Ministry of Development Funds and Regional Policy
Republic of Poland

NDC2050
National Development Concept

Document adopted by the Council of Ministers on 25 July 2025.

Warsaw 2025

INTRODUCTION

Current megatrends - the Emergence of the new economy, the Technological progress, Escalation of global social problems, the Growing pace of environmental changes, the Spatial reorganisation, the Transformation of the global order as well as ever more numerous hotspots of armed conflicts means that we are living in a world of dynamic change, uncertainty and an increasingly unpredictable future. All spheres of life of the global population are affected by these transformations in both the short and long-term perspective. Decision-makers - from the local to the international level - are duty bound to prevent passive drift and exploit the development opportunities arising from these changes. For this to happen, it is necessary to prepare strategic planning tools aimed at exploring the consequences of ongoing changes and outlining potential future scenarios, and, at the same time, allowing public policies to be formulated in advance, so that they could create the reality we desire as inhabitants of the Earth, individuals, members of communities, entrepreneurs, citizens or space users.

About the NDC and its content

The National Development Concept (NDC) was established by the Act on the Principles of Development Policy (Articles 8a-8c) and stems from the need for a new approach to the role of long-term planning. It is a document designed to enable the best strategic choices for the coming quarter of a century in the framework of medium-term strategies and public policies implemented by the State government, local governments and other stakeholders in the pursuit of development. In other words, the NDC is a roadmap for planning the development of the State aimed to provide a broad context in the long-term perspective. The tasks of the NDC include: (1) knowledge-based identification of the development trends and challenges that the State will face in the future, (2) outlining a deliberately idealised vision of the country in 2050 to determine the level of ambition for future public policies, (3) provision of future scenarios to allow “simulating” the environment in which public administration will be making decisions and to prepare public institutions to accomplish their development goals in diverse conditions, (4) identification of development challenges, (5) identification of key conclusions.

Rather than predicting the future, the document outlines potential transformation processes that may happen in the long term and change the reality of our country. This is a new way of planning development in Poland, but contemplating the future is nothing new. Man has always been interested in the future and has created its diverse visions. A look at a specific example of a vision of the future dating back to a century ago shows (see Figure 1) that even if it may have sounded abstract to its contemporaries, some of the predictions have become reality.

Figure 1. An extract from a newspaper article of 1923.

Jak będzie wyglądał świat w roku 2022?

Kraków, 8 lutego.

Jak będzie wyglądał świat za 100 lat? Takie pytanie zadał jeden z dzienników amerykańskich kilku osobistościom, pracującym w różnych dziedzinach działalności ludzkiej. I oto jakie otrzymał odpowiedzi:

Pan Griffith — „król kinematografu", oświadczył: „Za sto lat książki i gazety nie będą się już drukować. Ukazywać się one będą na ekranie kinematograficznym. Edukacya odbywać się będzie przy pomocy ekranu. Istnieć będą wówczas szkoły-kina i kina-biblioteki".

Walter N. Polakow, inżynier, dał następującą odpowiedź: „Nie będzie ani nafty, ani węgla. Wynaleziony będzie sposób zużytkowania energii radioaktywnej promieni słonecznych. Lotnictwo będzie zreformowane, gdyż samoloty nie będą już dźwigać aparatów, dających im siłę popędową, a zasadą ruchu będzie przyciąganie. Dzięki postępom, dokonanym przez techników, dzień pracy, który przed stu laty wynosił szesnaście godzin na dobę, a który dzisiaj wynosi ośm godzin, będzie za sto lat wynosił tylko dwie godziny".

Henry L. Mencken, autor i krytyk, stawia horoskopy polityczne, przyczem mówi: „Stany Zjednoczone będą za sto lat kolonią angielską".

Winifred G. Hendenberg, sekretarz Towarzystwa weteranów wielkiej wojny, pisze: „Jeżeli od dziś do roku 2022 wojna światowa nie będzie miała dalszego ciągu, to świat przeżywać będzie erę powszechnego braterstwa, które nie zazna ani nędzy, ani konfliktów zbrojnych, ani głodu, ani zniszczenia".

W. H. Anderson, dyrektor Ligi antialkoholicznej, prorokuje: „W roku 2022 alkohol zupełnie zniknie z powierzchni ziemi. Tylko kilku rzadkich degeneratów spożywać będzie pokryjomu to, co świat uważać będzie wówczas za truciznę".

Miss Margaret Sanger, promotorka ruchu „kontrolowanego przetwarzania się", pisze: „Kontrola generacyi ludzkiej będzie stanowiła część edukacyi kobiet. Wynikiem tego będzie większy rozwój intelektualny kobiety i większe szczęście małżeńskie, gdyż „miesiąc miodowy" trwać będzie kilka lat i przed urodzeniem pierwszego dziecka, małżonkowie będą mieli czas na poznanie się i zorganizowanie".

Mary Garrett Hay, prezydentka klubu wyborczego kobiet w Nowym Jorku, oświadcza: „Kobieta będzie pod każdym względem równa mężczyźnie. Wypełniać ona będzie zadania, do których jest najbardziej ukwalifikowana, gdyż starania, jakiemi teraz otacza rodzinę, będą ogromnie uproszczone przez wynalazki i współdziałanie męża".

Major John F. O. Ryan, komisarz „tranzyta", eks komendant 27 mej dywizyi amerykańskiej, zapowiada: „Środki transportowe tak dalece ułatwią wzajemną penetracyę ludów, że używany będzie jeden tylko język. Będzie to język najsilniejszy ze wszystkich".

Na Muzeum Narodowe: Marya Kołodziejczyk 1000 Mk.

Na sprowadzenie zwłok Rokitniańczyków: Feliks Sierkiejewicz 10.000 Mk.

DLA SPARALIŻOWANEJ: Jan Kielarowski, Iwonicz 3.000 mkp. Teresa Wohlowa, Kraków 10.000 mk. Dr Jerzy Kieszkowski 2.000 mkp. S. W. N., Kraków 5000 mkp. A. Golachowski 2000 mk. N. N. 2000 mk. Dr E. Stiel, Jarosław 5000 mk. Z. Więckowski, Kamienica, stud. med. część dochodu z przedstawienia 15.000 mk. Limanowa 1000 mk. R. Federowiczowa Rzepiennik Strzyż. 1000 mk. Jura 1000 mk. A. S. 5000 mk. I. Czanderna, Dębica 2000 mk. U. Jakubcowa, Żmigród 1000 mk. Sz. Pawłowski, Annopol 2000 mk. Z. Dębowski 5000 mk. Jabłonowscy, Stanisławów 20.000 mk. Kazimiera II., Bochnia 1000 mk. J. Bieńkowski 2000 mk. Gil Józef 2000 mk. M. R. 5000 mk. Szklarewicz M. 2000 mk.

DLA BIEDNEJ NAUCZYCIELKI: Preiszówna mk 2.000.

NA ZAKŁAD SIEROT W PAWLIKOWICACH: p. Marya Górska, zebr. od gości w kawiarni Centralnej 121.230 mkp.

DLA CIĘŻKIEJ STARUSZKI: Strzałkowa zam. wieńca na trumnę ukochanej córki Józefy Strzałkowej 10.000 mkp.

Source: Ilustrowany Kuryer Codzienny, 9 February 1923, p.12.

In an era of dynamic changes and threats that affect our reality in an unprecedented way in the technological, environmental, social, economic, spatial, geopolitical and security spheres, the specific role of this document is also to provide assistance in revising the existing strategic assumptions and in identifying, well in advance, their weaknesses and to inspire completely new, non-standard solutions. It is also worth emphasising that the NDC is an attempt to disengage from the current economic policy priorities and current social problems, which may be very different or disappear completely by 2050.

The knowledge contained in the NDC will enable ministries, local government units and other stakeholders to more easily identify areas of greater relevance for the present and future. They will also better understand what factors are important to the decision-making process and will be able to make strategic decisions that are conducive to long-term plans. Such an approach allows harnessing new opportunities by altering the objectives, actions or practices. Another benefit is to help in formulating responses to the potentially negative consequences of emerging risks or threats. Taking actions of an anticipatory, adaptive, mitigating or preventive nature, in line with the development challenges identified, will become easier.

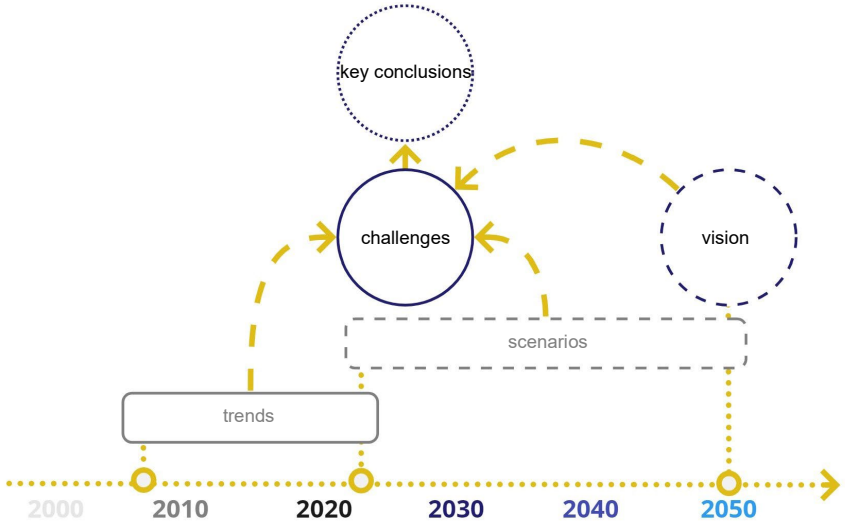
How was the NDC created?

At the start of the process of developing the NDC, some fundamental prerequisites were identified, acting as fundamental values to shape the country's development policies. They were taken into account at each stage of the work. These prerequisites are inclusiveness, social and generational solidarity, a resilient and socially responsible economy that is environmentally focused on space and the environment as a limited common good, responsible organisations and European integration. Furthermore, in the face of the current collapse of the geopolitical equilibrium developed earlier, values such as international security, sustainable global peace, the fostering and strengthening of democracy and the rule of law, as well as the respect for the rights and fundamental freedoms of citizens have also become particularly important.

The NDC, as a cutting-edge and foresight document, was prepared on scientific knowledge and expertise as well as the broadest possible data. A meta-analysis of the literature, an econometric analysis of data and Delphi studies were carried out in collaboration with the Institute of Urban and Regional Development (Polish: *Instytut Rozwoju Miast i Regionów*, IRMiR) and the Institute for Environmental Protection - National Research Institute (Polish: *Instytut Ochrony Środowiska - Państwowy Instytut Badawczy*, IOŚ-PIB) as part of the project consortium[1]. The application of the strategic foresight was supported by external experts and is one of the first attempts to employ it in full scale in the process of preparing an interdisciplinary strategic document in the Polish public administration. The logic behind the work on the document is presented on the figure 2.

[1] The consortium implementedthe GOSPOSTRATEG-III/0032/2020 project entitled: *Operationalisation of the Development Management System of Poland. Improving and introducing innovative and effective solutions into the socio-economic and spatial system as part of long-term development policy programming*.

Figure 2. The logic behind the work on the NDC



Source: own study.

For the purposes of the analysis, trends are defined as the directions in which specific phenomena are changing and are likely to continue changing at the global, European, and national levels. Trends influence various spheres of life for people living in different areas (administrative or functional) and require actions that either strengthen, counteract, or adapt in order to take advantage of the opportunities they present.

The developed vision is part of the applied strategic foresight. It represents the desired state of the country in 2050, that can be achieved by addressing the challenges ahead. The vision was formulated before the challenges were identified and serves as a reference for them. It also served as the starting point for the scenarios, which outline actions aimed at achieving the vision. Scenario-building contributed to a deeper understanding of how both Poland's external environment and the country itself may evolve over the next 30 years. The scenarios are plausible – they do not predict events, but show possible developments.

Challenges are issues of critical importance for the future of Poland up to 2050. They go beyond current problems and stem from previously identified long-term global, European, and national trends. These challenges emerge from the scenarios and refer to issues that require action in the field of public policy areas.

Key conclusions serve as the basis for developing subsequent public policies – they are drawn from the challenges. The implementation of public policies based on these conclusions is expected to lead to the realisation of the vision in the long term.

Notably, the development of the NDC is not an end in itself, as the process involved also an extensive exchange of ideas on and experience in strategic planning, and was an opportunity to develop innovative methods of working on government documents. As a new document in the development management system, the NDC is the impetus for creating a new quality of cooperation between government, civil society and the academic world. Participatory planning and consensus-seeking enables the NCR to be a "balanced aggregate" of diverse expectations, interests and solution ideas of the respective parties to the dialogue. A variety of working methods were employed, such as debates, public hearings, focus groups, expert panels and workshops, and their results were utilised. The activities involved scientists, both young and well-established, as well as experts, NGOs, think tanks, business associations, spatial planning offices, local and regional government units and ministries.

