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COUNTERACTING CLIMATE CHANGE IN THE CONTEXT OF IMPLEMENTING SUSTAINABLE DEVELOPMENT IN ECONOMIC AND SOCIAL ASPECTS

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ABSTRACT: The aim of the article is to present the current state of knowledge about climate change, the causes of these changes, and potential effects, both environmental, economic, and social. To achieve the formulated goal, the author attempts to interpret original research results in the area of climate change, as well as actions taken (at various levels) in the field of climate policy. This is intended to answer the question of whether the idea of sustainable development at the social and economic level is realistic in the context of climate policy. In the ongoing debate, the problem of adaptation to climate change has given way to the problem of pollutant emissions, and the available scientific knowledge is insufficient to predict what changes the climate will undergo in the coming decades and what impact humans will have on these changes. Based on the analyses carried out, the author of the article concludes that emphasis should be placed on solutions that support human well-being and minimise losses. Environmental protection, if it is to remain a science, must take responsibility for the entire environment, including human well-being, and cannot be done at the expense of human beings because it destroys the natural social order. The article verifies the following hypothesis: decisions made in the field of climate policy are insufficiently justified by scientific research, which provides irrefutable facts.

KEYWORDS: carbon emissions, climate change, sustainable development, international cooperation

Introduction

Climate change affecting the entire Earth in recent decades has been recognised as one of the most important scientific problems of the 21st century. Not only do they have a huge impact on the energy economy around the world, but they also change the living conditions of many species of plants and animals, as well as humans. WHO writes that climate change, both directly and indirectly caused by human activities, threatens the achievement of all Sustainable Development Goals (SDGs). It is expected that worldwide, between 2030 and 2050, it will cause over 250,000 additional deaths per year (WHO, 2017). Concrete climate action is needed to protect people and the planet. Action is needed across sectors and environments to promote resilience and combat climate change.

When talking about Sustainable Development, we should always remember that it is a development that should focus on maintaining a balance between economic and social development plans and their environmental limitations. Therefore, it should not and cannot lead to a deterioration of the living condition of societies, especially the poorest ones.

Many initiatives are being undertaken at the international level to save the natural environment. One of the first documents was the resolution of the United Nations General Assembly in 1969, accepting the report of UN Secretary-General Sithu U'Thant. The report noted that all nations of the world are facing a danger which in some areas and in some regions has already assumed critical proportions (U'Thant, 1969).

Another milestone in introducing environmental problems (including air-related ones) into politics was the publication in 1987 of the report Our Common Future by the World Commission on Environment and Development, operating under the auspices of the UN and chaired by Gro H. Brundtland. The document presents the foundations of the concept of sustainable development. In accordance with its principles, a program was initiated to transform the world economy and develop – on a global and national scale – a model based on reconciling economic interests, care for the environment (including air) and the quality of life of society (United Nations, 1987).

The report *"Our Common Future"* also resulted in the convening of the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. This event was abbreviated as the 1992 Earth Summit (COP). The 28th edition of the conference took place in 2023 and was named by experts as the event that left the largest carbon footprint. COP is an event where national leaders meet to determine how to step up global action to address the climate crisis. The very fact that the 28th edition of the conference took place in 2023 may indicate that, for the most part, the initiatives undertaken remain only declarative. For example, at the end of COP 2012, the governments of over 190 countries renewed their political commitment to sustainable development in the non-binding document *"The Future We Want"*. This was the basis for the adoption by the UN in 2015 of the document Transforming our world: *"2030 Agenda for Sustainable Development"* which includes the Sustainable Development Goals. The 2030 Agenda for Sustainable Development was adopted unanimously by all UN member states in a Resolution of the General Assembly on September 25, 2015 in New York (ONZ, 2015).

Climate change and sustainable development have many interconnections, as reflected in two transformational agreements adopted by nations within months of each other in 2015: the *"2030 Agenda for Sustainable Development"* and the *"Paris Agreement on Climate Change"*. According to the 2030 Agenda, contemporary modernisation efforts should focus on eliminating poverty in all its manifestations while achieving a number of economic, social and environmental goals (ONZ, 2015).

The United Nations Framework Convention on Climate Change and, at the same time, the international agreement on counteracting global warming were supplemented by the Kyoto Protocol, negotiated at the Kyoto conference in December 1997.

The difference between the Protocol and the United Nations Framework Convention on Climate Change (UNFCCC) is that the Convention encourages countries to reduce greenhouse gas emissions. This Protocol obliges them to do so, and it is legally binding (United Nations, 1997).

In the European Climate Law, part of the European Green Deal, the EU has set itself a binding goal: achieving climate neutrality by 2050. This means that greenhouse gas emissions must decline significantly in the coming decades. An intermediate step towards climate neutrality is to be a more ambitious goal of reducing emissions by at least 55% by 2030 (Huszlak, 2023).

The proposals from the package are intended to be a coherent and sustainable framework for the implementation of the EU's climate goals: they will ensure a socially just transformation, maintain

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and increase the innovation and competitiveness of EU industry, and at the same time guarantee a level playing field between economic entities from third countries, strengthen the EU's position as a leader in the global fight against change climate.

Taking into account the above, the aim of the article is to present the current state of knowledge about climate change, the causes of these changes and potential effects, both environmental and economic and social. The article verifies the following hypothesis: decisions made in the field of climate policy are insufficiently justified by scientific research, which provides irrefutable facts.

Materials and methods

In order to achieve the formulated goal and verify the research hypothesis, the author attempts to interpret the original research results in the area of climate change, as well as the actions taken (at various levels) in the field of climate policy (in Europe known as Fit for 55, in Poland: Ready for 55[1], as well as in the USA).

Available source publications on the causes and effects of ongoing climate changes were analysed. In the text, the author interprets and analyses the research results of leading climatologists, physicists and geographers, comparing them with other research and presenting arguments and conclusions for conducting climate policy. This is intended to answer the question of whether the idea of sustainable development at the social and economic level is realistic in the context of climate policy.

Results

The literature review and conducted research show that the climate is changing, as presented in Figures 1-4.

Figure 1 shows atmospheric carbon dioxide (CO_2) levels measured by NOAA since 1958.

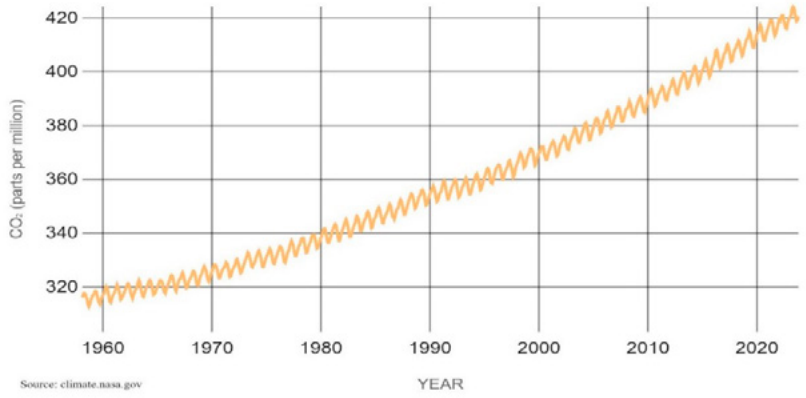

Figure 1. Carbon dioxide (CO_2) level in the atmosphere

Source: authors' work based on NASA (2024a).

