

## CONTEMPORARY TRENDS IN MANAGING HUMAN RESOURCES AND STEWARDING NATURAL RESOURCES WITHIN THE CONTEXT OF CLIMATE CHANGE

Katarzyna SUKIENNIK<sup>1</sup>, Michał DZIADKIEWICZ<sup>2</sup>, Judyta KABUS<sup>3\*</sup>,  
Renata WŁODARCZYK<sup>4</sup>

<sup>1</sup> Czestochowa University of Technology, Faculty of Management; katarzyna.sukiennik@pcz.pl,  
ORCID: 0000-0002-0195-7002

<sup>2</sup> Czestochowa University of Technology, Faculty of Management; michal.dziadkiewicz@pcz.pl,  
ORCID: 0000-0001-5450-1669

<sup>3</sup> Czestochowa University of Technology, Faculty of Management, judyta.kabus@pcz.pl,  
ORCID: 0000-0002-7119-3327

<sup>4</sup> Czestochowa University of Technology, Faculty of Infrastructure and Environment;  
renata.wlodarczyk@pcz.pl, ORCID: 0000-0002-0093-5178

\* Correspondence author

**Research background:** The management of natural resources with modern tools has become a contemporary requirement for social good. Global trends are an inspiration to make the best use of the natural resources available in terms of climate change.

**Purpose of the article:** The aim of this article is to assess contemporary trends and social behaviour related to natural resource management. The main hypothesis is as follows: the pro-ecological behaviour of an individual brings global benefits.

**Methods:** The article is based on theoretical and empirical considerations in the topic under study. An important issue raised in the article is the promotion of activities aimed at increasing the awareness of both the local and international community in the area of sustainable development.

**Findings & Value added:** This article presents the results of own research conducted in Poland and analyses them in relation to global trends. The presented research results show that all climate change begins with the proper management of managed natural resources by individual human behaviour. The respondents' answers made it possible to present social attitudes regarding the use of natural resources and environmental protection measures in everyday life. The research confirmed the validity of the hypothesis and allowed the aim of the article to be realised. Awareness of climate change is forcing societies to implement preventive measures in terms of environmental protection.

**Keywords:** natural resources, modern eco-trends, environmental and economic awareness, sustainable environment, climate changes.

**Category of the paper:** Research paper.

## 1. Introduction

The prudent management of the Earth's natural resources has a significant impact on climate changes worldwide. All human activities bring benefits or risks to the environment. For many years, environmental issues were less important than economic development, resulting in irreversible effects on the climate around the world. For several years, all environmental organizations have been alarming about unfavourable climate changes occurring too quickly. Currently, actions are taken to inhibit these phenomena. Stewardship of owned resources also relates to financial issues for both households and entire countries. The more resources are consumed, the higher the costs are. That is why it is so important to take care of the sensible use of natural resources and implement modern solutions to reduce costs. The current excessive consumption observed worldwide has a significant impact on the natural environment. The aim of the article is to assess contemporary trends and social behaviours related to the management of natural resources. The main hypothesis is as follows: the pro-ecological behaviours of an individual brings global benefits. Increasingly noticeable climate changes are causing adverse weather phenomena such as droughts, floods, storms and others, which the world has to deal with every day. Planet Earth has stopped keeping up with the pace of economic and social development worldwide. This article demonstrates authenticity in modern times through its analysis of socio-economic behaviours. Growing populations and the rapid pace of natural resource exploitation could cause a serious threat to survival on the planet.

## 2. Literature review

Earth offers an extraordinarily large amount of natural resources that allow for human and animal life. Defining the term natural resources, these are the wealth drawn from the environment for the functioning and survival of life (Bridge, Wyeth, 2020).

Natural resources are divided into (Rajović, Bulatović, 2017):

- inexhaustible (permanent) energy: solar, wind, running water, geothermal, air,
- exhaustible, among which a distinction is made between:
  - non-renewable which occur in limited quantities, mainly mineral resources e.g. coal, lignite, natural gas,
  - renewable, which are reproducible, but at very different times, e.g. wood, crop production waste, biogases, water, agricultural crops.

The division of natural resources is distinguished, taking into account their functions, e.g. energy raw materials, which include, among others: hard coal, lignite, oil, natural gas ([www.environmentgo.com](http://www.environmentgo.com)).