In accordance with the Act of 6 December 2006 on the Principles of Development Policy, the NDC, as a long-term document, will be updated whenever any significant changes in development trends occur in the country or worldwide.

TABLE OF CONTENTS

MEGATRENDS

Development planning requires identifying the trends rooted in the past that shape the present and the years to come. It is a step that enables understanding of development trends on a global, European and national scale, as well as their consequences in the social, economic, environmental, spatial and geopolitical spheres. It is also a starting point for forecasting changes in such domains critical to the national development as the environment and space, demography, education, social equality, innovation, technology, rule of law, security and territorial cohesion. The analyses led to the identification of the following megatrends and component trends that will potentially have the greatest impact on the situation and position of Poland:

1. **Emergence of a new economy**: Intensifying competition in the area of innovation; Progressive digitalisation of the economy; Increasing automation of work and flexibility of employment; Energy transformation; The Tension between globalisation and locality; Transformation of agriculture due to climate change, technological change and new consumption patterns;
2. **Technological acceleration**: Increasing popularity of the Internet of Things and increasingly powerful artificial intelligence, Growing importance of biotechnology, Growing importance of cybersecurity;
3. **Growth of global social problems**: Demographic uncertainty; Increasingly nomadic world; Increasing social inequalities; Developing demand for new forms and fields of learning;
4. **Increasing pace of environmental and climate change**: Progressive transformation of the Earth's climate system; Increasing degradation of the natural environment; Declining biodiversity; Unsustainable use of raw materials and waste management;
5. **Rearrangement of space**: Growth of strong cities and urban functional areas; Transformation of rural areas; Changes in land use;
6. **Transformation of the global order**: Growing international tensions, including new armed conflicts posing a threat of escalation; Growing political importance of Asia; Declining democratic mechanisms.

The infographics below offer a concise summary of what is known about the megatrends and trends identified. For a full description, see Annex1. The visualisations present key information about each megatrend and its sub-trends. Since Poland is part of the global and the European system, each infographics starts with presenting phenomena on this dimension. At the same time, key, sometimes alarming, facts are shown using maps, charts and figures to illustrate and understand how diverse the world we live in. The most important information on trends for Poland is also illustrated. Each megatrend is summarised in a box that presents selected impacts in Europe.

Data sources can be found on page 79. The data is described according to the following layout:

Percentage of companies that applied at least one AI technology in 2021.

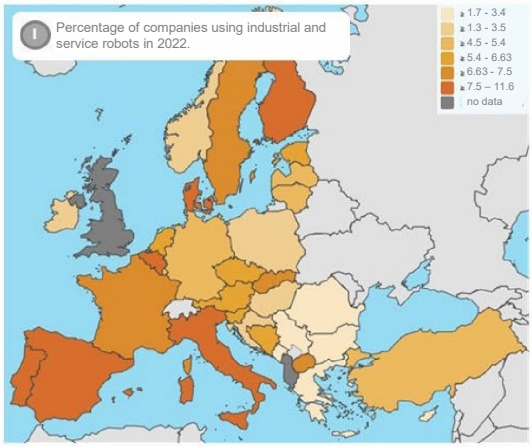
MEGATREND

EMERGENCE OF A NEW ECONOMY

TREND: INCREASING AUTOMATION OF WORK AND FLEXIBILITY OF EMPLOYMENT

The consistently developing robotisation and automation will have a significant impact on changes in the labour market. Estimates on the size of the market that could be subject to automation vary significantly, with Poland ranking high in most of them in terms of the percentage of jobs prone to automation.

1 Percentage of companies using industrial and service robots in 2022.



TREND: INTENSIFYING COMPETITION IN THE AREA OF INNOVATION

Over the last 10 years, no significant change in Poland's position in the ranking of innovation has been recorded. In order to benefit from the innovative economy, Poland must participate in competition effectively.

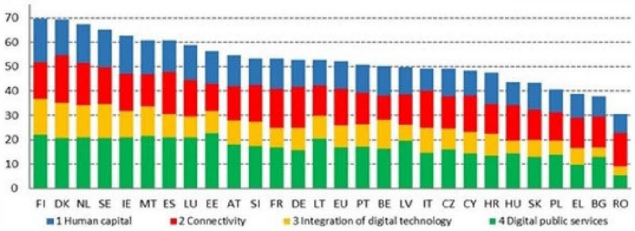
2 Global Innovation Index

	2014	2017	2020	2021	2023
Score(GII Index)	40.6	41.9	39.9	39.9	37.7
Number of countries surveyed	143	127	131	132	132
Poland, overall worldwide	45	38	38	40	41
Poland in the income group	39	35	35	37	36
Poland in Europe	29	25	25	27	26

TREND: PROGRESSIVE DIGITALISATION OF THE ECONOMY

The competitiveness of Poland's economy will depend on its level of digitalisation and ability to establish its own internationally competitive entities. At present, Poland's economy shows a low level of digitalisation, but the pace of this process is high compared to Europe and the world.

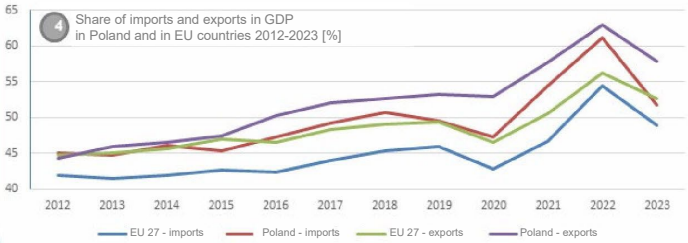
3 Digital Economy and Society Index 2022 (DESI)



TREND: THE TENSION BETWEEN GLOBALISATION AND LOCALITY

Over the recent years, Poland has seen an intensive growth in the share of exports and imports in GDP. Fluctuations in Polish exports and imports have been comparable to those in other EU countries.
In relation to the EU average, Poland has a higher share of exports and imports in GDP. A higher growth rate of the ration can also be seen

4 Share of imports and exports in GDP in Poland and in EU countries 2012-2023 [%]



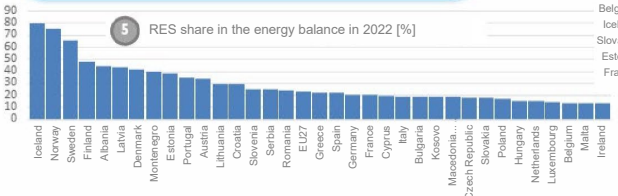
TREND: ENERGY TRANSFORMATION

Compared to other EU countries, Poland ranked low in terms of the RES share in the energy balance in 2022 (7th position from the bottom). However, some dynamic changes have been recorded in the country over the last 10 years. Poland is among top 10 countries for the RES share increase, with the figure exceeding the EU average.

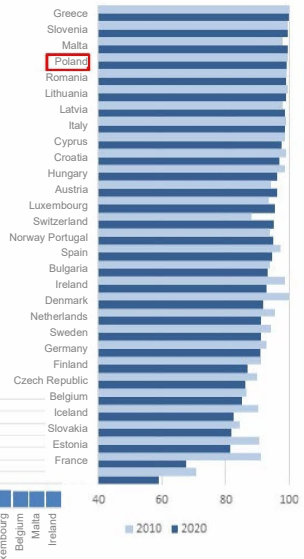
TREND: TRANSFORMATION OF AGRICULTURE DUE TO CLIMATE CHANGE, TECHNOLOGICAL CHANGE AND NEW CONSUMPTION PATTERNS

Poland shows one of the highest shares of agricultural holdings run by natural persons in the total number of agricultural holdings (99.2% in 2020). At the same time, in 2010-2020, the decline of this indicator was one of the lowest in Europe (0.3 pp)

5 RES share in the energy balance in 2022 [%]



6 Share of agricultural holdings run by a natural person in the total number of agricultural holdings in 2010 and 2020 [%]



EFFECTS OF THE MEGATREND

- increasing pressure to build an effective system of science-business-administration-society relations;
- mitigation of spatial constraints (global digital economy);
- decline of occupations involving work that can be performed by robots;
- long-term monitoring and reforms concerning energy policy;
- strong competition for capital flows at the local level;
- reduction of the negative impact of agriculture on the natural environment.

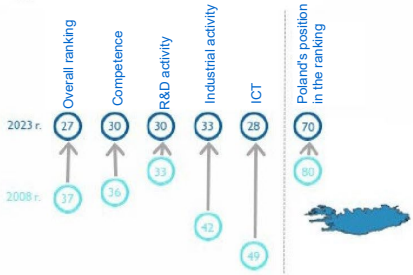
MEGATREND

TECHNOLOGICAL ACCELERATION

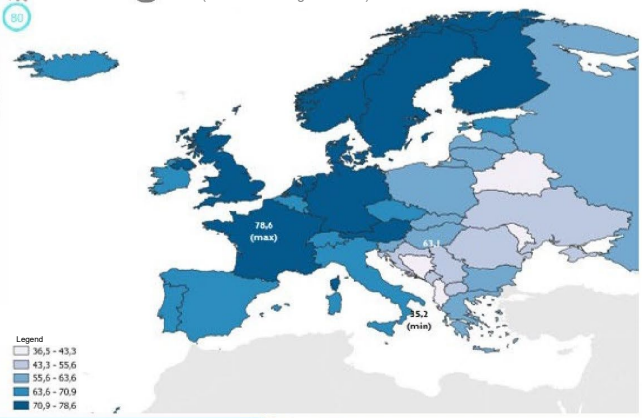
TREND: INCREASING POPULARITY OF THE INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE

Poland ranks at the bottom of European countries in terms of the percentage of companies using artificial intelligence. At the same time, it is among the top ten countries in terms of the number of specialists in this field residing in the country (3% of the European specialists).

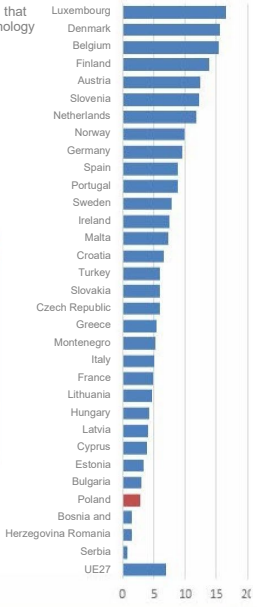
7 Poland's position in the UN technology readiness index



8 Index of the state's readiness to adopt AI technology in 2023 (value in the range of 0-100)



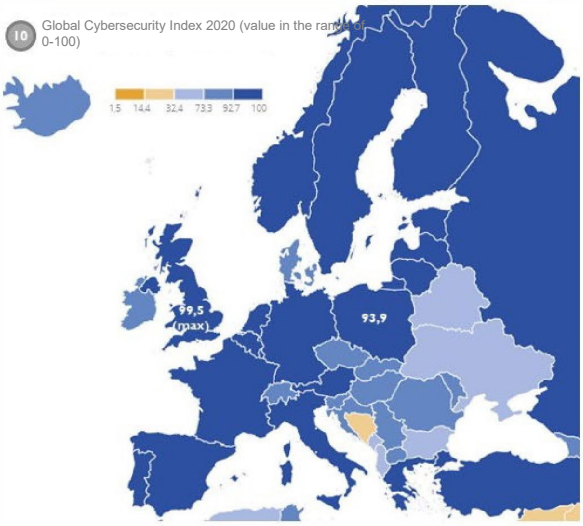
9 Percentage of companies that used at least one AI technology in 2023.



TREND: GROWING IMPORTANCE OF CYBERSECURITY

In Poland, as elsewhere in the world, a significant increase in the number of cyber crime cases and cyber threat incidents can be observed. The increasing human activity in the virtual world, as well as the impact of IT and other technologies on e.g. education, health and telecommunication security will make cybercrime protection fundamental to how societies function.

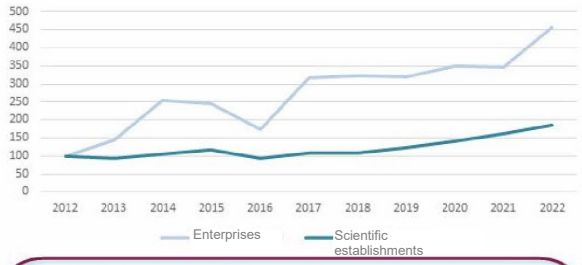
10 Global Cybersecurity Index 2020 (value in the range of 0-100)



TREND: GROWING IMPORTANCE OF BIOTECHNOLOGY

Biotechnology companies have been developing rapidly in Poland, both in terms of their internal R&D expenditure and the number of entities. In scientific establishments, the indicators have been at a relatively stable level.One of the National Smart Specialisations, biotechnology is currently an economic priority for Poland.