Figure 2 shows the change in global land and ocean surface temperatures compared to the long-term average from 1951 to 1980. 2020 statistically tied with 2016 as the hottest year on record since record-keeping began in 1880 (NASA, 2024b).

An analysis conducted by NASA shows that the average temperature of the Earth's surface in 2022 is equal to 2015, which was the fifth warmest on record. Continuing the planet's long-term warming trend, the global temperature in 2022 was 0.89 degrees Celsius above the average over NASA's baseline period (1951-1980). The last nine years have been the warmest since modern

[1] Fit for 55 is a legislative package announced by the European Commission. It concerns climate change and related management of greenhouse gasses. The basis of the package is the European Green Deal which assumes reducing emissions by 55% in 2050. The year that constitutes the reference point for this challenge is 1990.

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records began in 1880. This means that in 2022, Earth was about 1.11 degrees Celsius warmer than the average at the end of the 19th century (NASA, 2023).

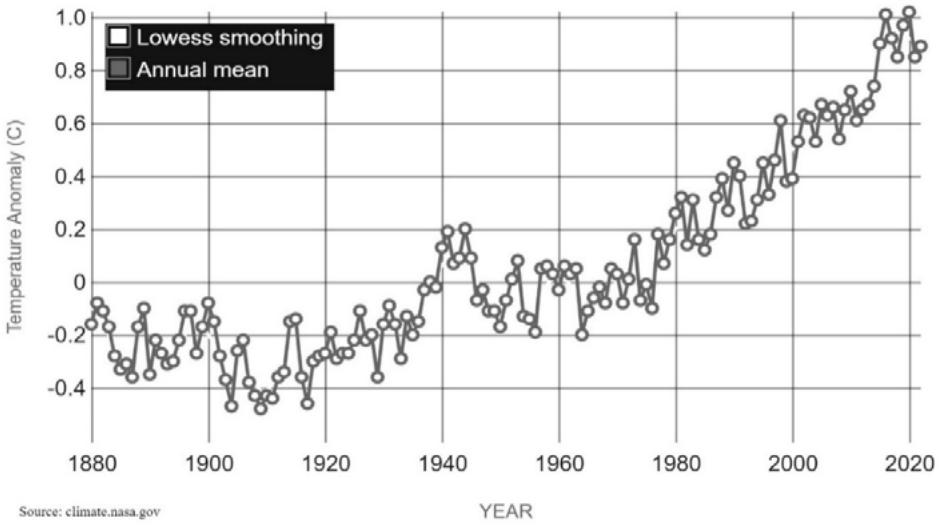

Figure 2. Global land and ocean temperature index

Source: authors' work based on NASA (2024b).

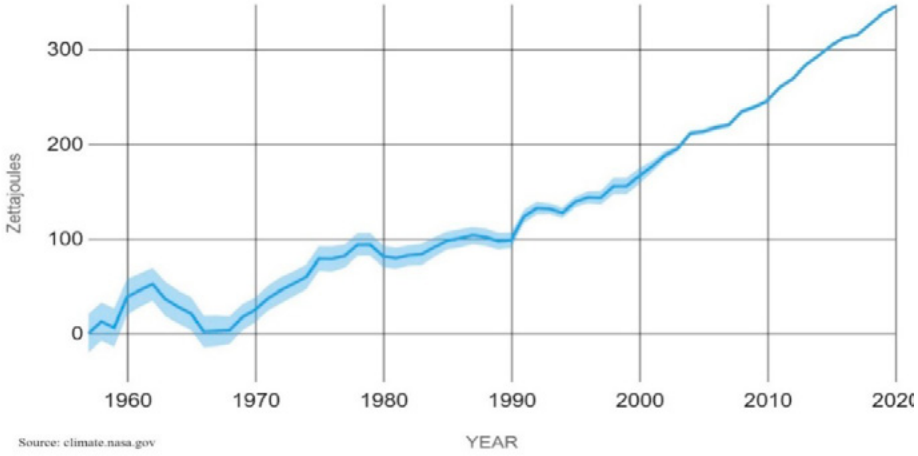

Figure 3. Ocean heat changes since 1955

Source: authors' work based on NASA (2024c).

As shown in Figure 3, ninety percent of global warming is taking place in the oceans, causing the internal heat of water to increase since modern record-keeping began in 1955. The heat stored in the ocean causes its water to expand, accounting for one-third to one-half of the rise in global sea level. Most of the additional energy is stored at the surface, at depths ranging from zero to 700 meters. The last 10 years have been the warmest decade in the ocean since at least the 19th century. 2022 was the warmest year on record for the ocean and recorded the highest global sea levels.

Sea level rise is mainly caused by two factors related to global warming: the addition of water from melting ice sheets and glaciers and the expansion of seawater as it warms.

Figure 4 shows how much sea level has changed from around 1900 to 2018. Positives (+) are what causes the global sea level to rise, while minuses (-) are what causes the sea level to fall.

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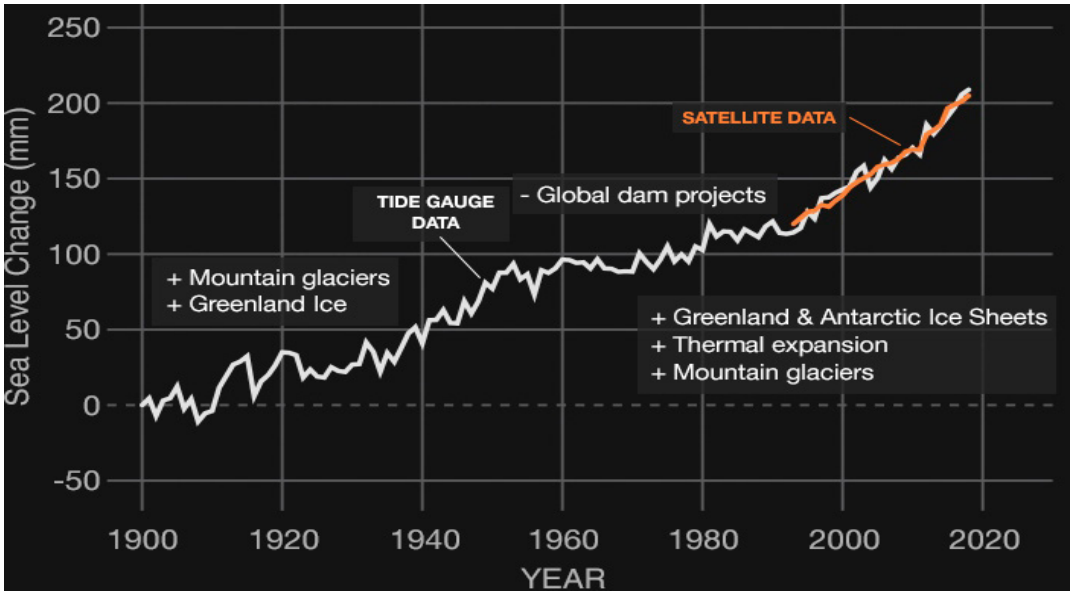

Figure 4. Sea level change from 1900 to 2018

Source: authors' work based on NASA (2024d).

