many difficulties. In particular, many countries (mostly developing countries) have begun to worry about the likely adverse economic consequences that the Kyoto Protocol could bring. Scientists generally believe that the global economy, in general, achieves an adverse economic effect, but it is unevenly distributed (Kim, 2020). Thus, some states receive significantly more losses than others, while others generally achieve a positive economic result. It greatly affects the desire of countries to participate in the agreement. Therefore, the prevention of such consequences plays a crucial

role in ensuring the participation of individual countries in this programme and the preservation of the international environmental regime.

In practice, developing a protocol to a significant increase in offshore processes. However, if in a classic offshore the reason for the migration of a company is most often low tax rates, then in this case the reason was the quota for gas emissions available in the country. Thus, the continued operation of the treaty over time will increase the likelihood of outsourcing of polluting production processes in regions with weaker environmental regulations; in the long run, this may lead to a change in the structure of trade based on changes in comparative advantage (Najarzadeh *et al.*, 2021). To be more precise, this will result in the fact that production will flow to poorer countries with less developed industry, which will allow them to produce more value added in exchange for worsening their environmental situation. Thus, in reality, the Kyoto Protocol only partially reduces emissions of gases into the atmosphere. In addition, this will lead to a decrease in the production of goods by highly developed states and an increase by less developed ones, which will greatly affect the processes of international trade in products of the industrial sector, since it partially offsets the advantages that industrial countries have in terms of the production of these products. It is likely that the Kyoto Protocol could be an effective method of combating pollution only in the face of restrictions on capital flows and trade, but it is impossible to achieve such a situation at the current level of economic and social development.

Admittedly, some enterprises go the other way: they try to reduce their emissions into the atmosphere through technological innovations (or, as they are called, green technologies). Indeed, if all companies in the Kyoto Protocol countries acted in this way, in the long run, countries would receive both economic benefits from the introduction of new technologies and environmental benefits due to reduced pollution levels (Lanoie *et al.*, 2011; Zhang, 2021). Support for the implementation of the protocol is strongly influenced by the concern of the local population: for example, studies have demonstrated that countries in which citizens expressed a higher level of concern demonstrated a better result in achieving the purposes of the protocol (Doyaili-Wangle, 2021). In some places, this has even led to strikes among workers: for example, in 2019, as part of the Fridays for Future movement, during the week of the climate strike, more than six million people at 6000 events in 185 countries occur against pollution (Taylor *et al.*, 2019; Fisher & Nasrin, 2021).

In fact, the question of the effectiveness of the Kyoto Protocol is more complex than it seems at first glance. The main dangers that arise from global warming have already been considered above. The Kyoto Protocol was considered one of the highest quality treaties for protecting the external environment and one of

the methods for a possible solution to these problems, since it was supposed to globally reduce greenhouse gas emissions into the atmosphere and the rate of global warming (or prevent it in principle). Based on the principle of "common but different responsibilities with corresponding capabilities", the Kyoto Protocol proposes a structure based on differentiated responsibilities for countries depending on their contribution to emissions, their history of development and economic situation (Grubb, 2004).

The problem is that at the time the protocol was written, scientists knew too little about subsequent global warming. It was assumed that the accumulation of gases and global climate change would occur gradually and at more or less equal rates throughout the entire territory of the earth's surface. However, studies conducted over the past decades present that this is far from being the case: the problem is more complex; thus, in different parts of the Earth, the climate can change in different ways. Therefore, according to the authors, this thesis about common but different responsibility is not fully justified. The reduction of gas emissions should occur evenly throughout the planet: too high levels of emissions, for example, in China and India, will cause great harm to the external environment in these countries. In addition, it is important to recall the studies cited above, which demonstrate that reducing the amount of greenhouse gases released into the atmosphere is useless in stopping or halting global warming. In other words, reducing levels of CO₂ emissions may not improve the situation with the level of pollution of the Earth's atmosphere. Therefore, there are significant doubts about how justified the protocol was and whether it is worth adhering to its principles.

Returning to the data obtained from Figure 1. Indeed, the planet, in general, is seeing a decrease in the growth rate of greenhouse gas emissions into the atmosphere. Such results may indicate the effectiveness of the Kyoto Protocol. However, this is most likely due to some other theme events. For example, with the fact that most countries have already passed the stage of industrialisation and reduce their pollution due to natural causes. In addition, it is evidenced by changes in pollution rates from some countries. It is how developed countries (mainly EU member states, and North American countries) generally reduce the amount of CO₂ emissions into the atmosphere, one of the reasons for which (although not the only one, as the effectiveness of introducing laws to protect nature, depends on the opinion of the broad masses about the importance of its protection) is the transition to post-industrial methods of building an economy. Therewith, developing countries, and especially China and India, have the highest growth rates of emissions due to ongoing industrialisation. Table 2 presents data on the growth rates of greenhouse gas emissions from some developing countries.