11 Internal expenditure on biotechnology activities in enterprises and scientific establishments - change in 2012-2022 (2012=100) [%]



EFFECTS OF THE MEGATREND

- increased technological polarisation;
- dominant role of competition in technology;
- use of artificial intelligence in management processes;
- minimised importance of physical space in certain fields;
- increasing human life expectancy;
- implementation of biotechnology for the environment and development of efficient agricultural bioproduction;
- threats to access to public services and utilities (e.g. cyber-attacks on hospitals);
- increased investments in safeguards.

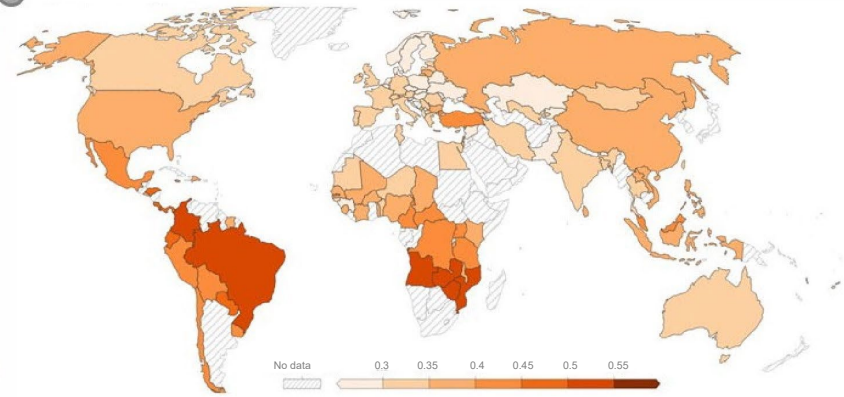
MEGATREND

GROWTH OF GLOBAL SOCIAL PROBLEMS

TREND: INCREASING SOCIAL INEQUALITIES

The world is witnessing an increase in multidimensional inequalities, including economic inequalities and those related to access to public services.
Gender inequality manifests itself in many ways, e.g. through discrimination, exclusion or income inequality. The widest income gaps between the top 10% of earners and the half of the population with the lowest incomes can be seen in the Middle East, Sub-Saharan Africa and Latin America.
In Europe, the gap between the two income groups continues to be narrowest

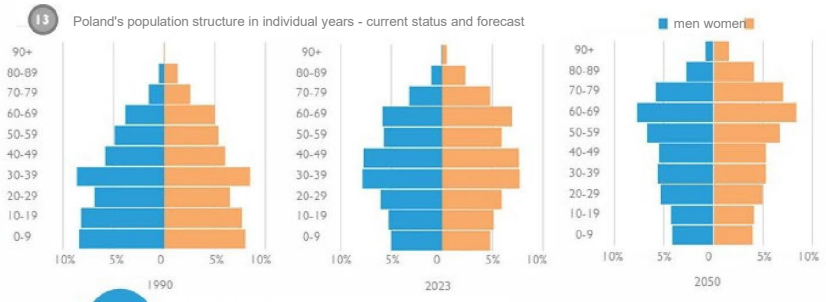
12 Global Gini coefficient in 2021.



TREND: DEMOGRAPHIC UNCERTAINTY

The world's population is growing steadily. It has increased by 800 million in the last decade and can reach nearly 9.7 billion by 2050. In Poland, the population decreased by 622,200 (approximately 1.6%) between 2010 and 2021. Increasing life expectancy can be observed.

13 Poland's population structure in individual years - current status and forecast

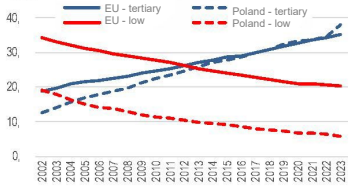


33.2 M — Population of Poland in 2050, decrease from 37.6 MM in 2023 according to UN scenarios

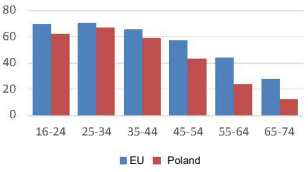
TREND: DEVELOPING DEMAND FOR NEW FORMS AND FIELDS OF LEARNING

Education has improved significantly in the EU and the OECD over the past 20 years. The percentage of adults with low education levels has decreased in the EU from 34.1% (2002) to 20.2%, and in Poland from 20.2% to 5.7%. The percentage of people aged 25-65 years with tertiary education has increased in the EU from 27.2% (2014) to 35.1%, and in Poland from 27.0% to 37.9%. Digital, civic and social skills, multilingual competence and entrepreneurship are among the most required competencies. Significant improvements in education levels are insufficient. Lifelong learning is becoming necessary. This is particularly evident in digital skills, the level of which decreases across respective age groups - in Poland more markedly than in the EU.

14a Persons aged 25-64 years with low education and tertiary education [%]



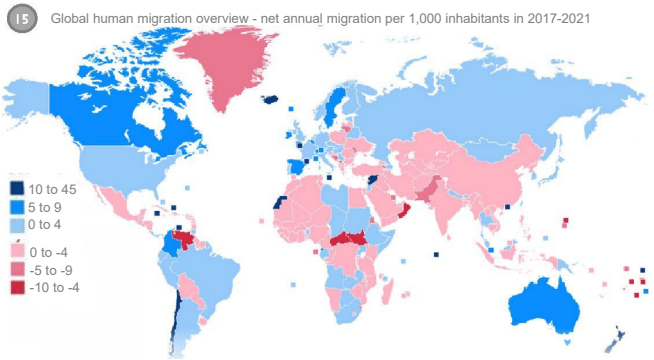
14b Persons with at least basic digital competence in 2023 (age groups) [%]



TREND: INCREASINGLY NOMADIC WORLD

Increased migration within and between world regions is anticipated. The European countries (Switzerland, Luxembourg and Cyprus) are among the top 20. Poland ranks in the middle (106th place). Furthermore, according to UN data, forecasts concerning the migration balance per 1,000 inhabitants in 2020-2050 do not show any strong fluctuations.
However, , according to historical trends, it is estimated that by 2050 the migration balance will be positive in Europe and negative in Poland.

15 Global human migration overview - net annual migration per 1,000 inhabitants in 2017-2021



EFFECTS OF THE MEGATREND

- increasing income, educational and "environmental" polarisation (access to clean environment);
- increased investment in ICT infrastructure for education and schooling, mainly in metropolitan urban centres;
- increased environmental anthropo-pressure as a result of increased migration;
- development of the labour market for the elderly, robots and artificial intelligence.

MEGATREND

INCREASING PACE OF ENVIRONMENTAL AND CLIMATE CHANGE

TREND: PROGRESSIVE TRANSFORMATION OF THE EARTH'S CLIMATE SYSTEM

Each of the last four decades was warmer than the previous one. The global average temperature between 2011 and 2020 was 1.09°C higher than that observed in the pre-industrial period (1850-1900). Rising temperatures are leading to the melting of glaciers and permafrost and higher ocean levels. Climate change is caused by excessive concentration of greenhouse gases (GHGs) in the atmosphere. Increased emissions of these gases are recorded on all continents. Per capita GHG emissions in Europe and Poland are higher than the G20 average.

99% of the world's population live in places where WHO air quality standards are not met

4 bn people live in areas where physical water shortages occur during at least 1 month in a year

30% of the global population do not have access to drinking water of adequate quality

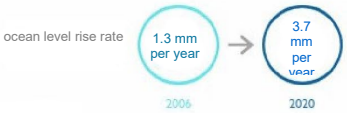
30% of industrial and municipal wastewater worldwide is not treated

PLN 1.15 bn total losses caused by extreme events over the last two decades in Poland

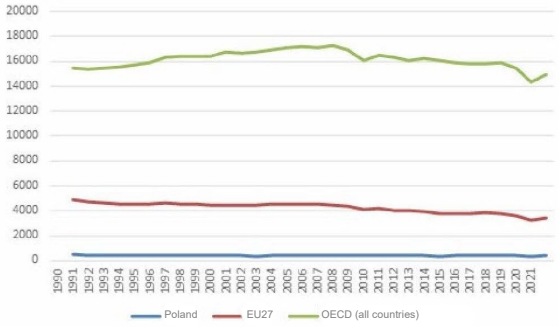
20 cm ocean level rise in 1901-2018

TREND: INCREASING DEGRADATION OF THE NATURAL ENVIRONMENT

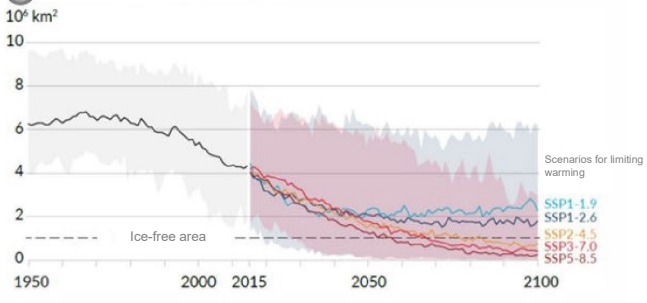
The main sources of atmospheric pollution include emissions from combustion of fossil fuels and biomass for heating purposes. In Poland, factors responsible for emission of fine particulate matter (PM2.5) include so-called low emission (nearly 50%), industry (28%) and transport (10%). Air pollution is responsible for nearly 40,000 premature deaths each year.



16 Change in CO_2 emission [M t]



17 Ice-free area



TREND: UNSUSTAINABLE USE OF RAW MATERIALS AND WASTE MANAGEMENT

Over the past 50 years, global raw material mining has tripled, with the growth accelerating further since 2000.
The volume of waste generated in developed countries is stabilising, contrary to Asia and Africa, where it is forecast to increase significantly.
In Poland, as elsewhere in the world, the problem of waste generation and management is growing. The material footprint is highest in high-income countries, where it is 60% higher than in upper-middle-income countries and more than thirteen times higher than in low-income countries.

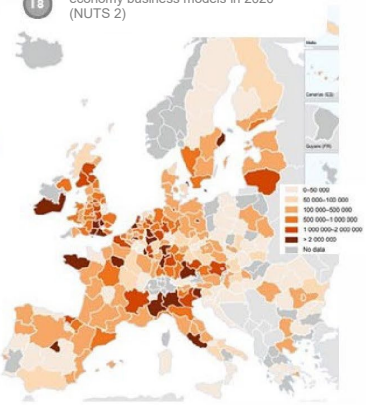
10 x the increase in plastic pollution of the seas

3.4 bn tonnes projected global waste growth until 2050

Material footprint per capita in 2020:
27 t/person in high-income countries

2 t/person in low-income countries

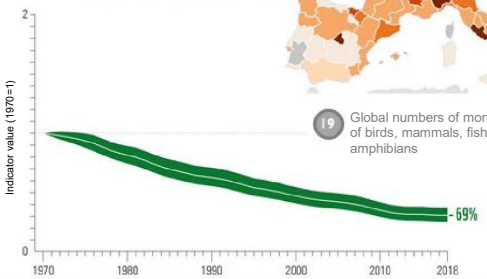
18 Turnover generated by circular economy business models in 2020 (NUTS 2)



TREND: DECLINING BIODIVERSITY

Biodiversity is declining at the ecosystem, species and genetic level. It is a result of changes in land use, habitat and landscape fragmentation, destruction of species, climate change and the spread of alien species.
Biodiversity is negatively affected by production and consumption patterns that result in excessive exploitation of natural resources, as well as water and soil pollution.

19 Global numbers of monitored species of birds, mammals, fish, reptiles and amphibians



EFFECTS OF THE MEGATREND

- gradual loss of basic natural services that determine human health and well-being;
- increased migration flows to Europe;
- increasingly difficult business environment, changes in food production and supply chains;
- increased frequency and duration of hydrological droughts resulting in a further decline in soil fertility and drying out of wetlands;
- local flooding and periodic exclusion of parts of land from use as a result of heavy rainfall and floods;
- increased production costs (e.g. for electronic products) due to a more difficult access to raw materials;
- increased cost of waste management, growing environmental burden of waste and increased importance of the circular economy.

MEGATREND

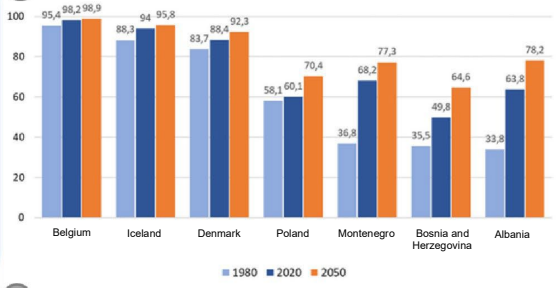
REARRANGEMENT OF SPACE

TREND: GROWTH OF STRONG CITIES AND URBAN FUNCTIONAL AREAS

The number of city dwellers is increasing steadily. The urban population has almost doubled in the last 30 years. In 2020, nearly 4.4 billion people (approximately 56.2%) lived in cities worldwide. At the same time, approximately 74.9% of the population in Europe lived in cities. It is estimated that 6.8 billion people, or approximately 68% of the global population, will live in cities in 2050. The urbanisation rate in Poland had been increasing since the beginning of the 20th century, reaching its peak of 62% in 1991. Since then, the urbanisation processes have stabilised, and slowed down since the mid-1990s. In 2021, 59.75% of Poland's population lived in cities.