However, to know and understand the reasons why the climate is changing and to see the scenario of possible changes in the future, knowledge about the processes involved is needed. Detection of cycles (deterministic components) in measurement series of climatological variables is of key importance in identifying the causes of fluctuations in the Earth's climate. Boryczka, in an article published in 2001, writes that the progressive warming of the climate of Europe (and Poland) in the 19th and 20th centuries is probably the result of the interference of natural temperature cycles synchronous with cycles of astronomical and geological variables (Boryczka, 2001).

This thesis is confirmed by research conducted by Marsz and Styszyńska published in 2022. The authors of the cited article believe that in Poland in the years 1951-1988 and 1931-1988, the annual temperature trend was zero, and warming began only in 1988 with a change in the temperature regime. The reason for the change in the thermal regime was an equally radical change in macrocirculation conditions, which occurred as a result of a change in the phase of the thermohaline circulation in the North Atlantic. Explaining the sequence of processes that led to the temperature increase indicates that they are the result of the internal dynamics of the climate system and not a consequence of the increase in the concentration of greenhouse gases in the atmosphere (Marsz & Styszyńska, 2022). This warming effect is called radiative forcing. Radiative forcing also causes a series of feedback effects, i.e. reactions that are a consequence of radiation, such as increased ocean evaporation, perhaps cloud condensation, above-average precipitation, a whole range of various phenomena about which there is now less scientific agreement as to the intensity of their occurrence.

Scientists are unclear about the net effect of radiative forcing and associated feedback on the Earth's temperature, but they agree that even a doubling of greenhouse gas concentrations would by itself have a moderate, small impact on climate change. The question that raises the most controversy is not about the amount of gases emitted but about the sensitivity of the earth's ecosystem to radiative forcing. Is human activity actually leading to a catastrophe, or is it relatively limited and can easily be balanced by the planet's natural adaptation to changes?

Another question that arises is to what extent global warming is the result of human activity and to what extent it is caused by natural temperature fluctuations, repeatable phenomena, and phenomena that may appear in the history of humanity. For example, both the literature that describes the issues discussed and government reports summarising and assessing the state of climatology clearly show that heat waves in the United States are no more frequent today than they were in 1900, and the highest recorded temperature has not increased in over the last fifty years (Koonin, 2021).

This last question is particularly important for determining the scale of anthropogenic warming. In this matter, scientists pay attention to several different phenomena, such as the Pacific Oscillation and the circulation sequence in the northern part of the Pacific Ocean. There is also an Atlantic Oscil-

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lation that lasts for decades, averaging about 60-80 years, and causes variable sea surface temperatures in the North and Upper Atlantic. Therefore, there is no simple answer to the question of what influences changes in the Earth's temperature, although there is agreement that the temperature is rising.

According to NASA's chief climate scientist, Gavin Schmidt, record temperatures in 2023 "are quite mysterious". In his opinion, they can only be partially explained by the El Niño phenomenon or human activity (Aubourg, 2024).

In general, scientists agree that the Earth has been steadily warming since the Little Ice Age, which ended around 1850.

The Little Ice Age occurred after the so-called medieval climatic optimum, approximately in the 15th-16th centuries. Then, average temperatures in the Northern Hemisphere dropped by about 1°C over several hundred years. So far, many factors have been speculated that caused such a climate change. These include a reduced level of volcanic activity, changes in the solar constant, and thermohaline circulation. Many scientists also claim that, in addition to the influence of nature, diseases contributed to the advent of the Little Ice Age. However, Professor Francois Lapointe and Raymond Bradley, who are the main authors of the latest research, claim that after carefully checking various sources, they discovered that in the late 13th century, huge amounts of warm water from the south began to flow north, with this transfer peaking in 1380. This caused the seas south of Greenland to become much warmer. This Atlantic circulation is a normal phenomenon, but it reached its peak in the 14th century. The warm water caused ice to break off the glaciers and then flow into the Atlantic, cooling it and reducing its salinity. Moreover, such a high level of Atlantic circulation had a major impact on the formation of high-pressure areas over Greenland. As a result, the Arctic was exposed to very high sunlight. Scientists point out that, in addition, volcanic activity was very low at that time, so the air was cleaner (Rybski, 2021).

There is very little or very patchy research on the impact of natural forces on world climate.

Roy Spencer of the University of Alabama, writing for NASA, noted that surprisingly little research has been done on the natural mechanisms of global warming. As he wrote, it was simply assumed that global warming was the work of humans. Assuming the goodwill of scientists, the first explanation that comes to mind is that scientists studied what they were able to study because there is a lack of reliable, comparable climate data from around the world for at least 500 years, and only such data could be considered conclusive. "Global warming" refers to the increase in average global temperature observed over the last hundred years or more. However, for many politicians and the public, the term suggests that humanity is responsible for global warming. However, research conducted by Spencer suggests that global warming is mostly a natural phenomenon and that the climate system is quite insensitive to humanity's greenhouse gas emissions and aerosol pollution (Spencer & Braswell, 2014). The "consensus" of this opinion is that the Earth's climate sensitivity is quite high, so warming is around 0.25 degrees C to 0.5 degrees C every 10 years as long as humanity continues to use fossil fuels as its main energy source.

The 2021 UN report draws five different climate scenarios and was created based, as we read, on a new methodology. The methodology is new, and these are complicated computer models, but the data that was used to model climate change is old because there is a lack of historical studies and temperature studies. Steven Koonin points out the fallibility of these models in his latest book "Unsettled: What Climate Science Tells Us, What It Doesn't". Koonin writes about confusing models that do not allow us to clearly state how the Earth will react in response to increased gas emissions. For example, models do not allow scientists to explain why there was rapid warming in the years 1910-1940 and why it was almost identical to that in the years 1970-2000, even though 100 years ago, the human impact on global climate was incomparably smaller (Koonin, 2021).

In "The Perspective" article appearing this week in the Proceedings of the National Academy of Sciences, Tim Palmer and Bjorn Stevens critically reflect on the current state of Earth system modelling. They argue that it is a mistake to treat global warming as the product of sophisticated models because such an approach underestimates the contribution of physical principles and simple models, as well as observations, in establishing this understanding. This formulation also inevitably leads to downplaying the shortcomings in modelling the state of the Earth system – which affects the development of science (Palmer & Stevens, 2019). The lack of detailed data in computer climate modelling makes the models unsuitable for predicting climate behaviour in practice. This is partially admitted

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even by the Intergovernmental Panel on Climate Change, which states that modelling methods are only as reliable as the data entered there. Since scientists don't have complete climate data, they study only what they have.