Table 2. Rates of environmental pollution by some developing countries in the periods from 1960 to 2020, %

Years	1960-1967	1968-1975	1976-1983	1984-1991	1992-1999	2000-2007	2007-2014	2015-2020
China	-7.57	13.24	4.72	4.56	2.96	10.64	3.97	1.61
India	5.28	4.33	5.34	7.40	5.46	4.79	6.47	1.48
Egypt	2.95	4.47	7.45	3.27	6.53	4.10	1.70	-0.53
Brazilia	5.04	10.00	0.98	3.79	4.93	1.99	3.62	-2.46
Mexico	5.22	8.31	6.07	2.12	2.31	2.78	-0.32	-5.83

Source: compiled by the authors based on *Our World in Data* (2022)

As presented in Table 2, although the emission rates of developing countries are positive (that is, physically increasing), they have generally been declining over the past 20 years. Although it is difficult to say for sure whether such a result is a consequence of the operation of the Kyoto Protocol, this at least indirectly indicates its effectiveness.

Thus, it is still difficult to say with certainty what the environmental impact of the Kyoto Protocol is, although it is more likely to have a positive impact on reducing greenhouse gas emissions. However, it is important to discuss the economic impact of this protocol. To do this, return to the data obtained in Table 1. They indicate that developed countries received an adverse effect from the implementation of the protocol, which led to a decrease in the growth rate of the industrial sector in the EU, the USA and Australia. However, interestingly, the Kyoto Protocol did not have visible adverse effects on the economic development of India, but on the contrary, it most likely became a positive factor for the development of industry. The reason for this is the tendency of companies described above to move their construction facilities to India to conduct their business. Notably, although, according to the authors, the reason for this trend is the fact of conclusion of the Kyoto Protocol, this is not necessarily the case, since a huge number of factors can influence the growth rate of the industrial complex in the country. It is indirectly confirmed by the rates of CO₂ emissions in the respective surveyed countries: a slowdown in the development of the industrial sector usually occurs together with a decrease in the level of greenhouse gas emissions into the atmosphere. In addition, the Kyoto Protocol did probably reduce the rate of industrial growth in India, but not as much as to result in a decrease. Or, based on the experience of highly developed countries, it can be assumed that the adverse effect of the Kyoto Protocol in India can still be observed over a wider distance.

The data obtained in the work are confirmed in the works of other scientists. Thus, the results of the analysis of GDP (gross domestic product) levels and CO₂ emissions in countries that are parties to the Kyoto Protocol demonstrated that their level of environmental pollution did decrease, and the GDP decreased (Kim & Tanaka, 2014). Thus, it can be agreed

that the protocol leads to both positive and adverse consequences. However, there is no consensus among scientists about which effects prevail: economic or environmental (Rhodes, 2016). Perhaps when more time passes and scientists have more data on the effects established by the protocol, it will be possible to say for sure, but not now. The protocol right now needs a lot of improvements that could level its problems (which were announced in the work). Decisions to continue the protocol or cancel it must be applied now, which is a serious problem. Therefore, this subject requires additional consideration using more accurate methods of forecasting and calculating.

CONCLUSIONS

The work examined current trends in the levels of environmental pollution by individual countries. The overall situation has been demonstrated to worsen over time, except for some regions, namely Europe and North America. In turn, in most developing countries (primarily China and India), emission levels are only increasing. There is still some disagreement among scientists about the causes of global warming, their consequences and in determining the actions that can be effective in overcoming the problem, which complicates the process of analysis.

The study has presented that the Kyoto Protocol does reduce CO₂ emissions in some regions and likely reduces the rate of growth in others. The authors presented that the Kyoto Protocol as such has a huge number of adverse aspects that are not obvious enough at first glance. Among them, notably, the general decline in the development of industry in most countries participating in the agreement, the increase in the geopolitical influence of some countries (the Kyoto Treaty even strongly affects political processes), changes in the competitive advantages of individual countries, changes in trade chains, migration of production capacities etc. The latter points are not purely adverse, as they bring benefits to individual (mainly developing) countries, however, since the relocation of enterprises to other territories is a laborious process, it still only leads to losses on a global scale.