This level is low compared to other highly developed countries, where the average share of the urban population exceeds 80%. The World Bank forecasts predict that after a temporary stagnation urbanisation in Poland will continue to reach 70% by 2050.

20 Changes in urbanisation rates in selected countries



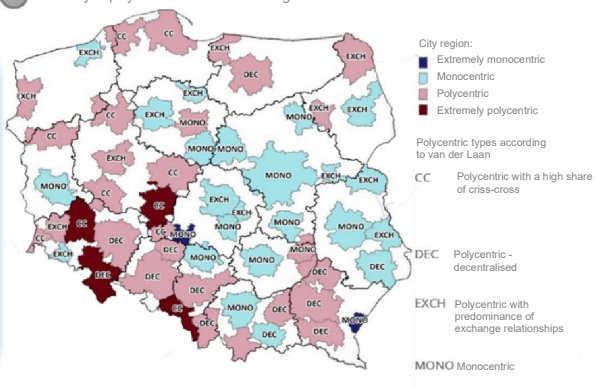
TREND: TRANSFORMATION OF RURAL AREAS

In 2010-2020, the number of agricultural holdings in Poland decreased by 13%. Although farms have increased their area, the overall share of agricultural land in the total area of the country has been declining steadily over the years.

The Polish countryside is becoming more multifunctional. In 2018, around 22% of economically active people in rural areas worked in agriculture, and only 10% considered this occupation as their main source of subsistence.

At the same time, the number of Poles living in rural areas has been increasing. There has been a positive urban-rural migration balance since 2000, and the process has accelerated in recent years due to the COVID-19 pandemic. In 1990-2020, the share of Poland's population living in rural areas in the total population increased from 38% to 40.6%. In particular, this illustrates the process of urban residents moving to suburban areas, which are partially losing their agricultural functions.

21 Diversity of polycentric nature of urban regions in Poland



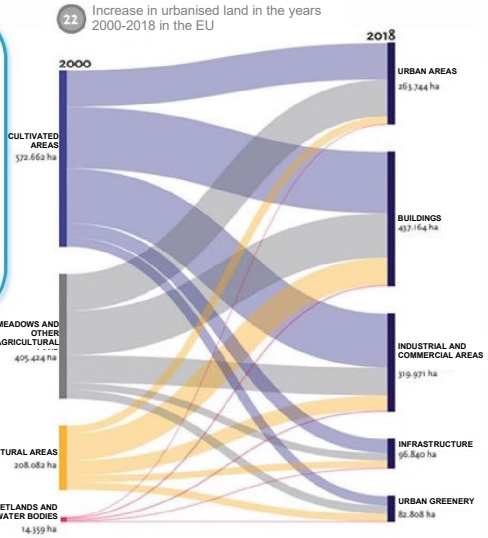
TREND: CHANGES IN LAND USE

The Earth's surface is under intensive transformation, with the area of developed land increasing worldwide. The area of arable land is expanding , mainly at the cost of forests, swamps and grasslands. The area of desert and semi-desert land is increasing.

Intensive development is taking place on the European continent, with agricultural space, primarily arable land, shrinking in favour of forested areas and urbanised developed areas, among others.

In Poland, increasing investment pressure contributes to the urbanisation chaos and loss of agricultural land. The share of developed areas is increasing in all regions. There is a gradual decline in settlement in areas characterised by peripheral location and depopulation.

22 Increase in urbanised land in the years 2000-2018 in the EU



from 9% to 13% - the increase in the share of developed and urbanised areas in Poland between 2002 and 2020.

by 11% - the reduction in global forest area between 2001 and 2021.

60-70% - of soils in Europe are unhealthy due to pollution, urbanisation and the effects of climate change

85% - of Poland's wetlands have been drained or degraded

EFFECTS OF THE MEGATREND

- spatial polarisation and the associated chaotic land-use changes — degradation of aesthetic and landscape values;
- progressive urban sprawl, loose and irregular development and further changes in the functional and spatial structure of the areas around cities;
- further fragmentation and development of open areas: land development in ecological corridors disrupting species migration, Land development in aeration wedges, a decline in biodiversity and loss of valuable natural areas;
- increasing disparities in the population structure: more young people, predominantly women, live in cities and urban functional areas, whereas further ageing of the population is recorded in areas affected by depopulation.

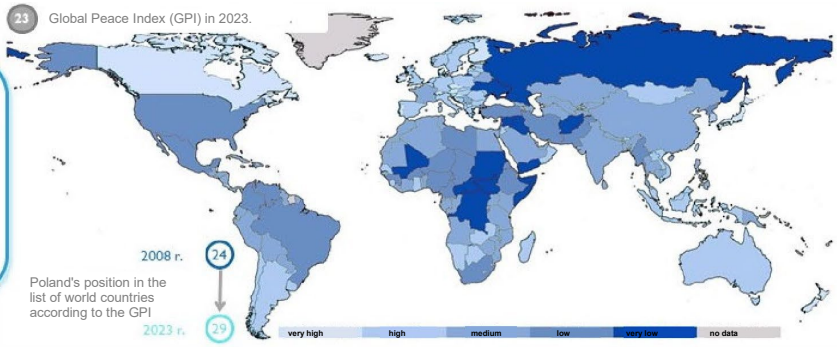
MEGATREND

TRANSFORMATION OF THE GLOBAL ORDER

TREND: GROWING INTERNATIONAL TENSIONS

Europe was recognised as the leader in the 2021 GPI statement. In 2023, 7 of the 10 most peaceful countries were located in Europe. This has changed over the past year, with 12 of the 36 European countries reporting an improvement in their position and 23 reporting a deterioration.

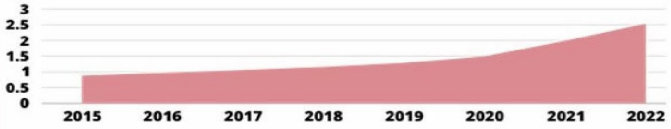
23 Global Peace Index (GPI) in 2023.



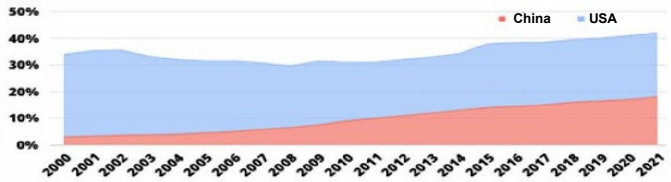
TREND: GROWING POLITICAL IMPORTANCE OF ASIA

Of the 20 fastest growing countries (GDP per capita) in 2010 - 2019, as many as 8 were in Asia. For Poland, China is the largest Asian trading partner (Poland's second largest trading partner in terms of imports, following Germany). Although China is not among Poland's main export countries, a clear upward trend is observed in this respect. In 2021, trade between Poland and China amounted to more than USD 42.1 bn.

24 Value of Chinese imports to Poland in PLN bn



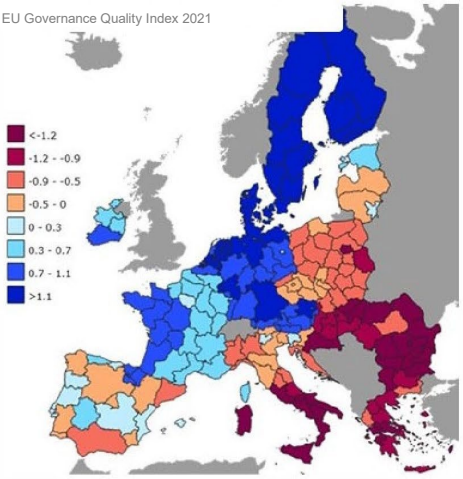
25 Share of China and USA in the global trade



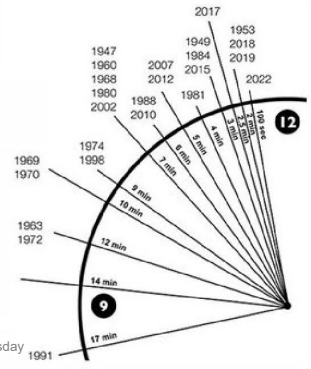
TREND: DECLINING DEMOCRATIC MECHANISMS

Mature democracies can be found mainly in countries of Northern and Western Europe. Central and Eastern and South-Eastern European countries are mostly categorised as imperfect democratic systems. In 2021, Poland had the democracy index score of 4.6 on a 7-point scale. At the same time, Poland is among countries where above-average negative developments were recorded in 2011-2021. In 2021, Poland had a negative score in the European Governance Quality Index. In 2010-2017, Poland stood out in the EU in terms of the number of regions where improvements were recorded, but in 2017-2021 another deterioration in the quality of governance was identified in many regions.

26 EU Governance Quality Index 2021



27 Minutes on the Doomsday Clock



1949: USSR's first nuclear tests

1953: The USA test hydrogen bomb

1984: US-USSR relations reach a critical point

2015: Climate change and fears of nuclear war

2022: Further climate change, pandemic, nuclear and cyber war concerns

1.5 min separate mankind from doomsday on Doomsday Clock in 2023.

EFFECTS OF THE MEGATREND

- growing political importance of Asia;
- decline of democracy;
- development of the policy to build Poland's strong economic competitiveness and the country's growing position in international structures;
- increased social polarisation and limitation of civil liberties,
- decline in public confidence and trust in political authorities.

VISION

In 2050 Poland is a country that has developed its growth potential providing sustainable foundations for the future and a place where we want to live and work. There is a consensus among society and decision-makers on the need to increase social and territorial cohesion, to curb polarisation in society and the critical role of the natural environment in development processes, especially in light of the increasingly severe and irreversible effects of climate change. A modern economy, managed in a socially and environmentally responsible manner, creates good development conditions for present and future generations. The consequences of the demographic gap have been bridged. The optimal use of technological, institutional and social solutions enables sustainable resource management. The country's polycentric settlement structure ensures sustainable development of all its territories, both cities with their functional areas and rural regions. Poland enjoys military, food and energy security, and is resilient to threats, holds a strong position in the shifting international order.

EMPOWERED SOCIETY

An open, inclusive, and healthy society that adapts to technological developments as well as the consequences of demographic and climate change.

In 2050, the society addresses identity, cultural, ethnic, and worldview diversity with respect, acceptance and understanding, appreciating the value of each individual and promoting equality and inclusion. Everyone can find a suitable place to live, work, conduct business or pursue social activities in Poland regardless of their race, gender, origin, religion or beliefs. The state strives for social inclusion and integration and supports individuals and families in crisis. This is facilitated by public institutions and development programmes focused on building and strengthening social cohesion and security, respecting the law and fulfilling the basic needs of every citizen of the country. Housing has become universally accessible.

Polish citizens have access to public services tailored to their needs and provided also in digital form. An accessible, efficient and modern healthcare system meets society's needs through advanced development of medicine and medical services, health promotion and prevention data-driven programmes and the development of the silver economy.

Education responds to the contemporary challenges, the expectations of the society and individual aspirations. On one hand, it focuses on the learners' acquisition of skills necessary for the economy, including universal skills that will enable the society to continuously adapt to change and, on the other hand, it encourages the development of individual talents and lifelong learning. It also has an important public and cultural awareness function to support the population in adapting to dynamic changes. Its development is based on new technologies and methods that enable greater personalisation of learning and teaching paths and ongoing verification of knowledge and skills, as well as simultaneous digital hygiene and adaptation of tools to students' level of development. Education also fosters social inclusion and equity by creating pathways that reduce inequalities in economic, cultural and special educational needs.

The implementation of a just transition has avoided exacerbating the problem of energy and transport poverty.

Labour market institutions and social service providers focus on enabling people to enter, stay in and re-enter the labour market in an increasingly automated and digital environment. Their offer is addressed to all residents of Poland, including migrants and refugees. The work-life balance has become attainable. It is common for employers to offer employment in forms that guarantee job security and flexibility, as well as the opportunity to provide care to persons in need of support.

The pension system is adapted to demographic shifts and flexible work patterns. Benefit calculation formulas take into account various emerging ways and possibilities of doing work and allow people to stay on the labour market for as long as possible.

Adequate labour market policies in the area of professional activation as well as policies focused on birth-rate, family, healthcare (oriented towards extending healthy life expectancy and improving the health of the population, as well as increasing physical activity), education and balanced migration policy have helped bridge the staff shortage gap in key sectors of the economy and in deficit professions. Good conditions for starting and growing

families have been created through, among other things, access to housing, well-organised social services, high-quality education and accessible healthcare services. The implementation guidelines of the migration policy are included in the labour market, healthcare, education and social integration solutions.