Robert L. Bradley, in an article published in the American Institute for Economic Research in 2021, wrote that in the future, it may turn out that the results of the climate models used were wrong, which led to an overestimation of warming and false fears of the human-caused greenhouse effect (Bradley, 2021). A press release from the University of Colorado at Boulder, titled "Warmer Clouds, Cooler Planet," with the subtitle "Precipitation-related 'feedback' cycle means models may overestimate global warming", points out that current climate models may be wrong about too much warming (ENN, 2021). A detailed justification for this can be found in the article by German researchers published in Nature Climate Change entitled "An underestimated negative cloud feedback from cloud lifetime changes" (Mülmenstädt et al., 2021).

Professor Judy Carey, one of the pioneers of climate research, speaks critically about modelling climate change (Carey, 2023).

Climate models aim to estimate trends, not events. For example, a fairly simple climate model can easily conclude that winter will be colder. However, it is not able to determine what the temperature will be on a specific day – it is a weather forecast. Weather forecast models rarely extend even two weeks into the future. Climate trends refer to factors such as changes in temperature or sea level over many decades. Trends are important because they eliminate or "smooth out" single events that may be extreme but rare. In other words, trends tell us where the system is heading. Computer modelling is the simulation and study of complex physical systems using mathematics and computer science. Models can be used to examine the effects of changes to any or all components of a system. Techniques of this type have a wide range of applications (Skeptical Science, 2024). The point is to acknowledge that there is a lack of detailed data that will allow us to definitively determine what this impact is.

The Nobel Prize in Physics was awarded to Siruko Manabe of Japan and Klaus Hasselman of Germany for climate modelling in 2021. In the chaos of the randomness model-found in everything from particles to various materials and minerals- scientists have found a way to take into account the possible impact of humans on the atmosphere. But figuring out how these global trends translate into concrete, tangible action is still a big mystery. How much, for example, a given region will warm with increased greenhouse gas emissions depends on local conditions, which are unpredictable, such as tree cover, air pollution, wind patterns and rainfall, as well as how much heat the atmosphere can store at any given time.

It is known that the climate is changing, and it is known what influences it, but it is still impossible to say with certainty to what extent humans are responsible for it.

The lack of hard data should encourage greater humility and reflection rather than climate aggression. Both when it comes to researching anthropogenic theories and undertaking radical solutions that can change people's lives. Such a model should warn against taking irreversible actions that, even if they help, may disproportionately harm our civilisation. Manipulations usually appear only at the level of climate journalism and political narrative because they do not result from scientific studies alone.

A perfect example is the UN report that was the basis of the Glasgow Summit (IPCC AR6). Contrary to sensational reports, the report does not say anything more than what was established in the 2013 report. Some formulations should even be optimistic. The report says the Earth has warmed by 1.1 degrees Celsius since the mid-19th century and has a critical opinion about global climate models, writing that climate models do not simulate extreme weather events. So, any predictions about future hurricanes or rainfall amounts or whatever are based semi-empirically on observations and are not directly made by climate models. IPCC AR6 fully acknowledges that global climate models cannot simulate regional climate variability with any skill because they do not allow the magnitude and timing of the main modes of natural internal climate variability that play a dominant role in regional climates to be determined (Curry, 2021).

A significant contribution to estimating climate sensitivity was made by the research of Lewis (2023). Lewis' research identifies statistical problems in estimating statistical sensitivity, and uses an objective approach and reviews, and revises preliminary assumptions, with particular attention to the latest scientific evidence.

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Combining different lines of evidence should, to the extent that they are independent, enable more accurate estimates of climate sensitivity than from any single line of evidence (Stevens et al., 2016).

Lewis's assessments had a major influence on the assessment of the Intergovernmental Panel on Climate Change's Sixth Assessment Report (AR6) on the balance of climate sensitivity, the probable lower end of the range being raised to 2.5 °C (from previously 1.5 °C).

It is worth paying attention to this because, in the past, the report's conclusions, which were presented to the media and politicians, often distorted the scientific research that was included even in the UN report itself. For example, a summary of the latest report to the European Commission concluded that heat waves have become more frequent since the 1960s. However, what has been omitted is the data showing that they occurred as frequently before 1900 as they do today (IPCC, 2021).

Earth's climate sensitivity is a key measure of the long-term climate response to external factors. This is perhaps the most important unquantified parameter of the climate system.

Pielke for the publication of The Climate Fix: "*What Scientists and Politicians Won't Tell You About Global Warming*" and the criticism of the calculations contained in the report of the UN IPCC climate panel, where, as he claimed, that climate calculations were overstated, he was harshly criticised by climate communities, even though the IPCC later acknowledged its mistakes. Pielke (2010) writes that climate change is real and that greenhouse gas emissions require action. However, ongoing research shows there is no evidence that hurricanes, floods, tornadoes or droughts have become more frequent or intense in recent times. The world's response to climate change is deeply flawed. The relationship between humans and the Earth system we inhabit works in two ways: humans influence the planet, and the processes taking place in the Earth system affect humans. This symbiosis is characterised by empirical complexities and uncertainties, the most intense of which is the global debate on climate change in recent years. Environmental research and science policy expert Pielke recommends first understanding why current approaches are failing and then considering better alternatives. Pielke calls for finding an alternative to various proposals, an example of which is the Kyoto Protocol, which states that ordering an end to climate change will make it disappear (Pielke, 2010).

Research by Frances C. Moore (Hoang, 2023) provides interesting insights that help understand the complex interplay between climate change and its consequences for society (see Figure 5).

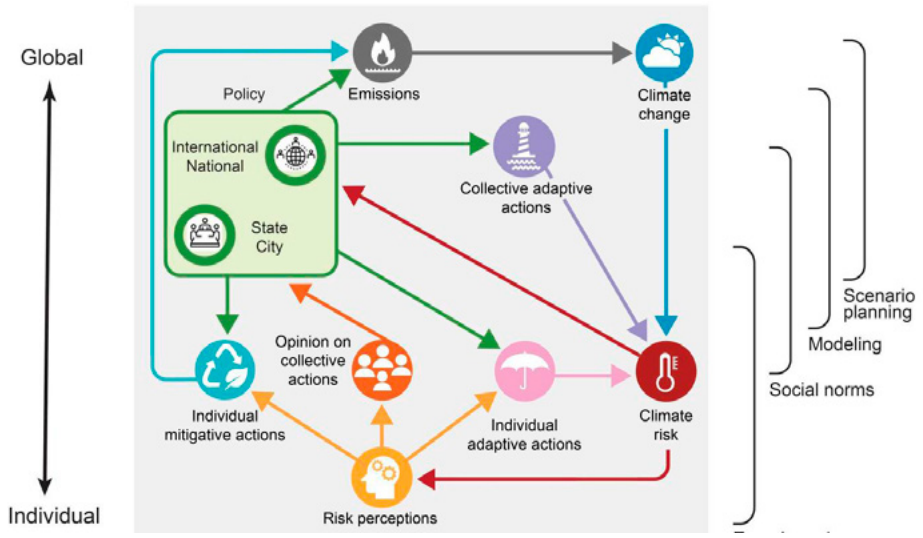

Figure 5. State actions and climate risk

Source: Hoang (2023).