Thus, it is impossible at this stage to say with certainty how effective this agreement is, if it is necessary in principle. The authors are inclined to believe that,

in the long term, this protocol will bring too large adverse political and economic consequences, which will be much lower compared to the benefits for the environment. It does not mean a denial of environmental problems and does not cancel their relevance, but only speaks of the demand for society to improve the terms of the contract or draw up a new one, with other principles of environmental protection. In future studies, it

is advisable to apply a comparative aspect and consider other environmental agreements for their perspective.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- [1] Ahmed, F., Ali, I., Kousar, S., & Ahmed, S. (2022). The environmental impact of industrialization and foreign direct investment: Empirical evidence from Asia-Pacific region. *Environmental Science and Pollution Research*, 29, 29778-29792. doi: [10.1007/s11356-021-17560-w](https://doi.org/10.1007/s11356-021-17560-w).
- [2] Arrhenius, S. (1896). [On the influence of carbonic acid in the air upon the temperature of the ground](#). *Philosophical Magazine and Journal of Science*, 41(5), 237-276.
- [3] Canada announced its withdrawal from the Kyoto Protocol. (2011). Retrieved from https://www.bbc.com/russian/science/2011/12/111212_canada_withdraw_kyoto.
- [4] Chen, X., Shuai, C., Wu, Y., & Zhang, Y. (2020). Analysis on the carbon emission peaks of China's industrial, building, transport, and agricultural sectors. *Science of the Total Environment*, 709, article number 135768. doi: [10.1016/j.scitotenv.2019.135768](https://doi.org/10.1016/j.scitotenv.2019.135768).
- [5] Cifuentes-Faura, J. (2022). European Union policies and their role in combating climate change over the years. *Air Quality, Atmosphere & Health*, 15, 1333-1340. doi: [10.1007/s11869-022-01156-5](https://doi.org/10.1007/s11869-022-01156-5).
- [6] Degroot, D., Anchukaitis, K., Bauch, M., Xoplaki, E., & Zappia, N. (2021). Towards a rigorous understanding of societal responses to climate change. *Nature*, 591(7851), 539-550. doi: [10.1038/s41586-021-03190-2](https://doi.org/10.1038/s41586-021-03190-2).
- [7] Dogan, E., Chishti, M.Z., Karimi Alavijeh, N., & Tzeremes, P. (2022). The roles of technology and Kyoto Protocol in energy transition towards COP26 targets: Evidence from the novel GMM-PVAR approach for G-7 countries. *Technological Forecasting and Social Change*, 181, article number 121756. doi: [10.1016/j.techfore.2022.121756](https://doi.org/10.1016/j.techfore.2022.121756).
- [8] Doyaili-Wangle, S. (2021). [Democracy, interest groups and compliance with the Kyoto Protocol](#). *Jena Economic Research Papers*, 1, 1-33.
- [9] Fisher, D.R., & Nasrin, S. (2021). Climate activism and its effects. *Wiley Interdisciplinary Reviews: Climate Change*, 12(1), article number e683. doi: [10.1002/wcc.683](https://doi.org/10.1002/wcc.683).
- [10] Grubb, M. (2004). [Kyoto and the future of international climate change responses: From here to where](#). *International Review on Environmental Strategies*, 5, 15-38.
- [11] He, R., Luo, L., Shamsuddin, A., & Tang, Q. (2022). Corporate carbon accounting: A literature review of carbon accounting research from the Kyoto Protocol to the Paris Agreement. *Accounting and Finance*, 62(1), 261-298. doi: [10.1111/acfi.12789](https://doi.org/10.1111/acfi.12789).
- [12] Hovi, J., Sprinz, D.F., & Bang, G. (2010). Why the United States did not become a party to the Kyoto Protocol: German, Norwegian, and US perspectives. *European Journal of International Relations*, 18(1), 129-150. doi: [10.1177/1354066110380964](https://doi.org/10.1177/1354066110380964).
- [13] Kanie, N. (2020). Leadership in multilateral negotiation and domestic policy: The Netherlands at the Kyoto protocol negotiation. *International Negotiation*, 8(2), 339-365. doi: [10.1163/157180603322576158](https://doi.org/10.1163/157180603322576158).
- [14] Kim, Y. (2020). Technological innovation, the Kyoto protocol, and open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3), article number 198. doi: [10.3390/joitmc7030198](https://doi.org/10.3390/joitmc7030198).
- [15] Kim, Y., & Tanaka, K. (2014). [Green innovation for sustainable development: A quantitative analysis of the impact of the Kyoto protocol](#). *PLoS One*, 15, article number 236299.
- [16] Kim, Y., Tanaka, K., & Matsuoka, S. (2020). Environmental and economic effectiveness of the Kyoto Protocol. *PLoS ONE*, 15(7), article number e0236299. doi: [10.1371/journal.pone.0236299](https://doi.org/10.1371/journal.pone.0236299).
- [17] Kyoto Protocol to the United Nations Framework Convention on Climate Change. (1997). Retrieved from <https://unfccc.int/sites/default/files/resource/docs/cop3/107a01.pdf>.
- [18] Lanoie, P., Laurent-Lucchetti, J., Johnstone, N., & Ambec, S. (2011). Environmental policy, innovation and performance: New insights on the Porter hypothesis. *Journal of Economic and Management Strategy*, 20, 803-842. doi: [10.1111/j.1530-9134.2011.00301.x](https://doi.org/10.1111/j.1530-9134.2011.00301.x).
- [19] Menton, M., Larrea, C., Latorre, S., Temper, L., & Walter, M. (2020). Environmental justice and the SDGs: From synergies to gaps and contradictions. *Sustainability Science*, 15(6), 1621-1636. doi: [10.1007/s11625-020-00789-8](https://doi.org/10.1007/s11625-020-00789-8).
- [20] Najarzadeh, R., Dargahi, H., Agheli, L., & Khameneh, K.B. (2021). Kyoto protocol and global value chains: Trade effects of an international environmental policy. *Environmental Development*, 40, article number 100659. doi: [10.1016/j.envdev.2021.100659](https://doi.org/10.1016/j.envdev.2021.100659).