An empowered society has been achieved, where everyone is and feels respected and safe, is a full member, has the opportunities for growth and self-fulfilment, and where strong and extensive social ties and relations enable individual social communities and the society as a whole to thrive.

ECONOMY OF THE FUTURE

Innovative, responsible, resilient to shocks and crises.

Poland actively participates in the global economy, creating, absorbing and disseminating modern technologies and innovations, conducting its activities in both the real and digital worlds. The country systemically supports the development of its existing technological capacities and fosters the creation new ones. Polish territorial brands in the fields of healthy food, green technologies, and digital innovation are globally recognised and profitable. Their promotion worldwide is one of the key aspects of the state’s foreign policy. Investors view Poland as a safe country due to the ease of doing business, the country's institutional, legal and political stability, and its active participation in the pan-European and international structures.

Poland is one of Europe's key economic hubs, making sustainable use of resources and is a strong industrial centre that not only ensures the stability of the labour market and the level of the economy, but also strengthens the country's security.

The technological leap is evident across many areas of life, and modern technologies are harnessed to ensure security in various operational domains of the state. The development and use of modern technologies are safeguarded by sustainable regulations and standards aimed to ensure privacy, cybersecurity and the prevention of abuse. Having at least basic digital competences has become common, and a significant proportion of the population has advanced digital competences. Building digital competence is an integral part of the education system for all age groups across society – from school children, through students and teachers to IT professionals.

The country's economy is resilient to shocks and crises, and its efficient data collection and analysis system enables early identification of opportunities and threats to development. The models of a circular economy and moderate economy are in place. The concerted effort of rural development stakeholders has made it possible to propel agriculture into a new era - the food system that is fair, healthy, environmentally friendly, ensuring animal welfare and resilient to crises, including those related to the long-term effects of climate change. The high quality of Polish food and implementation of the circular economy in agriculture enhance its competitiveness in the global market.

In the middle of the century, the country's energy system is stable and resilient to threats. Its security is ensured through the use of latest energy storage technologies and deployment of smart energy infrastructure. The system is based on a model of distributed, diversified zero-emission sources with a significant share of prosumer energy. This, combined with the country's relatively low energy intensity, especially in construction, has made energy clean, accessible and affordable. Transport and logistics have also been revolutionised. With a coherent and standardised infrastructure and the growing importance of sustainable mobility and smart solutions, the sector is now integrated, safe, zero-emission and adapted to the needs of both the population and the economy.

Concern for the environment and climate, along with responsibility and a robust institutional culture, sets the standard for public and private actors. Aided by the latest technologies and available data, decision-makers are accountable for the consequences of their decisions. Since social cohesion has become a priority, the entire society has the opportunity to benefit from the effects of green economic development.

PRESERVED NATURAL ENVIRONMENT

Proper protection of the country's ecological resources, which determine the health of people and ecosystems.

In line with the concept of environmental justice, the natural environment is of high quality and accessible to all residents and offers a range of ecosystem services. Natural capital is recognised as a critical resource and is integrated into development management processes. Thanks to a high level of environmental awareness, both decision-makers and citizens in Poland recognise the extent of ongoing, irreversible climate change and its

consequences and understand the importance of caring for the environment. Responsible use of the Earth's resources is widespread through the promotion of appropriate behaviour as well as environmental and climate education. Environmentally-friendly values and lifestyles have become prevalent throughout society.

Areas of natural value are protected effectively. The extent of protected areas, including those under strict protection, has been increased. The protection of wetlands, forest ecosystems and endangered species is specially supported. River renaturalisation, wetland and peatland reclamation and floodplain ecosystem rehabilitation programmes have been implemented. The coherence of the ecological corridor network is ensured.

Local communities living in areas of natural value support biodiversity conservation while benefiting from the sustainable use of natural resources.

Due to the deployment of new technologies in the energy, transport and construction sectors, along with sustainable urban mobility, air quality in Poland is very good.

Resource conservation and climate change mitigation have been achieved through the implementation of the circular economy, including the use of water-efficient technologies in sectors such as agriculture, industry and municipal services management. Food security is ensured by viable agricultural holdings. Pressure on soils and water has been reduced, and their high quality is protected consciously and responsibly.

Poland has become more resilient to the effects of climate change because of the consistent implementation of adaptation measures in various sectors and areas encompassed by the national adaptation strategy. Widespread urban greening to a satisfactory level has taken place, improving the living conditions in urban areas.

MODERN POLAND

Poland: resilient, democratic, supportive and secure in international alliances.

A fundamental shift in perception of development has enabled a move away from political and economic activities driven by short-term profits and immediate gains, and to focus on long-term goals aimed at fostering a happy life for residents, a sense of fulfilment, alongside green economic development that is socially, generationally and spatially responsible. The democratic system, based on human rights, the protection of fundamental freedoms, and the rule of law, enables citizens to participate actively and fully in the country’s development.

Poland enjoys military, food and energy security and is resilient to threats. It has a strong position in changing international alliances. Polish regions and metropolises are also recognised and competitive in both spatial and international relations. The sustainability of Poland's security is determined by cooperation within pan-European and transatlantic structures, bolstered by bilateral and macro-regional ties. In a world of changing international conditions and alliances, the country's security is also ensured by a professional, modern and multi-role army and an efficient civil defence system.

Poland's ability to cooperate, its solidarity, and active engagement in the fields of innovation, European security, and environmental protection have strengthened its role in international alliances. Thanks to the concentration of resources, effective institutional solutions, and the involvement of strong civil society organisations, Poland is internationally regarded as a reliable partner. The country's strong global position is additionally strengthened by a stable currency and sound public finances. This fosters long-term economic growth and is conducive to raising capital for the development of the country.

The country's international image is also strengthened by relying on the development of high culture in building the Polish reputation. Addressed both to the international audience and the country’s residents, these activities have brought a greater recognition to Poland and evoked a stronger sense of belonging and patriotism among Poles.

The efficient functioning of public institutions enables the support of residents and businesses without overburdening the state budget. Adequate sources of funding necessary for the modernisation of the state are provided. Smooth cooperation between the state government, local governments, and civil society organisations in developing and organising social partners that represent the interests of workers and employers has contributed to increased citizen loyalty and trust in the state.

The stability of institutions and law, combined with the ability to respond quickly to changing circumstances, is ensured by a professionally functioning administration.

The role of participatory democracy has increased. The involvement of citizens and NGOs in public life and informed electoral decision-making has increased significantly. Polish citizens are resilient to disinformation and populism, and they are aware of cyber threats. Electoral participation is widespread, and voter turnout is high.

COMMON SPACE

Well-planned and functional.

The country's development is shaped according to patterns that reflect the diverse characteristics of its territories. The socio-economic and spatial planning system takes these specificities into consideration, contributing to the generation of added value stemming from territorial potential.

The settlement network preserves the polycentric nature of the largest urban centres, complemented by a functionally connected group of sub-regional centres and complementary smaller urban centres. The polycentric settlement structure, balanced at the national scale, ensures sustainable development of all territories, both cities and their functional areas and rural areas. It also fosters the socio-economic cohesion of the whole country. Cities and their functional areas fulfil important economic and service functions, providing the residents with equal and efficient access to employment, healthcare, education, culture and other social and market services. The largest urban areas function as important university generating innovation, and as hubs where new technologies emerge through global cooperation networks. The processes of uncontrolled suburbanisation and anthropopressure on agricultural and naturally valuable areas have been curbed. Activities in urban functional areas, i.e. urbanised zones around large and medium-sized cities, are organised and regulated, which prevents spatial conflicts and enables rational land planning for the purposes of development, deployment of industrial and service facilities and environmental protection. Urban functional areas are important for improving access to a range of services in urbanised areas. Thanks to urban greening and proper rainwater and space management policies and the use of nature-based solutions, living conditions in urban areas have improved. Improved management quality and access to services in urban outskirts of cities, along with enhanced quality of the environment, have made urban areas more attractive to residents.

Polish towns and villages provide a friendly, safe and comfortable place to live. Regardless of location, residents can meet their reasonable and sustainable needs regarding access to public services, energy, Internet and communications networks, water, green spaces, and a high quality environment. With blue and green infrastructure systematically replenished and developed, these areas are resilient to climate change and foster human interaction.

Services are provided close to home or digitally, which reduces the need to travel long distances.

Rural areas are multifunctional. Potential sources of livelihood include agriculture, processing, agriculture-related services, local food production, renewable energy, eco-tourism, and unique crafts. The rural landscape has changed. Although its agricultural nature has largely been preserved, the increased agricultural productivity and efficiency has led to converting some agricultural land to other uses, thus contributing to climate protection.

Mobility has been made sustainable across the country through the deployment of well-developed zero-emission public transport infrastructure harmonised with roads for micro-mobility vehicles and pedestrians, particularly in urban areas. Efficient logistics, a convenient and low-cost public transport system, increasingly utilising autonomous vehicles, have significantly reduced individual car traffic, and in some cases eliminated, cars in city centres. A coherent and standardised transport network and modern technologies support also long-distance and regional transport. Transport exclusion has been tackled. A new systemic approach to spatial planning reduced spatial conflicts and also enabled the creation of functional and aesthetically appealing spaces.

A heightened sense of belonging and responsibility is evident, manifesting in greater care for public spaces and local communities.

SCENARIOS

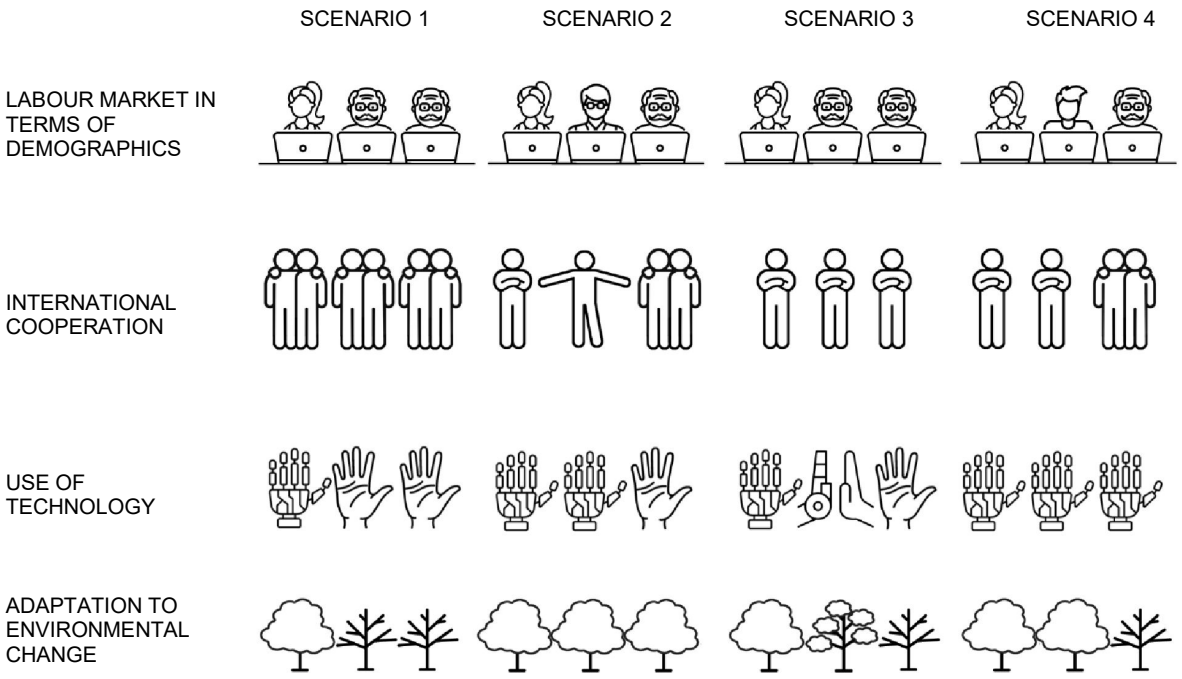
Understanding the future in the difficult and uncertain context currently faced by Poland requires identifying a number of different plausible scenarios and exploring what implications they may have.

This chapter presents a summary of four "forward-looking " scenarios. Their full versions can be found in Annex2.

The scenarios are intended to facilitate the understanding of how Poland's external environment (described in the boxes in each scenario) and the country itself may develop in the coming quarter century. The scenarios are (1) deliberately "fictional" - they do not contain predictions, but consist of sets of alternative futures in the form of snapshots or stories that provide an image of the future context; (2) probabilistic – they do not contemplate what will or should happen, only what might happen; they are "only" possible images of the future, necessary to inspire directions for public policy actions. The proposals contained in the scenarios should not be regarded as separable or target actions to be conducted by public administration. The intention behind the whole strategic foresight process carried out as part of the work on the NDC is to show possible action options that make sense in new circumstances and that either change or refresh our understanding of the present and the future.