Government actions at multiple scales (green colour) affect climate risk (red colour) in multiple ways by reducing or increasing greenhouse gas emissions (grey colour) and supporting adaptive (or maladaptive) actions (pink, purple colours). Moreover, the actions of the authorities are influenced by the opinions and interests of residents, businesses and other organisations (orange colour), which

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in turn shape the actions of households and businesses (pink, blue colours). Interacting actors are nested at multiple spatial scales (left) and rely on different sources of knowledge to make decisions (right).

Michael Schellenberger believes that the climate science community is demoralised by the excess of easy money, lack of criticism and lack of assessment of the effectiveness of their work. In his published book, he very carefully analyses the activities of some non-profit organisations that are financed by large corporations, from Gazprom's anti-shale gaz campaign to foundations cooperating with, for example, technology companies that use child slave labour in African cobalt mines. In this well-documented publication, Shellenberger exposes the hypocrisy of the ecological movement, which paints climate change in apocalyptic terms while steadfastly fighting against nuclear energy, the only source of green energy whose implementation could realistically lead to avoiding the worst climate threats. (Shellenberger, 2020).

In 2021, the editor-in-chief of prestigious medical journals published a joint appeal to world leaders for actions that would reduce population mortality due to climate change.

A report by the World Health Organization (WHO) states that compared to a future without climate change, the following additional deaths are predicted for 2030: 38,000 from heat exposure of the elderly, 48,000 from diarrhoea, 60,000 from malaria and 95,000 due to childhood malnutrition. WHO predicts a dramatic decline in child mortality, as reflected in the decreasing impacts of climate change from child malnutrition and diarrhoea between 2030 and 2050. On the other hand, the number of deaths related to heat exposure (over 100,000 per year) is expected to increase by 2050. The impact is greatest in a low-growth scenario due to higher mortality rates expected in low- and middle-income countries. The socio-economic baseline scenario estimates approximately 250,000 additional deaths due to climate change per year between 2030 and 2050. These numbers do not represent a prediction of the overall health impacts of climate change because it was impossible to quantify several important causal pathways (WHO, 2014).

In principle, both the authors of the appeal and the WHO are right. In recent years, more people are dying from heat exposure. Over the last 20 years, heat-related mortality in people over 65 has increased by 54%. What they do not add is that at the same time, the number of people over 65 increased by approximately the same amount. By its nature, this must have resulted in higher mortality, since there were more people over 65 years of age.

Lomborg, in "Cool It", argues that the predicted temperature increase could save the lives of over 1.3 million people per year. This is because many more people would avoid early death due to cold than there would be at risk of heat-related respiratory disease deaths. Lomborg concludes that the proposed extension of the Kyoto Protocol to reduce greenhouse gas emissions "would save 4,000 lives a year in developing countries, but would sacrifice more than a trillion dollars and 80,000 lives a year". Lomborg does not question the negative impact of human activity on the climate, does not question the role of carbon dioxide in global warming, and supports activities aimed at minimising the negative effects of industry's impact on the climate, including technological changes in the energy industry. However, he claims that the actions currently undertaken are ineffective; they are mainly aimed at "improving the well-being" of politicians and decision-makers, and they mainly affect the weakest, and the society is not reliably informed about the real threats (Lomborg, 2007; Lomborg, 2009).

Failure to take into account the adaptability of societies to new climatic conditions and ignoring the positive effects of global warming that will occur in certain areas (e.g. China, Canada, Denmark, Russia) are Lomborg's next basic objections to commonly held theories. For example, according to the only peer-reviewed study on the subject, published in Ecological Economies, global warming may increase the number of deaths by approximately 400,000 worldwide, but it will also have a positive effect of reducing by 1.8 million deaths caused by cold (Lomborg, 2008). Lomborg's most important objection to current concepts for limiting the effects of global warming concerns the issue of their effectiveness. Firstly, an analysis of the current effects of activities aimed at reducing CO_2 emissions shows that the results are less than mediocre in relation to the expected ones. Secondly, the currently proposed solutions do not withstand a simple calculation of economic efficiency, calculated as the ratio of benefits to expenditure. An expert opinion commissioned by the Copenhagen Consensus Center showed, for example, that the costs of reducing the temperature by 2°C by the end of the century would amount to costs of $46 trillion globally, while the cost caused by climate damage with

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a temperature increase of 2°C is estimated at only $1.1 trillion (Lomborg, 2008). This evaluation is confirmed by other economic models. Reducing the damage by $1 would, therefore, cost approximately $42, which is economic absurdity.

In 2021, Koonin's book titled "*Unsettled: What Climate Science Tells Us, What It Doesnt and Why It Matters*", in which the author attempts to explain what climate science says, what it doesn't say, and why it matters. In the book, Koonin states that science regarding the Earth's climate is not yet established. He argues that experts, politicians, and the majority of the public who believe otherwise are victims of what he has publicly called "consensus science" (Koonin, 2021).

In 2021, there was a flood in Germany that took the lives of many people. The main cause was identified as climate change. German Chancellor Angela Merkel then visited the flood-affected areas, provided quick help to the victims and called for the fight against climate change (Archyde, 2021).

On the other hand, studies of tens of thousands of rivers around the world show that most are now flooding less often, not more often, than in the past. Some rivers still flood, and of course, they are always a media topic, but more moving stories do not mean that these climate changes are greater. In July 2021, a river that led to the tragic flood actually had record amounts of water that day, but then the water level in that river was lower than, for example, the tides in 1804 and the flood in 1910, as already mentioned by Björn Lomborg, author of the book *"False Alarm".*

Hannah Clarke, a professor of hydrology at the University of Reading in the UK who designed Europe's Early Flood Warning System (EFAS), said German authorities had failed to provide adequate evacuation instructions. Some local governments in Belgium and Luxembourg told residents to leave their homes after heavy rains. However, Professor Cloke said: "Jumping into the water or getting behind the wheel to escape is very dangerous". In addition, Professor Cloke pointed to the problem of the German flood protection system, which entrusted local governments with taking all actions related to counteracting heavy rains and floods without a coherent and coordinated warning system (Cloke, 2021; Archyde, 2021).

In the 1920s, climate disasters around the world killed an average of half a million people a year. Today, they cause the death of less than 20,000 people a year, despite the increase in the world's population and the increase in gas emissions since 1920.

According to scientists who published the first study linking temperature changes to the annual increase in mortality, extreme weather conditions accounted for 9.4 percent of all deaths in the world in 2000-2019. Although most deaths were caused by exposure to hypothermia, the trend is likely to reverse as the planet warms (Ciborski, 2021).