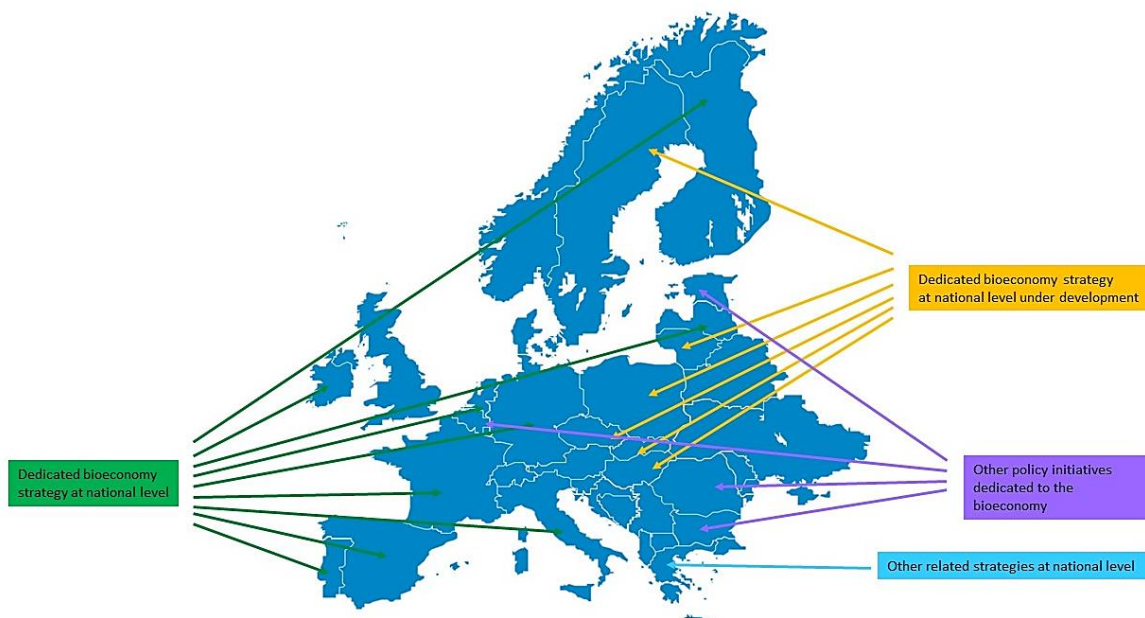
Natural resources and how they are managed are key to the future (Pencarelli et al, 2020). Globally, the way of life of the population has changed a lot compared to a few decades ago. Therefore, the most important commodities such as energy, water and food needed for life are being consumed more and more. It is necessary, then, to manage resources rationally and to use renewable energy sources, which have many advantages (Lewicka et al., 2020). Current consumer behaviours are more difficult to predict due to dynamic changes in the national and international environment (Sarraf, 2019). Increased consumption and lack of care for the environment is leading to irreversible climate and socio-economic changes. The scale of environmental change and its complexity is a contemporary problem that has never existed before (Shin et al., 2021). At present, there is a noticeable trend towards excessive consumerism and the desire to have as many possessions as possible (Heinonen, Strandvik, 2021). Products often bought in excess are not needed at all. This contributes to overproduction and affects the environment and the use of natural resources such as water, raw materials, minerals, soil, etc. (Fernandes, Moreira, 2019). A main problem in today's society is also waste, which affects the global economic, social and environmental situation (Gharzai et al., 2020). Too many products create more and more pollutants entering the atmosphere and generate a large amount of waste. It is forecast that sales of many commodities could fall significantly in the coming years due to the economic situation in many regions around the world (Bain, Company, 2020). Adequate environmental management and consumption of available raw materials should reduce adverse climate change and have a positive impact on the economic situation (Bras et al., 2020).

The topics of natural resource management and social and economic impacts on climate change are being addressed by international institutions such as the Intergovernmental Panel on Climate Change (IPCC), which has indicated that human activity is responsible for climate change, the rapid warming of the Planet and related environmental changes on Earth (IPCC, 2021). It is forecast that people born in 2020 may experience 6.8 times more heat waves during their lifetime (Luten et al., 2021). The International Energy Agency (IEA) reports the following trends in biodiversity ([www.gov.uk](http://www.gov.uk)):

- enhance the protection and restoration of ecosystems,
- mitigating climate change,
- action on pollution, invasive alien species and overexploitation,
- more sustainable production of goods and services, especially food,
- reducing consumption and waste.

Many international organisations point to the dangers of mismanagement of natural resources. Already in 2020, the Global Footprint Network estimates that 7.8 billion people will have consumed far more resources and emitted more waste than can be naturally renewed, absorbed by the Earth (Statistical Information on Electricity Monthly Bulletin). Resource efficiency is one of the approaches also proposed by an international group of experts called the IRP to decouple economic growth from environmental degradation while improving human well-being ([www.resourcepanel.org](http://www.resourcepanel.org)).

Today, changes in global energy security have considerable implications for future societal functioning. Rational use of the limited resources needed for energy generation, such as coal, natural gas and oil, will allow them to be used for a longer period of time. Strategies for the protection of natural resources are being developed and implemented in European Union countries (Figure 1.)

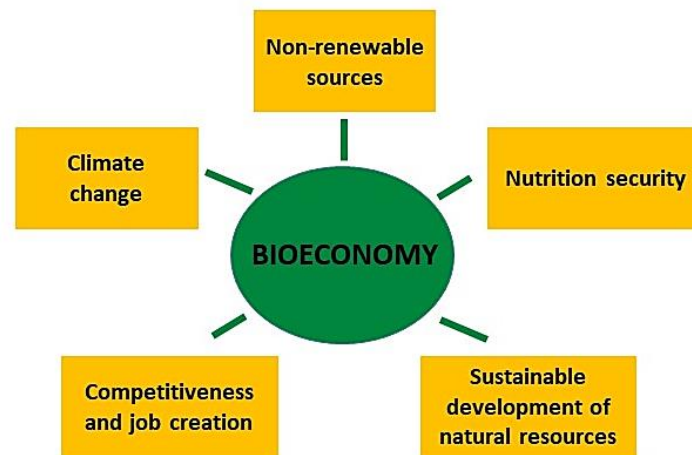


**Figure 1.** State of national bioeconomy strategies in the EU27 as of February 2022.

Source: [www.gov.ie/en/consultation/fd200-bioeconomy-action-plan-consultation/](http://www.gov.ie/en/consultation/fd200-bioeconomy-action-plan-consultation/)

According to the information presented above, in December 2022, ten Member States had national bioeconomy strategies in place. These countries are: Austria, Germany, Spain, France, Finland, Ireland, Italy, Latvia, the Netherlands and Portugal. A further seven Member States were in the process of developing strategies. This group included: Czech Republic, Croatia, Hungary, Lithuania, Poland, Sweden and Slovakia. Other countries were implementing regional initiatives and national adaptation strategies.