The main differences between the four scenarios are presented on the figure 3.

Figure 3. Selected differences between scenarios



Source: own study.

POLAND IN A WORLD COMMITTED TO FURTHER GLOBALISATION

Poland operates in a world where automation and technology are developing, albeit at a rate insufficient to effectively support counteracting numerous negative aspects of the existing technological trends.

At the same time, high openness of societies positively affects cooperation in many areas. This makes it possible to either capitalise on the positive aspects of certain trends or to take action to prevent or counteract their negative consequences.

In Poland, increased competition with other countries for hard-to-reach technologies has forced a closer integration of science and business and the establishment of intensive cooperation with global high-tech corporations. These conditions have also prompted a wider use of strategic foresight in the administration and economy.

Moderate progress in automation and technology, as well as staff shortages due to the ageing population, have exacerbated problems on the Polish labour market. It was necessary to suplement the pension system with measures encouraging the voluntary extension of the retirement age, the operating rules and the privileges obtained. New working models adapted to the needs of people at the retirement age who wish to remain economically active have were put in place. The population ageing required also some changes concerning enhanced health promotion and disease prevention and the widest possible use of technological solutions to facilitate access to medical services and remote health monitoring. The silver economy developed rapidly. Furthermore, labour market shortages in a situation where it was necessary to compete with other countries for workersdirected the country's migration policy towards attracting specialists who represent deficit occupations and towards creating innovative solutions to make the settlement and adaptation process sufficiently attractive to them. That process was encouraged by the openness of the society. The growing labour market demand for the skills of the future influenced changes in the educational system, however, they were not radical.

A number of legislative solutions and investments in reliable sources of energy generation (nuclear power), storage and use of alternative energy sources (RES, hydrogen), as well as increased energy efficiency (also in transport), enabled the country to achieve energy security and a near-zero-emission condition in 2050.

However, it was not possible to inhibit progressive climate change. Nevertheless, openness and cooperation enabled increased efforts to improve the environment and prepare solutions for areas vulnerable to the effects of climate change. The desertification, steppe or flooding problems in certain areas specifically affected agriculture and increased the risk of food insecurity. Changes in agriculture focused on the use of solutions to increase efficiency and enable the production of new varieties in changing climate conditions. Mandatory clean transport zones were established in cities, coupled with the deployment of blue and green infrastructure.

The population inflow concentrated in large citiesmade it necessary to prevent urban sprawl. It was important to strengthen small and medium-sized cities as attractive places to work and live. Housing policy and better access to public services were essential in this regard. A package of basic services was introduced, transport accessibility was increased, and the territorial redistribution of income to residents of small and medium-sized towns was improved. A comprehensive analysis of the functioning of the local government was also carried out, followed by a reform leading to better distribution of competencies and strengthening the independence of the local government. The relationship between the state and corporations evolved towards more partnership-like relations, which encouraged a stronger corporate involvement in areas previously dominated by the state (e.g. the pension system, smart solutions in public services, active migration policy).

Poland is an active international player, earning the reputation of a responsible partner in international relations. It has played an important role in shaping the future of the European Union and creating solutions to ensure that NATO maintains its cohesion and is adapted to new threats.

Duo to the great openness of the world contributed to the increasing importance of virtual communities and their impact on various areas of socio-economic life. Measures were taken to prevent unethical behaviour in the virtual world. Tools were also developed to counteract disinformation, protect privacy, regulate AI rules, control algorithms and the related legal liability, and to ensure the security of transactions and communication.

POLAND IN A WORLD OF INTENSIVE USE OF TECHNOLOGY AND GRADUAL SOCIAL ATOMISATION

Poland operates in a high-tech world. An incredible level of automation and digitalisation, development of biotechnology and artificial intelligence, and transfer of activities to the virtual world are the main elements that describe the global reality.

In such a world, it has become possible to pursue more ambitious environmental activities and to better adapt to the effects of climate change. This has been fostered both by a willingness to cooperate and by technological advances that have enabled ground-breaking solutions and a large reduction of the adverse human impact on the environment. The openness of the society has facilitated the development of the best solutions that foster rapid development. Transhumanism and space conquest are no longer just ideas. The role of corporations has become more prominent and now they carry out a substantial part of the state tasks. Taxes charged on automation have allowed the introduction of a guaranteed basic income. The use of modern technologies, in particular artificial intelligence, has become widespread, albeit to a growing criticism from techno-sceptics, and the transfer of a substantial share of human life spheres to the virtual world has contributed to the deterioration in the quality of social bonds.

The development of technology triggered the need to strengthen the country's competitive advantages and to find solutions that allowed it to actively participate in the global race. Focus was placed on, among others, the start-up economy and profiling of technology activities (aerospace valley, astronautics, space utilisation). The impact of technological progress became apparent also in the army, with the introduction of more autonomous solutions and cyborgisation meant to be used in accordance with the ethics of war.

With advances in technology, the transfer of a large part of life to the virtual world (public services, leisure services, etc.) followed by the increased influence of corporations, it became crucial to regulate the development of artificial intelligence and to enhance the protection of the right to privacy. The debate on citizens' needs had led to a new social contract between the society, the state and corporations, but a risk of decreasing citizens' identification with the state emerged.

A new approach to education became the only possible solution to prepare the learners to live in a rapidly changing world. The education system, including adult learning, had been reformed with a focus on comprehensiveness, experimentation, individualised learning paths, teamwork and self-assessment and the development of social skills. In doing so, opportunities to develop digital hygiene skills were provided.

The inequalities in access to the latest technological advances (e.g. biotechnology) and the embodiment of the idea of transhumanism had led to greater social polarisation. It became necessary to provide support to those who found it difficult to grasp the new technological reality. A guaranteed basic income was introduced, providing income for the part of society that lost their jobs in a highly automated world. Its financing was possible through introduction of additional taxes (taxation of automation and luxury goods, corrective taxes). A system of targeted public investment has also been developed to tackle structural unemployment. Emphasis was also placed on developing a culture of lifelong learning, diversifying economic activity in areas at risk of structural unemployment and providing dedicated financial support to businesses and social economy actors. Progressive automation and technological advancement had positively translated into healthy life expectancy and provided a stimulus for making retirement options more flexible.

Innovative solutions became widely available to enable Poland to shift to a zero-emission energy system, which brought changes in all sectors of the economy (logistics, construction, agriculture, etc.). The pursuit of energy security resulted in legislative and investment solutions fostering the generation, storage and use of energy from alternative sources such as RES, distributed energy, as well as nuclear energy (including small modular reactors, the so-called SMRs) or fusion power. The awareness of the major impact of consumption on the natural environment, the availability of raw materials and the exploitation of space led to the development of a consensus and the introduction of a number of moderate economy solutions.

The polycentric layout of urban centres and the balanced development of the country were also been enhanced through preferential tax arrangements and financial incentives addressed to smaller towns. Following global trends, the concept of "smart cities" was also implemented. Significant resources were allocated to research and development to build strong university and new technology centres. The technological progress brought significant

changes to agriculture and the proportion of land use for growing crops and raising animals. New functions began to develop in rural areas (opening up to nature, ecosystem services, RES, etc.). Priority was given in all areas to low- and zero-emission public transport, as well as to the use of micromobility vehicles.

POLAND IN A WORLD OF SHORTAGES AND DISRUPTED SUPPLY CHAINS

Poland operates in a world of shortages characterised by difficulties in accessing raw materials, energy, technologies. There is no will to cooperate to find solutions to common problems is also missing. Differences are growing.

There are shortages of jobs in some places and shortages of labour force elsewhere. Emerging technological solutions are incompatible with one another due to limited cooperation between states, and energy prices are high due to the deficit of raw materials and increasing demand. Efforts to inhibit the growth of emissions and climate change have failed. Environmental degradation is rising. Conflicts over resources are increasing. The existing order based on the operation of international organisations fails to fulfil the function of reconciling the interests of different states. A shift away from globalisation towards local economies and local connections is taking place.

In the world of limited cooperation between countries, a deficit of technologies and raw materialsand where the need to ensure social and territorial cohesion of the state it has become necessary to accelerate building a moderate economy and a circular economy. Food security has become particularly important. Food waste prevention programmes were initiated, and support was provided to the development of regenerative agriculture. Water conservation and retention programmes were implemented. In addition, the emergency management system was reformed and oriented towards the management of food reserves in case of crop failure and energy supply in case of blackouts.

In order to ensure the greatest possible energy self-sufficiency, measures were taken to increase the use of domestic energy resources, improve energy efficiency, develop nuclear power and RES, increase the role of biogas, expand energy storage, increase the use of hydrogen and recover energy resources. In the 2030s, most of the buildings underwent deep and comprehensive thermo-modernisation. Peak-hour electricity consumption was also reduced by means of smart metering and new dynamic tariffs.

Furthermore, faced with shortages and the need to shorten supply chains and meet local needs, the state started to play an increasingly important role in the economy. Greater support was provided to Polish companies, including those in the innovation sector. A stronger focus on local solutions triggered the need of strengthening local structures – mechanisms were implemented to support local governments, e.g. through local currencies, climate bonds. At the same time, Poland made intensive efforts to ensure supranational recognition of national standards on which domestic solutions and technologies were based in order to maximise the already limited opportunities for Polish companies to operate on foreign markets. In a world dominated by shortages, education focused on developing the most necessary skills, i.e. creativity and collaboration. Teaching the care for resources, the natural environment and space also played an important role in education.

Universal climate and environmental education helped achieve a high level of public awareness and sensitivity and implement the sharing economy. Moreover, a decision was made to increase the space of protected areas, including through the establishment of new national parks. At the same time, mechanisms were put in place to support local communities through e.g. environmental subsidies for local government units and increased forest tax rates. Methods for valuation of ecosystem services were developed, and the services themselves were integrated into decision-making processes. New conservation regulations included, among others, increased protection of wetlands, natural floodplains and ecological corridors. A strong link between costs and consumption was established. A strategy for adapting the country to climate change has been prepared. The strategy coordinated adaptation measures in sectors and territories particularly vulnerable to climate change. Preferences were introduced for green investments, including projects aimed at increasing the RES share in the system and implementing sustainable public procurement. The programme for systematic elimination of low emissions was expanded significantly.

In the world of scarcity, deficits affected also space, especially space with high functional values. New attractive areas have been created through recycling of low-quality spaces with underdeveloped socio-economic functions. Focus was placed on better connections among local centres. An integrated and accessible public transport system was built and expanded in a manner that allowed it to substantially replace individual transport. A system of social housing for long-term rental, managed by local government units, was also developed.

Considering the ageing population, a number of measures were necessary to encourage people to stay in the labour market for as long as possible. Focus was placed on more extensive use of flexible arrangements - remote working, combining work with childcare and care for persons in need of support, health promotion and disease prevention also at the workplace, programmes supporting re-entry into the labour market and retraining. The migration policy has been focused on creating conditions for accepting individuals in professions where there is little interest among Polish citizens or a shortage of qualified personnel in highly specialized occupations, as well as supporting settlement processes aimed at social, cultural, and economic integration, in order to avoid the creation of separate enclaves.

In health care, an emphasis was put on health promotion and disease prevention, including increased education about diets tailored to life circumstances and planetary diets, as well as coordinated care and greater use of digital solutions, e.g. artificial intelligence and telemedicine, to make healthcare services more efficient and accessible.

The need for the state to be more involved in problem solving and development management led to the strengthening of a professional public administration, which became a competitive employer.

Increased socialisation of public decision-making has also been introduced (lawmaking, preparation of strategic documents) and the implementation of specific projects for local communities with stakeholder involvement, including deliberations, citizen panels and consultations. In parallel, the staffing of public administration (highly qualified specialists) was strengthened. Consequently, regulations were enacted to eliminate the assignment of public administration tasks to private entities.

Poland ensured the security of its citizens both in terms of both cybersecurity and public safety (creating appropriate institutional, financial and competence solutions) and access to raw materials. Information systems and the critical infrastructure of the state were developed through e.g. modernisation of the army based on domestic industry and weapon technologies.

POLAND IN A WORLD OF DRASTIC TECHNOLOGICAL, ECONOMIC AND SOCIAL DIFFERENCES

Poland operates in a world of great differences. Some regions of the world are "areas of prosperity" while others are "areas of poverty". The lack of global cooperation has made it impossible to solve many of the problems plaguing humanity, and international tensions constantly pose the risk of conflict escalation. "Areas of prosperity" and "areas of poverty" enter into alliances to satisfy their ad hoc interests. Technological progress benefits only "areas of prosperity" that strive for self-sufficiency and reduction of the length of their supply chains. Environmental costs and benefits are distributed unevenly. International organisations serve as a façade. States and corporations manipulate and strive to control citizens.