In the fight against climate change, the European Council (EC) presented a draft regulation that is intended to strengthen the resilience of forest ecosystems and their key function in the fight against climate change and loss of biodiversity. As the European Commission states, forest areas in Europe are suffering from an ongoing climate crisis and unsustainable human activity. The growing pressure leads to tragic events, such as fires, which, according to the presented report, affected almost 900,000 hectares of forests in 2022. 96% of these fires were caused by humans. However, these forest fires were also caused by rising temperatures and droughts related to climate change (Joint Research Centre, 2023).

Recently, forest management has been the cause of numerous forest fires in the United States and Canada. Environmental activists forced private owners to ban the removal of fallen trees, flammable undergrowth and increased felling of trees. This resulted in the fires spreading easily through forests (Rudzki, 2023).

Research on forest fires in 30 countries conducted by Grajewski did not generally confirm the views regarding the forecasts of an increase in the number of forest fires and the size of burned forest areas as a consequence of climate change (Grajewski, 2017). The author writes in his article that the accumulation of flammable materials in previous years, combined with the increase in temperature and the frequency of droughts, will constitute a major challenge for fire protection systems in forest areas.

The negative experiences of Canada, the United States or published scientific research in this area do not prevent the European Commission, under the Fit for 55 program, from working on a directive prohibiting any logging in most European forests, which may result in similar phenomena in the future.

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According to scientists from Technology Review, published by the prestigious Massachusetts Institute of Technology (MIT), some emissions may have a positive impact on global warming. This thesis calls into question the shape of individual anti-emission policies implemented by some countries and international organisations. According to scientists, this phenomenon is an unintentional experiment in climate change that has been going on for over a hundred years. According to MIT Technology Review, ship emissions may have contributed to global average temperatures being 0.25 degrees Celsius lower now than in the past (Wiech, 2018). Given that the global climate goal is to keep temperature increases to within 2 degrees Celsius compared to the pre-industrial era, reducing global warming due to shipping emissions is a significant help. Interestingly, already in 2009, a group of scientists, including from the Center for International Climate and Environmental Research in Oslo and the British Manchester Metropolitan University, warned that if the decision to limit sulfur emissions is made, future generations will struggle with a rapid acceleration of global warming. Two models were then presented regarding the possible development of events: one with maintaining the emission level from 2000 and the other with a reduction of this top-level by 90%. In the first case, the sulfur effect on slowing climate change lasted for 350 years. In the second case, negative changes could be observed after 70 years (Wiech, 2018; Dubiel, 2023).

According to the Danish Center for Environment and Energy at Aarhus University, the implementation of the Sulfur Directive resulted in a decrease in sulfur concentrations, which was recorded in 2015 at an average of 50-60% (Wiech, 2018). However, the new law also had a side effect. According to portalmorski.pl, more stringent sulfur limits resulted in increased carbon dioxide emissions into the atmosphere (Wiech, 2018).

The link between sulfur dioxide reduction and global warming was made by the IPCC in a 2021 report, which found that if it weren't for sunshades made from SO_2 pollution, average global temperatures would already have riseen by 1.6 degrees Celsius above pre-industrial levels.

A collection of 24 indicators on energy use and environmental protection has been released by the European Environment Agency (EEA). These metrics include final energy consumption, greenhouse gas emissions, and the total amount of energy derived from fossil fuels. For statistical purposes, there are three primary categories for energy consumption: industry, construction, and transportation. The construction category is further subdivided into residential construction and service construction, excluding industrial facilities. Currently, more than half of the residential buildings in EU countries were constructed prior to 1970, with the remaining third being constructed between 1970 and 1990. The energy efficiency of newly constructed residential buildings is, on average, 60% higher than that of buildings built prior to 1970 and roughly 28% higher than that of buildings built during the 1980s (Economidou et al., 2020).

Buildings built in the last five years use, on average, 30% less energy than those built in 1990, thanks to the introduction in many European countries of more precise measurement tools and stricter design standards regarding energy savings. Table 3 presents the energy demand characteristics of the housing stock in Europe.

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Table 1. Types of residential buildings in terms of their energy consumption in selected European countries in 2000

Country	Population xl0^3	Housing resources		Construction period					
		Quantity (milion)	Average per 1 inhabitant (m^2)	<1919	1919 – 1945	1946-1970	1971-1980	1981-1990	>1990
Belgium	10 446	4.8	86.3	15.0	16.5	29.0	15.2	9.2	15.1
Czech republic	10 221	4.3	76.3	10.9	14.7	26.3	22.5	16.4	8.2
Denmark	5411	2.6	109.1	20.2	16.9	28.3	17.6	9.7	7.4
Germany	82 501	38.9	89.7	14.6	12.6	47.2	10.9	14.6	-
Estonia	1347	0.6	60.2	9.4	14.2	30.0	21.5	19.6	5.3
Greece	11076	5.5	82.7	3.1	7.2	31.8	24.5	19.1	14.3
Spain	43 038	20.9	90.0	8.9	4.2	33.5	24.1	13.6	15.7
France	60 561	29.5	89.6	19.9	13.3	18.0	26.0	10.4	12.4
Ireland	4 109	1.4	104.0	9.7	8.2	16.4	17.5	16.2	31.9
Italy	58 462	26.5	90.3	18.0	*(19:*	47.3	18.2	9.4	7.1
Cyprus	749	0.3		-	7.4	16.9	20.7	27.4	27.1
Latvia	2 306	1.0	55.4	11	13.8	27.7	22.6	21.1	3.7
Litwa	3 425	1.3	60.6	6.2	23.3	33.1	17.6	13.5	6.3
Lithuania	455	0.2	125.0	11.9	14.8	27.0	14.9	11.6	17.1
Hungary	10 098	4.1	75.0	13.9	12.5	26.1	22.3	17.7	7.4
Malta	403	0.1	106.4	14.9	11.0	29.4	16.9	15.8	11.8

The European Commission mandated the introduction of a building energy certificate, which will allow energy demand to be estimated in order to lower the energy consumption of newly built residential buildings. The Energy Performance of Buildings Directive (EPBD), similar to the Construction Products Directive (CPD), introduced a more integrated approach to assessing the energy demand of buildings. By 2020, its use is expected to have resulted in significant savings (roughly 22%) in terms of space heating, lighting, and ventilation. This directive applies to both commercial and residential construction.

It introduces:

- a uniform method for calculating the energy efficiency of a building,
- minimum energy efficiency standard for new facilities and facilities undergoing modernisation,
- energy certification system for new and existing buildings.

As minimum requirements necessary at the facility design stage, the directive requires a detailed analysis of the following aspects:

- thermal characteristics of the building (external and internal partitions) and tightness of the facility,
- heating and hot water supply installation, including its insulation,
- air conditioning system,
- mechanical ventilation system,
- location and orientation of the facility in the field, taking into account climatic conditions,
- passive system of obtaining energy from solar radiation and protection against sunlight,
- natural ventilation,
- indoor climate in rooms, taking into account design requirements.

The state of work pertaining to the execution of the EPBD directive differs amongst nations. In Western European and Scandinavian nations, the directive is currently fully in effect.

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Discussion

The preamble to the 2030 Agenda for Sustainable Development states that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge (ONZ, 2015).