- [21] Nguyen, J.H., & Phan, H.V. (2020). Carbon risk and corporate capital structure. *Journal of Corporate Finance*, 64, article number 101713. doi: [10.1016/j.jcorpfin.2020.101713](https://doi.org/10.1016/j.jcorpfin.2020.101713).
- [22] Organisation for Economic Co-operation and Development. (2022). Retrieved from <https://www.oecd.org/>.
- [23] Our World in Data. (2022). Retrieved from <https://ourworldindata.org/co2-emissions>.
- [24] Paris Agreement. (2015). Retrieved from https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
- [25] Pascolini-Campbell, M., Reager, J.T., Chandanpurkar, H.A., & Rodell, M. (2021). A 10 per cent increase in global land evapotranspiration from 2003 to 2019. *Nature*, 593(7860), 543-547. doi: [10.1038/s41586-021-03503-5](https://doi.org/10.1038/s41586-021-03503-5).
- [26] Radovanovic, R., Filipovic, S., Vukadinovic, S., Trbojevic, M., & Podbregar, I. (2022). Decarbonisation of eastern European economies: Monitoring, economic, social and security concerns. *Energy, Sustainability and Society*, 12, article number 16. doi: [10.1186/s13705-022-00342-8](https://doi.org/10.1186/s13705-022-00342-8).
- [27] Rhodes, C.J. (2016). The 2015 Paris climate change conference: COP21. *Science Progress*, 99, 97-104. doi: [10.3184/003685016x14528569315192](https://doi.org/10.3184/003685016x14528569315192).
- [28] Scotese, C.R., Song, H., Mills, B.J.W., & van der Meer, D.G. (2021). Phanerozoic paleotemperatures: The earth's changing climate during the last 540 million years. *Earth-Science Reviews*, 215, article number 103503. doi: [10.1016/j.earscirev.2021.103503](https://doi.org/10.1016/j.earscirev.2021.103503).
- [29] Sikora, A. (2021). European Green Deal – legal and financial challenges of the climate change. *ERA Forum*, 21(4), 681-697. doi: [10.1007/s12027-020-00637-3](https://doi.org/10.1007/s12027-020-00637-3).
- [30] Sorokhtin, O.G. (2007). *Evolution of Earth's climates*. Retrieved from <https://goo.su/VWfD>.
- [31] Sovacool, B.K., Griffiths, S., Kim, J., & Bazilian, M. (2021). Climate change and industrial F-gases: A critical and systematic review of developments, sociotechnical systems and policy options for reducing synthetic greenhouse gas emissions. *Renewable and Sustainable Energy Reviews*, 141, article number 110759. doi: [10.1016/j.rser.2021.110759](https://doi.org/10.1016/j.rser.2021.110759).
- [32] Taylor, M., Watts, J. & Bartlett, J. (2019). *Climate Crisis: 6 Million People Join Latest Wave of Global Protests*. Retrieved from <https://www.theguardian.com/environment/2019/sep/27/climate-crisis-6-million-people-join-latest-wave-of-worldwide-protests>.
- [33] Usman, M., & Hammar, N. (2021). Dynamic relationship between technological innovations, financial development, renewable energy, and ecological footprint: Fresh insights based on the STIRPAT model for Asia Pacific Economic Cooperation countries. *Environmental Science and Pollution Research*, 28(12), 15519-15536. doi: [10.1007/s11356-020-11640-z](https://doi.org/10.1007/s11356-020-11640-z).
- [34] Vladimirov, V.A., & Churakov, Y.I. (2014). [The problem of global climate change as a natural hazard](#). *Civil Protection Strategy: Issues and Research*, 4(2), 506-519.
- [35] Zhang, D. (2021). Green credit regulation, induced R&D and green productivity: Revisiting the Porter Hypothesis. *International Review of Financial Analysis*, 75, article number 101723. doi: [10.1016/j.irfa.2021.101723](https://doi.org/10.1016/j.irfa.2021.101723).