To prevent asymmetrical spatial development, Poland created compact, multifunctional local centres to meet the basic needs of the inhabitants. Spatial recycling and solutions to make forms of use more flexible were also applied. Less developed areas became specialised in leisure services, as the amount of leisure time increased due to the introduction of reduced working hours and a guaranteed basic income.

Concern for the quality of the environment led to wider promotion of environmental education and enhancements in the emergency management and civil protection system. The existing environmental resources were identified and brought under partial rationing schemes, with the most degraded assets subjected to restoration. Furthermore, the efforts of various actors responsible for climate change adaptation management in terms of drought prevention and flood risk minimisation were coordinated, including through the deployment of blue and green infrastructure and catchment management. Environmental costs became an integral part of the country’s development planning.

Research on plant proteins has spread and the results have been widely used, contributing to environmental and climate protection, improved human health and more efficient use of agricultural land.

The energy transformation was successfully implemented. The focus was placed on developing a system based on RES, nuclear power and greater energy efficiency.

Bridging social inequalities, including efforts to ensure that Poland's development is not "insular", became a strategic priority. A successful revolution in education has yielded results in the form of creative generations equipped with advanced and specialised digital skills and able to respond to the challenges of the labour market. A limit of working hours and the guaranteed basic income, financed from taxes on automation and proceeds from taxes on capital and luxury goods, were also introduced. Workers whose occupations had been replaced by automation were provided with support in the form of e.g. vocational retraining programmes and schemes designed to assist the creation of partnerships between companies developing in new sectors and education/training providers. At the same time, a system of incentives was put in place to retain specialists (particularly in the field of digital solutions) who live in the country and encourage those who live abroad to return to Poland.

The widespread use of digital solutions also enabled integration of health and social care systems, including, in particular, in the area of long-term care within both sectors, as well as other healthcare services and social and welfare benefits. This had a significant impact on the effectiveness of measures oriented towards bridging social disparities. At the same time, the pension system was reformed. Transfers for privileged groups were eliminated and the system was redesigned to allow people to stay in the labour market for as long as possible.

To improve the healthcare system, successful efforts were made to promote wide use of AI-based solutions, humanoid robots, robot nurses and technological solutions designed to restore mobility for patients with disabilities (e.g. prosthetic limbs and exoskeletons). In view of the increasingly strong consequences of growing social isolation, a reform of the psychological and psychiatric support system for people in crisis was undertaken and preventive measures were introduced.

With the high level of automation, the demographic gap was no longer a big problem and it was therefore decided to apply a selective migration policy. Based on indicators of talent attractiveness in the context of the Polish economy, the policy was targeted at attracting highly qualified specialists, entrepreneurs and active investors..

In order to increase the country's energy potential, Poland initiated a programme of reforms within the EU whose main objectives included, among others, coordination of Member State activities in the field of space exploration and the extraction of raw materials from space and the ocean floor. At the same time, a focus was placed on bilateral alliances that safeguarded the country against a potential deterioration of relations with the allies that supported Poland's raw material security. Cybersecurity was recognised as a priority in the world of such a dynamic technological progress. Regulations were put in place to ensure transparency of algorithms, ethical design of educational content and security of user data. Other regulations were implemented to preserve individual privacy and personal freedom to the greatest extent possible.

Public security was ensured by creating a modern army in accordance with the guidelines set by of security organisations. Artificial intelligence started to be used for crime prevention and security monitoring, including by means of drones and robots patrolling the streets.

Following budget cuts, public administration was reduced to a small group of highly specialised civil servants who, supported by advanced AI-based technologies, would successfully fulfil their public mission by developing strategic and operational plans to be subsequently implemented by external actors.

CHALLENGES

In the context of modern civilisational aspirations, one can assume that the task of public policies is to enhance the quality of life of the society as a whole and of each individual citizen. To avoid being swept away by the trends and instead influence their course, it is necessary to have a vision of Poland that the current generations want to pass on to their successors and a strategic perspective and the courage to transform deeply (challenges). With this in mind, challenges have been developed on the basis of the following assumptions: (1) they are determined by a vision of the ideal country in 2050, (2) they are crucial for Poland's future in the 2050 perspective (therefore, they extend beyond current problems and issues), (3) they arise from previously identified long-term trends taking place in the world, in Europe and in the country, (4) they take into account possible future development trajectories of the world and Poland (scenarios), (5) they refer to the issues that require action in the area of public policies (however, they are not detailed action plans – it is intentional that they do not refer to the necessary legislative processes, institutional procedures or specific policy change proposals), (6) their implementation may lead to various changes in the spatial organisation, including its functions and landscape.

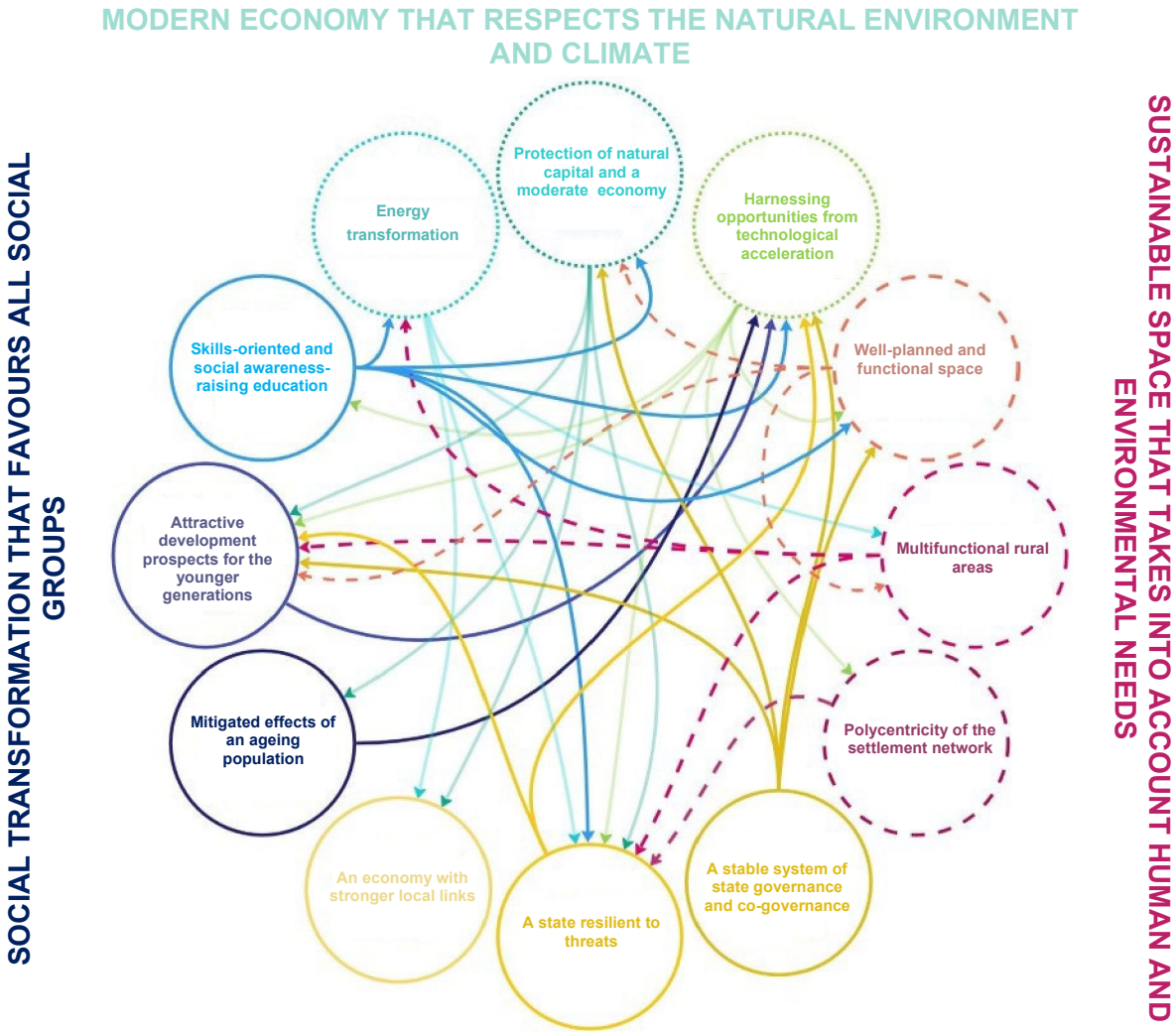
In order to make Poland a prosperous country that takes advantage of opportunities, mitigates risks and is resilient to various negative phenomena that may occur in the future, the institutions responsible for the country's development (at central, regional and local levels) and civil society face the following four challenges: (1) Social transformation that favours all social groups, (2) Modern economy that respects the natural environment and climate, (3) Resilient State with a strong position in Europe and worldwide, (4) Sustainable space that takes into account human and environmental needs.

The challenges identified in the course of work on the National Development Concept, as well as the transformative approach to addressing them within the framework of national development management, are consistent and coherent with the EU’s approach. The European Commission identifies three transformations as key to the future of Europe: innovation (accelerating innovation and finding new drivers of development), energy and decarbonisation (reducing energy prices, continuing decarbonisation and transitioning to a circular economy) and security (enhancing Europe’s independence in ensuring security and defence in an increasingly unstable geopolitical environment) (Draghi 2024)

The descriptions of the challenges are concluded with vulnerability or resilience maps that summarise the issues described under each challenge. The maps are results of the survey carried out during the work on the NDC. The survey took into account objective and available municipal indicators relevant to the individual topics. The maps show the vulnerability of the territories in social, economic and environmental terms, and the differences in the resilience of the European Union states. The image of Poland's space in its various dimensions should be treated as a diagnosis of the current status for each of these dimensions, a source of data for regional and local government policies and a starting point for further territorial approach to the development policy. The maps are not evaluative or intended to rank individual territories. Rather than that, they are meant to show the multidimensional situation of municipalities which may show different levels of resilience and vulnerability in various dimensions. The description of the methodology, list of indicators and data sources can be found in Annex 3.

Examples of potential spatial impacts resulting from the challenges are also provided at the end of each challenge.

Figure 4. Links among the identified challenges



Source: own study

SOCIAL TRANSFORMATION THAT FAVOURS ALL SOCIAL GROUPS

The current technological acceleration and its implications for all spheres of human life (e.g. ways of acquiring knowledge, forms of work or leisure, social relations and inequalities) as well as changes in geopolitical conditions and the natural environment are triggering civilisational change (see Trend: Transformation of the global order). Various areas must be transformed to ensure that the social transformation underway is beneficial to all social groups.

In the first place, key changes are required in education, as it is of fundamental importance for the future and for many aspects of socio-economic life (see Trend: Developing demand for new forms and fields of learning).

Current transformations carry serious consequences also for the future and health of the human being as an individual and as a member of a local, family or work community. It is necessary to reformulate the existing labour market models, migration policy, housing, pro-natalist and pro-family policies, health care (physical and mental) and the pension system (see Trends: Demographic uncertainty, increasingly nomadic world, Increasing social inequalities).

Skill-oriented and social awareness-raising education

A good primary and secondary education system is one that shapes the core values and attitudes, and flexibly adapts to the society's current and future needs, thus helping learners prepare for a happy and fulfilled life, including a working life, as well as for life in a global world and international environment. It is therefore necessary to fundamentally transform the education system so that it fully helps the young generations to adapt to the rapid transformations of the world and to the various spheres of their lives (social relations, family, work and career, health, personal development, social activities, creative activities, leisure, health and relations with nature). These changes are needed both in terms of the teaching content, the teaching staff and the way the education system operates.

Today’s young people will change professions many times throughout their adult lives because in the age of automation, robotisation and extended use of artificial intelligence many industries or professions will have a shorter life than the entire professional activity of a man. To enable the younger generations to effectively face such circumstances, the education system should put emphasis on equipping learners with key skills and competencies as well as the competencies of the future. From today’s perspective, these include digital competencies, STEM, virtual literacy, complex problem solving, integration and critical analysis of information and data, cognitive flexibility, communication and collaboration, financial education, security, negotiations, creativity. The ability to use or create technologies safely is and will continue to be one of the factors for success in the labour market and in society. Therefore, it should already be an elementary ability, just like literacy. On the one hand, these competencies are needed so that today's young people and the next generations are not digitally excluded or can develop their desired digital talents. On the other hand, they must be aware of the dangers of manipulation and the violation of their fundamental rights and have the ability to interpret the world individually and to be able to balance the use of digital technologies for career development and their negative impact on mental and physical health.. Furthermore, in order to enable the present and future young generations to function efficiently in a transformed society with a high risk of weakening the quality of social and family ties, they need an educational system that is focused on the development of their emotional intelligence and social competence skills (understanding and managing emotions, self-motivation, empathy, trust, tolerance, dealing with criticism, accepting failure, openness to new challenges, creating bonds, conflict resolution skills, arguing one's case, communicating effectively, common good orientation). Learning by doing will also be important. It is also important to foster their ability and willingness to build contacts with other people so that they are able to engage voluntarily, are educationally mobile and feel the need for intercultural and intergenerational solidarity and understanding. The attitude of social and civic activism should be shaped from an early age. The educational system should instil in young people the courage to actively respond to the reality by, among other things, organising themselves or becoming involved in the existing organisations. The

system should also foster conditions for the development of social capital, notably as regards building mutual trust with other members of the local community. Strengthened social capital, understood as social trust, solidarity and civic activity, is the foundation for successful both economic and social transformation. It will be important to introduce special school and extracurricular programmes that promote openness and tolerance and support multiculturalism and integration of young people from different backgrounds and countries. This process can be supported by establishing and developing cooperation among schools and local NGOs, the cooperative sector and social economy actors.