The European Union has identified five main areas/assumptions for the bioeconomy (Figure 2).



**Figure 2.** The main conceptual framework of the bioeconomy in the European Union.

Source: Own elaboration based on [www.gov.ie/en/consultation/fd200-bioeconomy-action-plan-consultation/](http://www.gov.ie/en/consultation/fd200-bioeconomy-action-plan-consultation/)

The five most important tasks of the European Union Member States in creating bio economies are to create food security in all countries of the Community, to take care of non-renewable energy sources and to apply the principles of sustainable development of natural resources through their rational use, to take care to minimise the adverse impact on climate change, to create a competitive market and to create jobs for the citizens of the European Union. On the basis of these assumptions, the principles of a conceptual framework for Member States have been developed (Giuntoli et al., 2023; Bogdanski et al., 2021; FAO, 2021).

Global trends in natural resource management and ongoing climate change inspired the authors of this article to conduct their own research on public awareness of environmental protection.

### 3. Research methodology

The article uses quantitative research based on a traditional and electronic survey questionnaire. The questionnaire was developed to assess public awareness of the implementation of environmental and economic solutions. The survey was divided into three sections. The first concerns the environmental and pro-social activities undertaken to build the environmental awareness of the population. The second part of the questionnaire relates to the individual attitudes of residents towards the diffusion of environmental solutions in their own households. In addition, the survey questionnaire shows whether residents feel the need to promote sustainability. The third section includes a metric to identify the gender, age, education, place of residence and source of income of respondents. More than 600 anonymous respondents from all over Poland took part in the survey. The respondents were both women, who constituted 53%, and men 47%, aged 18 to over 65 years. The respondents came from

various regions of Poland and were characterized by: basic education 6%, vocational education 19%, average education 42% and higher education 33%. The article presents only some of the respondents' answers that directly influenced the realisation of the objective of the work.

## 4. Results

The survey questionnaire asked respondents whether measures aimed at biodiversity conservation were being taken in their neighbourhood. Of the 38% of affirmative local responses and 47% of affirmative individual responses, the following actions were identified. (Table 1) It should be noted that respondents could indicate more than one answer.

**Table 1.**

*Characteristics of local and individual actions taken aimed at biodiversity protection*

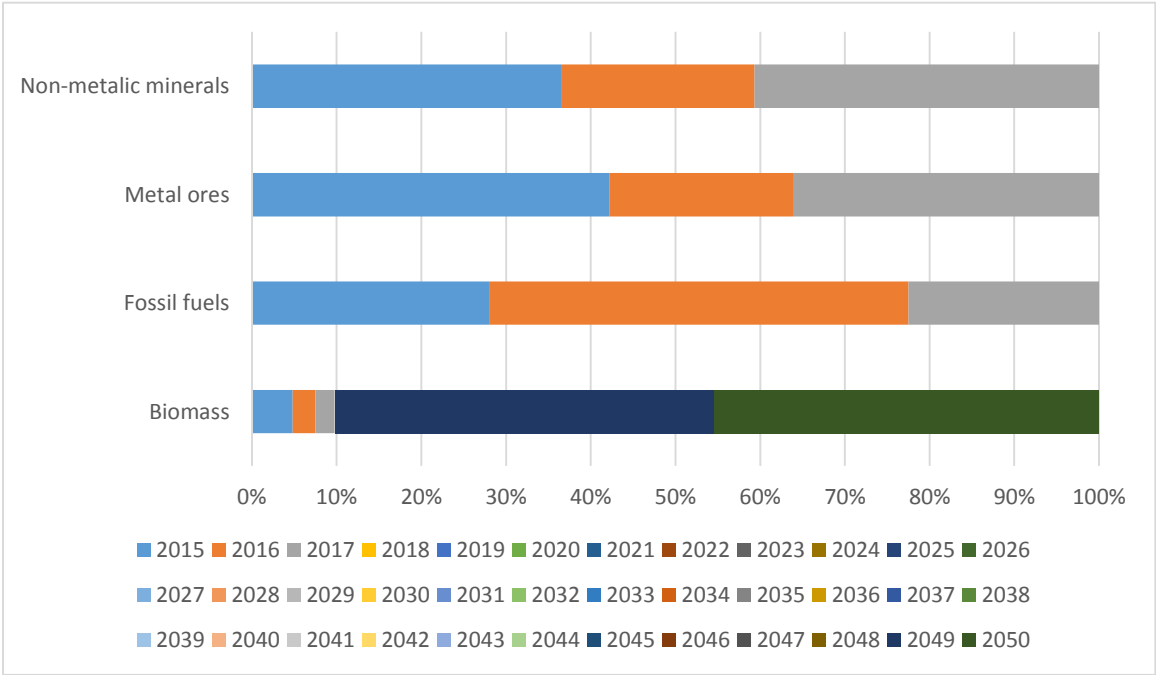
Type of local actions	Number of responses	Type of individual action	Number of responses
Expanding green spaces (e.g. by rebuilding concrete squares, limiting pavement extensions, etc.).	146	Ownership of wild landscape features	62
Increasing water-absorbing utility surfaces (e.g. car parks, pavements made of water permeable material - grates)	72	Reducing the use of chemicals in the garden in favour of manures, herbal extracts, etc.	129
Establishment of flowering gardens	78	Establishment of flowering garden	165
Establishment of facade gardens	40	Growing herbs	160
Establishment of flower meadows	70	Establishment of flower meadow	83
Reducing deforestation and forest degradation	36	Construction of insect houses	87
Maintenance of old trees	81	Installation of nest boxes on trees	84
Planting new trees	127		
Renaturalisation (savagery) of the landscape	21	Renaturalisation of part of the plot - "giving it back to wildlife"	39

Source: Own elaboration, N = 605.