Економічний ефект від заходів, передбачених Кіотським протоколом, за регіонами (станом на 2020-ті роки)

Ентоні Міллер

Кандидат наук в освітньому лідерстві, педагогічний радник – запрошений лектор
Університет Отгонтенгер
13370, вул. Жукова, 51, м. Улан-Батор, Монголія
<https://orcid.org/0000-0001-7827-9716>

Авазбек Атаханов

Докторант
Киргизький національний університет імені Ж. Баласагына
720033, вул. Фрунзе, 547, м. Бішкек, Киргизька Республіка

Мушфіг Гулієв

Доктор економічних наук, професор
Азербайджанський державний економічний університет
AZ1001, вул. Істіглаліят, 6, м. Баку, Республіка Азербайджан
<https://orcid.org/0000-0002-1104-5402>

Хатіра Гузейнова

Доктор економічних наук, професор
Академія державного управління при Президентіві Азербайджанської Республіки
AZ1001, вул. Лермонтова, 74, м. Баку, Республіка Азербайджан
<https://orcid.org/0000-0001-8590-1091>

Тарлан Азізов

Докторант
Азербайджанський державний економічний університет
AZ1001, вул. Істіглаліят, 6, м. Баку, Республіка Азербайджан
<https://orcid.org/0000-0001-6848-7968>

Анотація. Кіотський протокол став перспективною складовою для вирішення однієї з найбільш актуальних та обговорюваних науковцями проблем – забруднення атмосферного повітря. Тому залишається важливим розглянути, чого ж насправді вдалося досягти за 17 років дії договору, які ефекти (екологічні чи економічні) переважають в результаті його дії. У цьому дослідженні особливий акцент зроблено на впливі Кіотського протоколу на окремі регіони, такі як Європа, Азія, Америка та інші. Таким чином, мета роботи – продемонструвати, як ця угода вплинула на розвиток країн певних регіонів, до яких наслідків вона призвела і наскільки ефективною виявилася. У роботі були використані наступні методи дослідження: статистичний, графічний, історичний, моделювання та прогнозування. Під час написання роботи було продемонстровано, які переваги та недоліки має Кіотський протокол як документ щодо захисту зовнішнього середовища. Крім того, автори описали основні екологічні вигоди та економічні втрати від цієї угоди. Дослідження показало, що Кіотський протокол дійсно зменшує викиди CO₂ в деяких регіонах і, ймовірно, знижує темпи зростання в інших. Однак в країнах-учасницях угоди спостерігається загальний спад промислового розвитку. Автори роблять висновок, що наразі неможливо з упевненістю сказати, наскільки ефективною буде ця угода, але її негативні політичні та економічні наслідки будуть набагато меншими, ніж екологічні вигоди. Крім того, були розглянуті регіональні особливості впливу Кіотського протоколу на розвиток окремих країн. Робота дозволяє по-новому поглянути на ефективність Кіотського протоколу і дає нові відповіді на питання про корисність цього документа та раціональність виконання його умов

Ключові слова: сталий розвиток; регіональний розвиток; міжнародні відносини; зовнішнє середовище; забруднення повітря