In the context of the ongoing climate policy, a fundamental question arises: How realistic is the idea of sustainable economic development, and how can the formulated goals be achieved so that their implementation produces the desired effects?

Turner and Lassman (2020) of the Competitive Enterprise Institute estimated the costs of implementing the Green New Deal (GND) for the average American household. At its core, the Green New Deal is a radical plan to decarbonise the USA. The presented calculations are not favourable for either GND supporters or the typical American household. At best, it can be described as an expensive proposition that relies on technologies that have not yet been invented. It is more likely that the implementation of the GND will result in a serious economic crisis and price increases, which may be particularly painful for institutions such as hospitals and schools. The increase in costs will be very noticeable for the transport and production industries. The presented calculations show that only in the first year of GND implementation, it may cost an average household approximately USD 74,287. The costs of GND implementation for 11 American states are presented in Table 2 (Turner & Lassman, 2020).

For comparison, in 2022, the real average U.S. household income was $74,580, down by 2.3% from the 2021 estimated household income of $76,330, and in 2019, the income was $68,703 (U.S. Census Bureau, 2023). This means that the average American household would have to allocate all of its income only to cover the costs related to the new climate policy, and this would still be insufficient.

The very high costs of implementing GND are also confirmed by studies by Bank of America (Bank of America, 2022).

Table 2. Total household costs in 2019

State	Year 1 Household Costs	Annual Household Costs Years 2-5	Annual Household Costs Years 6 and After
Alaska	$84,584	$57,171	$51,740
Colorado	$74,287	$46,874	$40,451
Florida	$76,109	$48,696	$40,828
Iowa	$76,683	$49,270	$41,420
Michigan	$74,470	$47,057	$40,602
New Hampshire	$74,723	$47,310	$39,821
New Mexico	$74,432	$47,019	$40,970
North Carolina	$74,609	$47,196	$40,697
Ohio	$75,807	$48,394	$40,663
Pennsylvania	$75,307	$47,894	$40,983
Wisconsin	$75,252	$47,839	$40,906

Source: authors' work based on Turner and Lassman (2020).

In the case of the European Fit for 55 program, the European Commission estimates it at around EUR 130 trillion euro, but the European Commission's ambitious plan goes far beyond changes in the energy structure. It also applies to the reconstruction of the entire infrastructure, logistics, housing, replacement of cars, electrical equipment, etc.

According to the International Renewable Energy Agency (IRENA), the transition to a low-carbon economy will cost approximately USD 110 trillion (IRENA, 2019).

Calculations by the same institution from 2023 already say that to achieve the 1.5°C target by 2050, a total of USD 150 trillion is needed, which means, on average, over USD 5 trillion per year (IRENA, 2023).

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The largest Swiss bank, UBS, estimates that the cost of additional investments is USD 300 trillion. For comparison, foreign direct investment in 2022 amounted to USD 1.3 trillion (UNCTAD, 2024). Raising the next trillions of dollars in the coming 30 years will be more difficult than anything humanity has ever done before. Especially since, as you can read further in the above-mentioned report, the annual investment gap in implementing the Sustainable Development Goals in developing countries increased from USD 2.5 trillion in 2015 to an alarming USD 4 trillion. The increase is due to both insufficient investment and additional needs.

Bank of America admits that this means an additional increase in inflation of about 1-3% per year for the next 30 years on top of the already high inflation. We are, therefore, talking about additional taxation of society amounting to tens of trillions of dollars. According to Bank of America, this money will have to be refinanced by central banks, and this may provide an opportunity to lobby and push for a green revolution.

It is worth noting that industrial revolutions differ from social revolutions primarily in the order of what fails and falls first. In the case of an industrial revolution, old technology dies first because new and cheaper technologies emerge better suited for mass solutions. The old industrial elites are giving way to new ones, and with them comes a whole new generation of employees who need a new system of values, to which the political system and the resulting ideological divisions only later adapt. In the case of a social revolution (and the climate revolution is one of them), the process of change is the opposite. First, there are ideologies and slogans that lead to the destruction of the old economic system, and then, as a consequence, it leads to a change in the organisation of industrial production.

The "climate revolution" has all the attributes of a social revolution, not an industrial one.

Its goal is to change human environmental behaviour, not to adapt to what is happening, to new, more effective technologies. Like each of its precursors, the climate revolution has bright, wonderful goals, but they are postponed somewhere in the distant future, which may occur, provided the current order is destroyed. In every revolution so far – the industrial revolution, new industries were created in place of fallen industries. New professions were also created, providing more and better jobs. In turn, each social revolution left behind impoverished nations, broken lives and years of retardation behind the rest of the world.

The author points out the differences between the industrial and social revolutions in order to organise the narrative and to get to the main argument of climate policy supporters, which is a concern for future generations.

If we treated investments in climate repair like any other long-term investment that is intended to serve future generations, then economists, when estimating the profitability of an investment, talk about the discount rate – i.e. the cost of capital conversion into the value of future benefits. The simplest way to evaluate a given investment or government policy is to check whether the sum of the costs and the sum of the benefits has a net present value greater than zero. If so, the project is economically justified. If we only accept the main argument of climate policy advocates, that climate change will cause enormous damage and it will be a hard life for future generations, even a zero discount rate is acceptable. Such calculations are missing.

The natural environment is just one of the areas that determines the proper development of humans and the satisfaction of their needs.

The 95,000 deaths per year from childhood malnutrition due to climate change (WHO, 2014) should not occur. There is enough food produced in the world, and the challenge is to distribute it to the right places. Helping developing countries produce their own food and make better decisions about their agriculture would make a significant difference to people's well-being.

There is a justified concern that the need to incur huge financial outlays to reduce greenhouse gas emissions will affect investment opportunities in other areas, such as investment expenditures in medicine, education, defence, etc.

For the average citizen, the most visible effect of the introduced climate policy is the gradual increase in electricity prices (green inflation). Western companies are suspending the search for traditional energy sources for fear of increasing governmental regulations and ecological pressures, and new energy sources do not fill the gap left by old energy sources, which results in an increase in the industry's operating costs. All this creates a permanent field for price manipulation. Adapting production methods to low-emission technologies that emit less greenhouse gases will require, on the one hand, massive and expensive investments, which in the short-term will increase the marginal

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cost of each unit produced, and on the other hand, the use of rarer and therefore more expensive materials. This will create upward pressure on prices. The ecological transition will also require the use of a "price signal": raising the price of fossil fuels through taxation (carbon tax) and carbon markets (explicit price) and regulation (implicit price) (FXStreet, 2023).

The governments of many pro-environmental countries need to realise that shutting down the old economy too quickly risks pushing the price of cleaner construction beyond their reach. The world faces a growing paradox in the campaign to stop climate change. The harder it pushes the transition to a greener economy, the more expensive the campaign becomes and the less likely it is to achieve its goal of limiting the worst effects of global warming. New government spending increases the demand for materials needed to build a cleaner economy. At the same time, tightening regulations limits supply and discourages investment. In the past, switching to a new energy source was a big boost in comparison to the old one. The advent of steam power inspired sailing ship manufacturers to innovate more in those 50 years than in the previous 300 years. Electricity had a similar effect on gas lighting. Blocking the construction of new mines and drilling platforms will not always be an environmentally and socially responsible move. Governments, especially environmental groups, must realise that shutting down the old economy too quickly risks pushing the price of cleaner construction beyond their reach (Sharma, 2021).