The data shows that residents notice measures being taken in the form of expanding green spaces 146 responses, planting new trees 127 responses, or caring for old trees 81 responses. All the actions identified in the survey questionnaire are needed and support the return to the natural state of the environment. Most of the measures are implemented individually by respondents who are involved in growing herbs 160 responses given, establishing flowering gardens 165 responses or reducing the use of chemicals in the garden in favour of manures, herbal extracts 129 responses of respondents. All actions in favour of biodiversity protection applied individually or in groups increase the chance of positive environmental change.

Constant technological development means that the demand for energy is constantly increasing (Kautish, Sharma, 2019). Electricity and heat have become the most essential resources needed for people to function around the world. The ability to own these resources provides a better quality of life for each household and the economic viability of businesses (Cranfield, 2020). It is important to change the strategy of business entities in order to meet the growing expectations of demanding customers (Heinonen, Strandvik, 2021; Tevšić, Nanić, 2020).

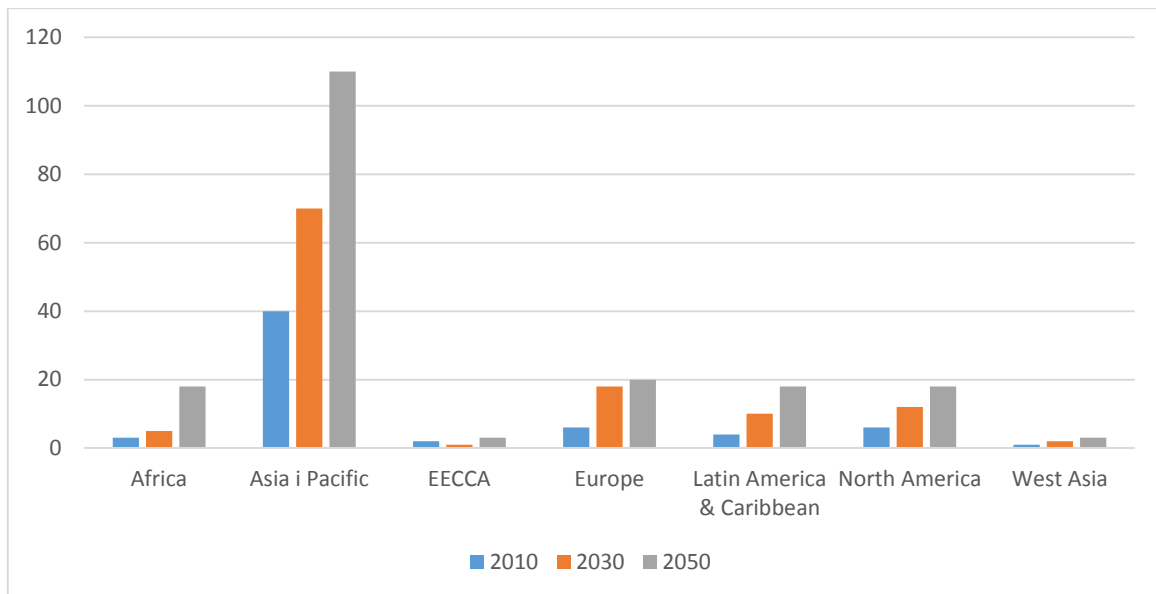
The ability to extract natural resources allows energy to be obtained. Trends in resource extraction by the four categories (biomass, fossil fuels, metal ores and non-metallic minerals) from 2010 to 2050 are shown below (Figure 3).



**Figure 3.** Global resource extraction from 2010 to 2050 for existing trends.

Source: [www.resourcepanel.org/reports/assessing-global-resource-use](http://www.resourcepanel.org/reports/assessing-global-resource-use)

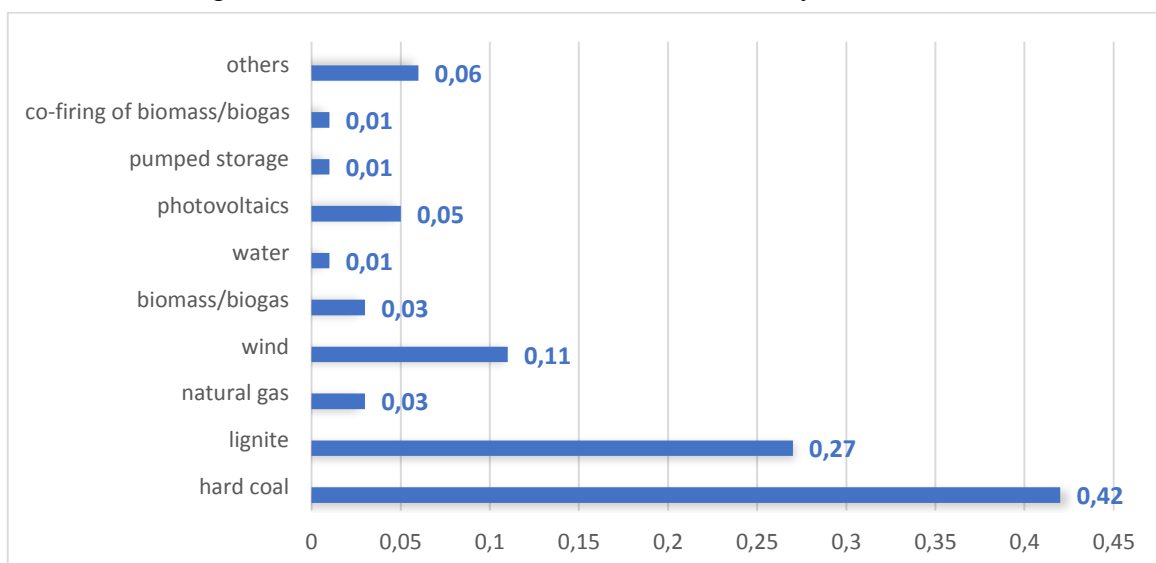
Global trends indicate that extraction of particular resource groups is increasing due to growing social and economic demand. The largest group is minerals, which, according to the trends presented, are expected to maintain growth until 2050. Another extracted resource is biomass, which is much less extracted by 2050 than minerals, but is still on an upward trend. Extraction in individual regions of the world is also shown below (Figure 4).



**Figure 4.** Global resource extraction by world region 2010-2050 for current trends.

Source: [www.resourcepanel.org/reports/assessing-global-resource-use](http://www.resourcepanel.org/reports/assessing-global-resource-use)

According to the data in Figure 4, the largest extraction of raw materials is and will be in Asia and according to forecasts it will exceed 100 trillion tons by 2050.



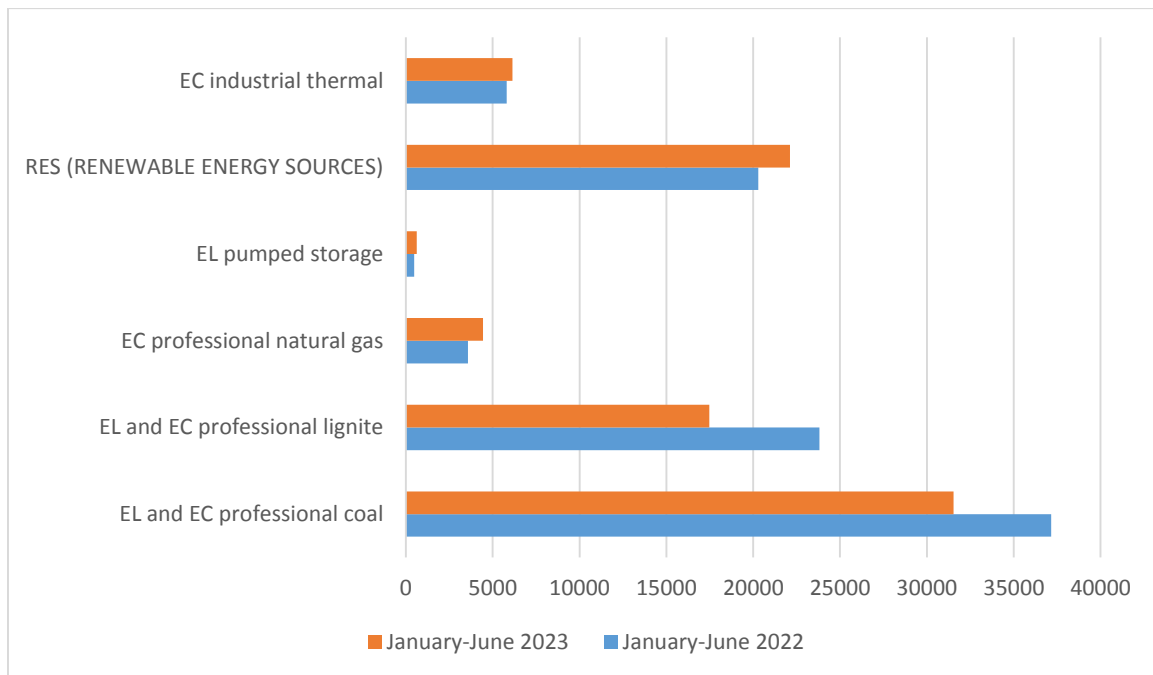
**Figure 5.** Energy sources in Poland in 2022.

Source: Based on the Energy Market Agency.

The main resource used and extracted in Poland for years has been coal. Data from the Energy Market Agency shows that in 2022 the raw material used for energy production in Poland was hard coal and lignite, the least used resource for energy production was water.

From the data shown in the graph above, the main source in Poland in 2022 was: hard coal and lignite, accounting for 69% of energy resources. The least used was energy from water, just 1%. Energy production in Poland in 2022-2023 is shown in Figure 6.





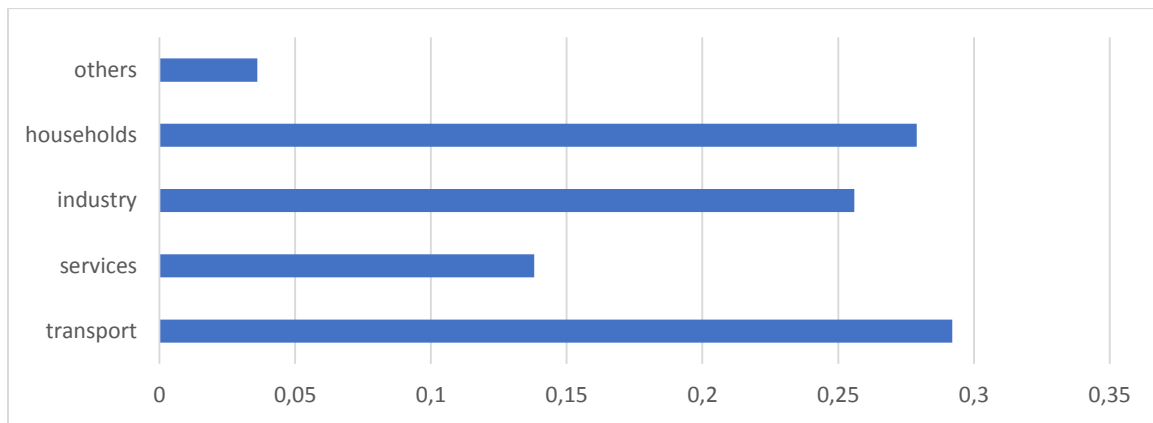
**Figure 6.** Electricity production by fuel [GWh] January-June 2022 to January-June 2023.