In the EU, the costs of implementing Fit For 55 will be most painfully felt by the poorer social classes who have to come to terms with a lower standard of living, especially from countries that are least prepared for the ongoing energy transformation.

Taking into account how quickly electricity prices have increased in recent years, the increase in transport costs may be as much as 10-20% annually. As we live in times when supply chains span thousands of kilometres, prices of all industrial and food products may increase. Although this will most likely force the shortening of supply chains, in the long run, it will result in a decline in consumption due to the rising costs of living for all consumers.

When considering the effects of EC directives, the cost increases resulting from individual regulations should be added up. In addition to the extension of the Emissions Trading System (EU ETS) for transport, it should be added that these regulations will also cover buildings and construction. This means that if a property uses energy from burning coal or gas to heat a property, residents will have to pay more. The increase in fees in Poland may also amount to several percent per year. This will be accompanied by an additional cost related to the EU Emissions Trading System (EU ETS), namely from the original EU ETS (covering the energy sector); the number of emission allowances will decrease not by 2.2% per year but by 4.2%.This may have disastrous consequences for Polish coal-fired power plants.

From the perspective of the Polish economy, this may mean the need to quickly shut them down and replace them with renewable energy, which has no chance of replacing energy losses from conventional sources due to natural conditions: weak winds and poor sunlight. Also, the construction of nuclear power plants takes too long to be a real alternative before 2030. For the average citizen, this means much higher energy bills.

In this way, the planned reduction in greenhouse gas emissions will be achieved, mainly by limiting consumption by residents of countries that are least prepared for the revolutionary transformation.

This will happen not only due to the difference in income per capita between the average inhabitants of Western and Central Europe. An equally important, and perhaps even more decisive, issue is the state of adaptation to the Fit For 55 requirements.

Citizens of countries that have a significant share of renewable energy in the energy system or nuclear power plants will not experience many additional costs. This is not only about electricity bills but also industrial production and services that require electricity, the price of which is included in the value of the product offered. The same applies to heating buildings.

Meanwhile, Poland is not prepared to implement the EC directive in any area, which may result in a "shock therapy" for its citizens as painful as that of the early 1990s.

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Conclusion

In 1989, the head of the UN environment committee warned that rising sea levels would flood islands and soon swallow entire societies. In 2007, the chairman of the intergovernmental panel on climate said that humanity must immediately change its habits because after 2012 it will be too late (Diamond, 2009). In 2012, British scientists assured that in just 7 years, the last Arctic glaciers would melt and flow into the oceans. In 2019, the UN again indicated that an ecological catastrophe would occur in 2031. In the 2022 Report, we read that global warming, which will reach 1.5°C in the near future, will inevitably result in an increase in many climate hazards and numerous risks to ecosystems and people (very high level of confidence).

In the ongoing debate, the problem of adaptation to climate change has given way to the problem of pollutant emissions. Even if the emissions problem is solved, floods and storms will still occur. So, the whole issue of reducing vulnerability and adapting to extreme weather and rising sea levels should go beyond the global warming debate.

Never in history has the destruction of social order been beneficial to humanity. Environmental protection, if it is to remain a science, must take responsibility for the entire environment, including human well-being.

We cannot abstract from human nature. From striving for happiness, striving for wealth and the well-being of all people in the world.

The eighteenth-century father of liberalism, Jeremy Bentham, in "The Principles of Morals" asks whether it is possible to understand that there are people so unreasonable that they prefer a man who is not there to one who is and persecute the living under the guise of paving the way to happiness for those who have not yet been born and maybe they will never be born?

More and better can be done for future generations by focusing on doing best what we do today for the present, and specifically on avoiding new fiscal crises, maintaining political stability, guarding the foundations of values that created our civilisation, creating conditions for the development of science, telling the truth about the climate, giving our civilisation a chance to slowly, step by step, develop the best possible ecological solutions. The ecological revolution cannot kill science.

If we are to be good stewards of the future, we must first be good guardians of what we have inherited and what we owe to our contemporaries.

The authors of the article concludes that emphasis should be placed on solutions that support human well-being and minimize losses and recognize that the key to saving the natural environment is the wealth of nations, not the annihilation of the sources of their wealth.

To sum up, it can be concluded that current scientific knowledge is insufficient to predict what changes the climate will undergo in the coming decades and what impact humans will have on these changes.

The contribution of the authors

Conceptualization, B.S.; literature review, B.S. and M.B.; methodology, B.S.; formal analysis, B.S. and P.G.; writing, B.S., M.B. and P.G.; conclusions and discussion, B.S. and M.B.

The authors have read and agreed to the published version of the manuscript.

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PRZECIWDZIAŁANIE ZMIANOM KLIMATYCZNYM W KONTEKŚCIE REALIZACJI ROZWOJU ZRÓWNOWAŻONEGO W ASPEKCIE GOSPODARCZYM I SPOŁECZNYM

STRESZCZENIE: Celem artykułu jest zaprezentowanie aktualnego stanu wiedzy na temat zmian klimatycznych, przyczyn tych zmian i potencjalnych skutków, zarówno środowiskowych, jak i ekonomiczno-społecznych. Dla zrealizowania sformułowanego celu autorzy podejmują próbę: interpretacji oryginalnych wyników badań w obszarze zmian klimatycznych, a także, podejmowanych działań (na różnych poziomach) w zakresie polityki klimatycznej. Ma to doprowadzić do odpowiedzi na pytanie, czy w kontekście prowadzonej polityki klimatycznej realna jest idea zrównoważonego rozwoju na poziomie społecznym i gospodarczym? W toczącej się debacie problem adaptacji do zmian klimatycznych ustąpił miejsca problemowi emisji zanieczyszczeń, a dostępna wiedza naukowa jest niewystarczająca, aby przewidzieć, jakim zmianom ulegnie klimat w nadchodzących dekadach oraz jaki wpływ na te zmiany będzie miał człowiek. Na podstawie przeprowadzonych analiz autorzy artykułu wnioskują, żeby kłaść nacisk na rozwiązania, które wspierają dobrostan człowieka i minimalizują straty. Ochrona środowiska, jeżeli ma pozostać nauką, to musi brać odpowiedzialność za całe środowisko, również za dobro człowieka, nie może odbywać się jego kosztem, ponieważ burzy to naturalny porządek społeczny. W artykule weryfikowana jest następująca hipoteza: podejmowane decyzje w zakresie polityki klimatycznej mają niewystarczające uzasadnienie w badaniach naukowych.

SŁOWA KLUCZOWE: emisje dwutlenku węgla, zmiany klimatyczne, zrównoważony rozwój, współpraca międzynarodowa

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