Source: Statistical Information on Electricity Monthly Bulletin, Ministry of Climate and the Environment Energy Market Agency s.a. Warsaw 2023, p. 19.

The implementation of modern technological solutions is an opportunity to increase the use of renewable energy sources, which in future will make it possible to become independent of fossil sources, which are running out and adversely affecting the environment.

All sectors of the economy and households need energy to function. A strategy called the Green Deal has therefore been implemented in the countries of the European Union, which aims to increase resource efficiency and create clean, closed-loop economies. The strategy assumes that member states should be climate-neutral by 2050 (Kardung et al., 2021). Investing and creating modern energy tools should restore biodiversity and reduce pollution. Innovative solutions need storage facilities in which to store the energy produced. It is therefore important to create modern energy and storage networks (Kenai et al., 2018).

Analysing the available data for final energy consumption in the European Union in 2021, it can be seen that there are three dominant categories: transport (29.2 %), households (27.9 %) and industry (25.6 %) (Figure 7).

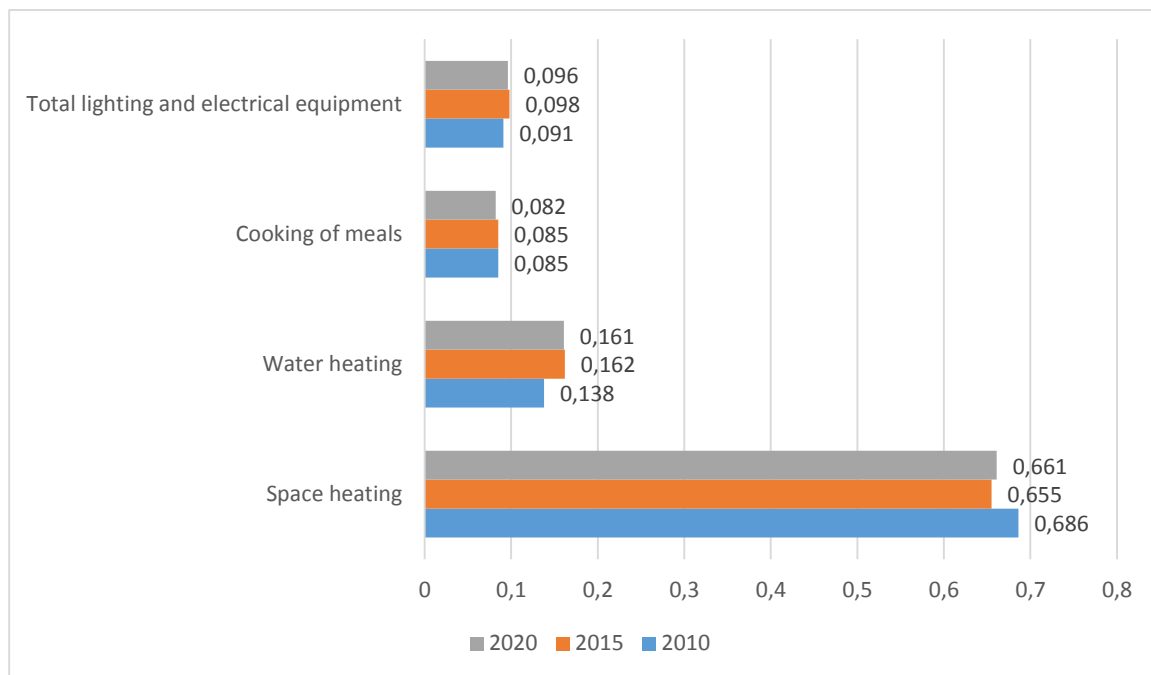


**Figure 7.** Final energy consumption in the European Union by sector in 2021 (% of total, based on terajoules).

Source: Eurostat [www.europa.eu](http://www.europa.eu)

Energy consumption is the highest in transport, accounting for almost 30% and households 28%, followed by industry 26% and services 14% and other sectors, just under 5%.

Referring to CSO data from 2010-2020, the structure of energy consumption in households in Poland, by type of use, is as follows (Figure 8).

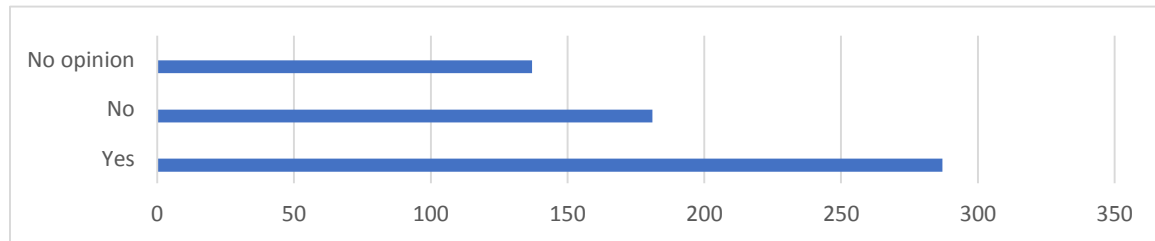


**Figure 8.** Structure of energy consumption in households in Poland, by type of use, 2010-2020.

Source: Own elaboration based on [www.stat.gov.pl](http://www.stat.gov.pl)

According to the data provided, most energy in Polish households is used for space heating, as much as 66% in 2020. Heating water uses around 16% of energy, while cooking uses 8.5% and lighting including electrical appliances uses just under 10%.

Analysing the high energy consumption in Poland, the survey asked about actions taken to reduce these costs. Respondents were therefore asked whether, in their opinion, any measures were being taken in their place of residence to implement modern solutions to reduce the costs of common energy consumption.



**Figure 9.** Structure of the answers given regarding the implementation of modern solutions reducing the costs of common energy consumption.

Source: Own study, N = 605.

Figure 9 shows that the vast majority of respondents answered in the affirmative, the characteristics of the implemented individual solutions are presented below (Table 2).

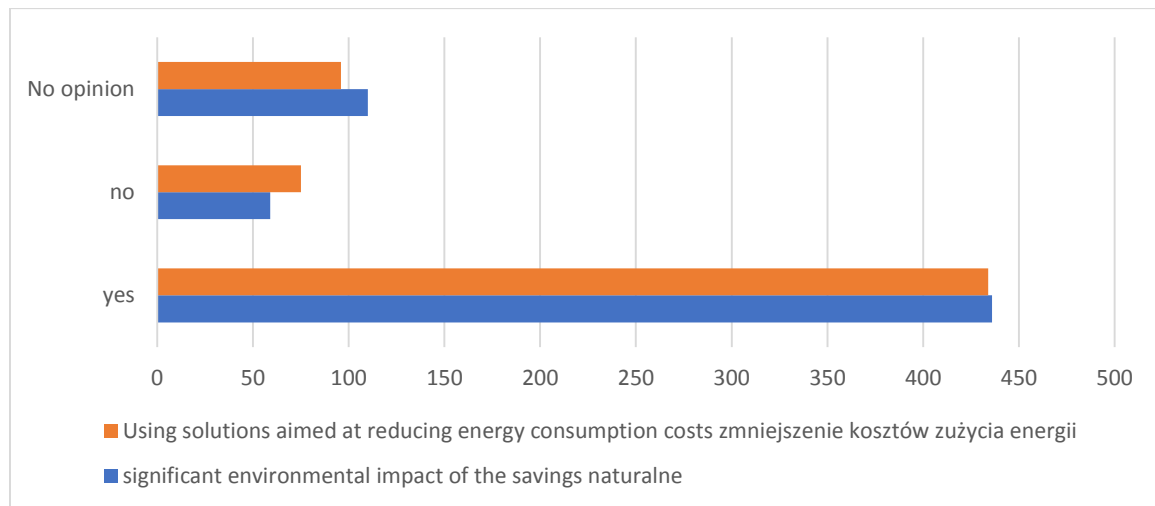
**Table 2.**

*Characteristics of the implemented solutions affecting the cost of shared energy consumption*

Type of modern solutions	Number of responses
Upgrading or installing a new energy network	96
Thermo-modernisation of housing	143
Construction of new dwellings in energy-efficient buildings	99
Use of renewable energy sources, including:	110
Solar energy (photovoltaic panels)	171
Wind (wind power plants)	46
Water (hydroelectric power stations)	27
Geothermal (geothermal power plants)	14
Biomass (biomass power plants)	11
Energy modernisation of public buildings	72

Source: Own elaboration, N = 605.

The most important solutions identified in Table 2 are the use of thermo-modernisation of dwellings and the use of renewable energy sources in which the use of photovoltaic panels is most frequently mentioned. Residents noted that the changes indicated above reduce the cost of common energy consumption in their place of residence. In Poland, the use of modern energy sources is increasing year on year, which undoubtedly has a positive impact on the climate. Analysing the relationship indicated in the survey between the significant impact of energy saving on the environment and the use of solutions aimed at reducing energy costs in the respondents' own environment, the following response rates were obtained (Figure 10).



**Figure 10.** Structure of the answers given regarding the relationship between the significant impact of energy saving on the environment and the use of solutions aimed at reducing energy costs in one's own environment.

Source: Own study, N = 605.

The vast majority of respondents note the significant impact of saving energy and using solutions to reduce energy consumption. The specific measures used to reduce energy costs are as follows (Table 3).

**Table 3.**

*Characteristics of measures aimed at reducing energy consumption costs in one's own neighbourhood*

Types of action	Number of responses
Replacement of the furnace with a modern heat source (e.g. heat pump)	144
Installation of photovoltaic panels	132
Insulation of the building	231
Using appliances with a high energy rating	183
Using energy-efficient light bulbs	300
Adjusting light intensity	108
Reducing the use of electrical appliances in the household	137
Using Eco programmes (e.g. in dishwashers, washing machines)	169
Switching off lights in empty rooms	261
Switching on high energy-saving mode on televisions	84
Switching on sleep mode on computers	142
Use of night-time tariffs	80

Source: Own elaboration, N = 605.

The data shows that the awareness of respondents and the measures applied are in line with global trends and fit in with the objective of minimising the consumption of natural resources in order to curb climate change. The activities most frequently indicated by respondents, i.e. using energy-saving light bulbs, switching off lights in empty rooms, and insulating buildings, reduce household energy consumption.

Behavioural change that takes into account environmental protection is a long-term process and requires a high degree of social and economic awareness (Shams et al., 2020). Environmental awareness is changing year by year as people recognise that preventing

environmental degradation is simpler and cheaper than repairing damaged nature later (Butler, Hackney, 2021).

Increasing public awareness and learning to reuse products is good for the environment. Promoting different groups of environmentally friendly products is a needed environmental and economic initiative (Kureshi, Thomas, 2020). Innovative bio-based products and the discovery of new applications reduce pollution (Jansen et al., 2021). Today, reusing waste, i.e. recycling, is an important activity (Chaturvedi et al., 2021; Pencarelli et al., 2020). An important aspect of energy conservation is its positive impact on the emission of harmful substances into the environment.

The benefits of reduced pollution result in less negative global climate change.

Globally, everyone recognises the negative economic and climate changes that are taking place, which is why modifications need to be made to electricity management habits in private and working life. Rising energy prices are encouraging rational management of energy resources. Saving energy benefits the household budget. The rational management of energy resources has recently become one of the most important measures in all European Union countries. Rising electricity and gas prices have led to a number of recommendations to reduce the demand for these resources. Below is a summary of several countries that have implemented recommendations for citizens to reduce their electricity consumption.

**Table 4.**

*Recommendations for citizens to reduce electricity consumption in selected EU countries*

<b>Poland</b>	<b>Germany</b>	<b>France</b>	<b>Italy</b>
Efforts to reduce energy consumption have included: - in retail and service establishments switching on only part of the lights, dispensing with illuminated signs - some shops are also planning shorter opening hours during the winter season - reducing heating to 19°C.	Efforts to reduce energy consumption have included: - banning the use of most outdoor lighting for buildings and monuments - lowering the minimum temperature in offices and public places to 19°C.	Efforts to reduce energy consumption have included: - heating only switched on when the temperature drops below 19°C - air conditioning switched off until the temperature does not exceed 26°C.	Efforts to reduce energy consumption have included: - reducing the lighting of public places and shops at night - increasing the operation of coal-fired power plants to reduce the use of more expensive gas for energy production.

Source: Own elaboration based on [www.pieniadze.rp.pl](http://www.pieniadze.rp.pl)

When talking about saving energy, it is important to follow global principles. The most important issue is to choose the right supplier and the most favourable tariff, adapted to your needs and possibilities. There are many different ways to save electricity at home, and they can be divided into three main categories:

- Purchase of suitable household appliances.
- Setting up/positioning the equipment.
- Use of the equipment.

An important source of energy costs is lighting, replacing incandescent bulbs with modern energy-efficient bulbs, preferably leds, allows far less energy to be used than traditional incandescent bulbs. It is also important to remember to clean dusty bulbs, which give much less light. During the day, it is best and healthiest to use daylight. When reading books or working in the evening, switch on a spot light; it is not necessary to illuminate the whole room.

The largest energy consumption cost, which can be significantly reduced through simple means, results from space heating. For heating to be effective, it is important to start by sealing or replacing the windows and doors through which most heat escapes. Care should be taken to ensure that the right type of heating source, e.g. radiators, are always uncovered and clean. The decoration of the room should be planned in such a way that curtains, furniture or other elements do not act as a barrier to heat. It is important to install a heat-reflective foil on the wall behind the radiator, it increases the thermal efficiency. A good way to do this is to close the curtains at night so that heat does not escape and to open them during the day when the sun can reheat the room. Installing thermostatic valves to regulate heat in less used rooms is another way to reduce energy consumption. All rooms should be ventilated briefly and intensively, several times a day. During this time, it is best to turn down the radiators. The rooms should also be properly ventilated.

Respondents to the survey also indicated other ways in which they care for the environment and the climate (Table 5).

**Table 5.**

*Characteristics of measures to protect the environment and climate*

Type	Number of responses
Reducing consumption (e.g. limiting the purchase of products and services)	233
Eco-driving (e.g. driving steadily, maintaining optimal engine speed, etc.)	207
Limiting car travel (e.g. using public transport, taking a neighbour to work, etc.)	213
Limiting meat consumption	113
Buying sustainable products (e.g. organic food, products made from recycled materials, etc.)	111

Source: Own elaboration, N = 605.

The presented results of the self-report survey confirm public awareness of the need for environmental protection measures and the rational use of natural resources. All the changes in daily life implemented out of concern for the environment have greater or lesser effects in the long term, so it is important to promote and implement them.

## 5. Conclusion

To sum up the above considerations, the most important issue is the appropriate, rational management of the natural resources we have in the world. Excessive use of certain non-renewable raw materials will result in their shortage over time. It will be possible to replace

certain groups of raw materials with others, although this may increase the cost of socio-economic life. The article is an original look at the topic under study and shows the level of public awareness in Poland in relation to global trends, which are similar. A weakness of the presented research is the area in which it was carried out, focusing only on Poland. Referring them to global trends, however, allows for a broader perspective on the topic under study. Recent years and the energy crisis have prompted all countries to engage in a global struggle to minimise the adverse social and economic impact of climate change. Only the implementation of global norms and principles for managing natural resources and protecting the environment can significantly hold back the rate of adverse climate change. The article proves that the hypothesis posed relating to the pro-environmental actions of the individual in the global interest is true. In the future, it is planned to carry out the study again and to extend its scope in order to analyse public awareness and the changes taking place in the subject area studied. All changes in the management of natural resources must be implemented individually so that entire societies, countries can avoid climate catastrophe. The most important benefits of the rational use of energy are a reduction in energy consumption costs, i.e. a reduction in energy expenditure, environmental protection and pollution, and longer use of existing limited energy resources.

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