The education of children and young people should also be based on the culture of supporting the development of individual talents, aspirations and passions, as well as experimentation (rather than just bridging the deficits). Teaching staff should acquire skills similar to those of mentors or coaches, sharing their knowledge and experience with learners and stimulating their pupils to continuously acquire knowledge and skills. This process of change should be supported by the automation of some of the teachers‘ tasks, e.g. the individualisation of learning, the monitoring of students’ progress or the grading of work. Teachers should become coordinators of the educational process and not just lecturers. It will also be important to develop safe student-teacher and student-student relationships based on trust, respect, partnership, communication and cooperation.

In the context of the demands presented above, the challenges faced by the teaching staff and the education system as a whole are immense. The system should enable teachers to adapt to teaching new content in line with contemporary requirements. They must have the adequate conditions to enhance the quality and promotion of innovative forms of teaching and learning. It is important for teachers to use new teaching technologies (especially those related to distance learning and, in a less formal way, technologies such as virtual reality, simulations and e-learning platforms while and targeting both "traditional" professions and modern technologies such as artificial intelligence, robotics or the blockchain technology). Accordingly, teachers should be adequately remunerated and motivated to continuously improve their competencies and skills. The teaching profession should enjoy a high level of public trust and recruitment should be based on positive selection.

Given the challenges faced by the society in connection with the accelerated transformation of the world and the consequences for the future of the planet, the function of public awareness raising comes as another aspect that needs to be strengthened across the education system. Raising social awareness based on universal values such as respect, responsibility, honesty, solidarity and social sensitivity should be just as important as training in the aforementioned skills of the future. For the future of the present and next generations to be at least acceptable, the ability to care for health, resources, the environment and space, as well as knowledge of these issues, should be passed on to children from an early age. It will involve continuous work on raising the environmental sensitivity through environmental, nature, environmental and climate education programmes in order to implement a moderate economy based on, among others, reduction of excessive consumption, reduction of the carbon footprint, climate-friendly attitudes, sustainable animal breeding, prevention of food waste, change in dietary habits and a greater use of local products (see Challenge: *Modern economy that respects the environment and the climate*). At the same time, it is worth encouraging physical activity, including that associated with the choice of zero-emission forms of transport (e.g. cycling). Such measures will, in the long term, have a positive impact on the environment and human well-being and generate savings for the healthcare system. It is equally important to build awareness of the new technologies both in terms of the benefits they bring and the risks they entail, especially in the area of fundamental rights and democracy (see Challenge: *Harnessing opportunities from technological acceleration*). A change in the perception of space, especially with regard to its role as a common, albeit limited, good (see Challenge: *Sustainable space that takes into account human and environmental needs*) is just as essential. Reversing the adverse spatial changes requires raising the status of space in the public consciousness to that of a common good, i.e. the public interest that is more important than personal gains. There is a need for abandoning the false perception of freedom when the freedom and well-being of others are infringed.

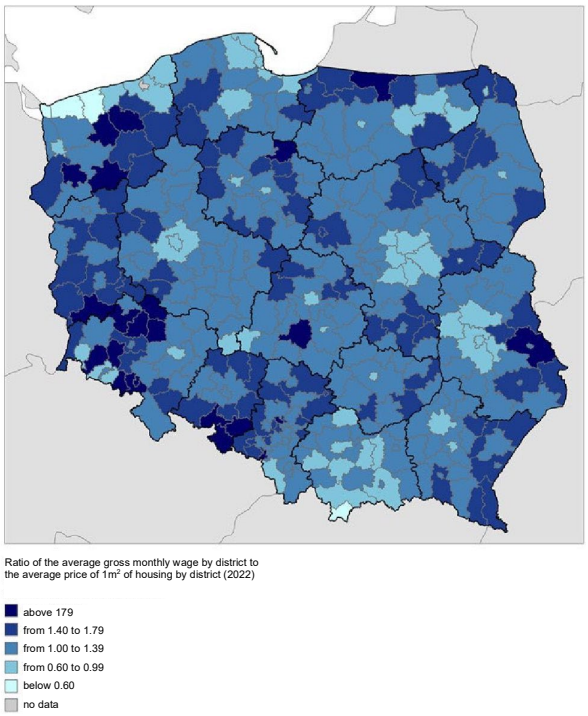
Building public awareness is not limited only to the youngest. It should extend beyond education to programmes tailored for different social and age groups, so that the largest possible section the population (including decision-makers) is aware of the phenomena and issues that have a significant impact on the future of local communities, the country or the globe, and so that everyday behaviour as well as individual and institutional decisions could be informed and ethical.

Attractive development prospects for younger generations

Young people are creative, focused on individual development and independence, and want to know everything immediately (the nanosecond culture). They are fluent in the virtual world and have an intuitive ability to operate applications and use data. They have high self-confidence and high expectations. They are enterprising and not afraid of taking risks. They expect their working and private lives to form a complementary whole. They change their place of employment frequently and wish to travel. They are focused on rapid development that makes use of modern technologies. They find it very important to have the opportunity to work remotely and, in addition, in an international environment, with job stability and the possibility to develop by carrying out interesting projects. In summary, the ambitions of younger generations are huge as they go in line with the social and technological transformation that is taking place now.

Some of the young people do not see any development prospects in the country and choose to emigrate, which will change the age structure in the country all the more. From their point of view, the country's higher education system does not have an attractive offer compared to education centres abroad. The availability of housing - as a means to lead an independent, self-reliant life, to start a family life and as a tool for satisfying their basic needs, including the need for security - is low. Housing has become a luxury good, not a right. Its availability depends largely on wages and market prices, which vary considerably across the country (Map 1). The problem is particularly evident in big cities, where most people are streaming in, as cities offer better access to quality education and other public services, as well as attractive jobs.

Map 1: Ratio of the average wage to the average price of 1m^2 of housing[2]

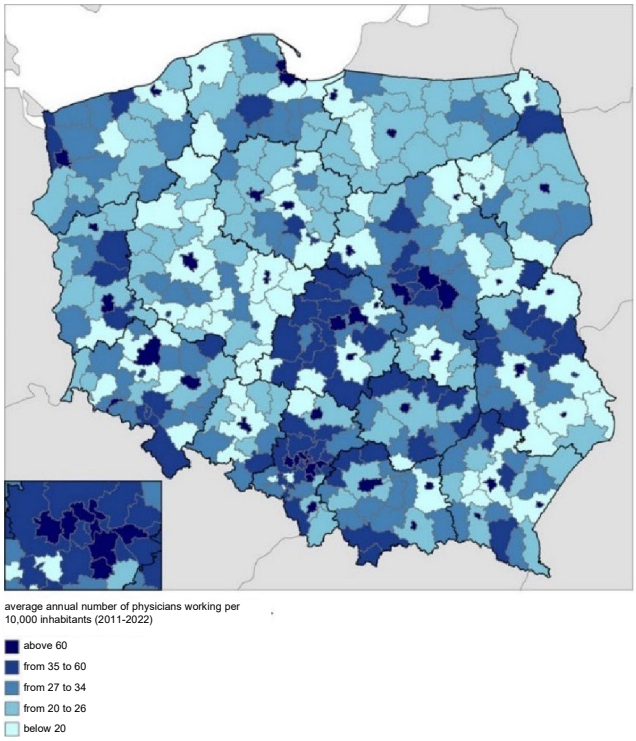


Source of data: own study based on Statistics Poland (GUS) data

Furthermore, the existing work models do not match young people's expectations or ways of pursuing a personal development path. Young people believe that the prospects for safe parenthood are not encouraging. The same applies to the quality and availability of healthcare services, which varies greatly across the country (Map 2).

[2] The data for the district of Skierniewice and the city of Jastrzębie-Zdrój is for 2021 (no data available for 2022)

Map 2: Number of physicians working per 10,000 population (2022)[3]



Source of data: own study based on Statistics Poland (GUS) data

The state's housing policy should offer a choice between ownership of a dwelling and secure rental so that access to affordable housing with decent living conditions is guaranteed as a fundamental human right. This requires planning and taking systemic measures to improve the housing situation in Poland, in particular for the economically disadvantaged. It is necessary to adapt the stock and availability of housing for rent or purchase, taking into account demographic trends and pronatalist and migration policies. It is important that the construction of the housing stock is compliant with the principles of spatial order, universal design and takes into account energy and water conservation. For new construction, it is also necessary to include blue-green infrastructure in the design, with environmental and social benefits. At the same time, the state should have a strong influence on the rules of the housing sector and the ability to limit and prevent the negative effects of free market mechanisms. This is important given the concentration of ownership of the housing stock in the hands of entities that are not its actual users. The resulting speculation and overpricing of properties, which in consequence significantly reduces their availability, must be reduced. The state should also become involved where the free market does not provide the adequate supply of housing stock – social and communal housing in particular needs to be developed and supported. The process of creating accessible housing stock should also take into account vacancies and unused office buildings, in the development of which social economy actors should play an important role, as well as locations within a city or functional area. Within the process of upgrading and adapting such properties to the needs of families, consideration must be given to seniors and people with disabilities. It is also important to apply a housing standard that will include architectural accessibility, low emission and energy efficiency as well as availability of goods and services and opportunities to participate in social and public life.

To keep young people in the country, it is also necessary to intensify efforts aimed at creating conditions for educational and professional development. There is a need to invest in modern educational programs that are tailored to the demands of the labour market (see Challenge: Skill-oriented and social awareness-raising education) and to develop cooperation between universities and industry to facilitate young people in acquiring practical skills. At the same time, it is essential to develop support programs for young entrepreneurs, which include access to affordable financing, mentoring, and infrastructure (start-ups, technology parks). Equally important are programs that enable gaining professional experience abroad, while ensuring attractive conditions for returning to the country and promoting flexible forms of employment, such as remote work, which allows for balancing professional and personal life. It will also be crucial to invest in the development of modern healthcare, including the digitalisation of

[3] No data available for 2012

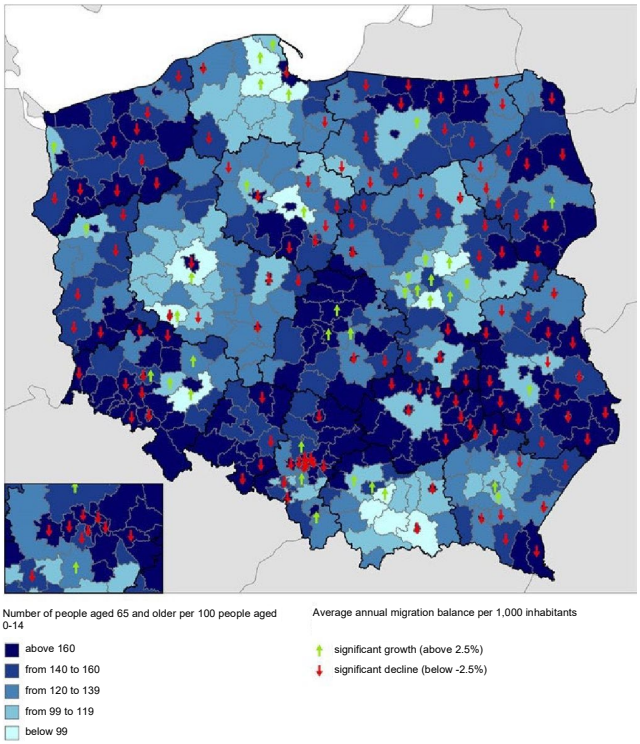
the system and increasing the number of specialists, as well as the development of psychological support services and programs for health promotion and disease prevention. The young generation is a social group that carries and is most strongly affected by the transfer of various spheres of life to the virtual world, which can bring social atomisation, degraded quality of social ties as well as mental and physical health problems. It is therefore important that, on the one hand, young people are equipped with the skills to adapt to the changing social norms (including, in particular, changing neighbourhood/community and intergenerational relations, which are likely to shift towards greater isolation) and, on the other hand, have the capacity to take care of their mental and physical health as well as family, friendship, social ties. An anticipatory change in various support systems and the promotion of the development of culture and sport is therefore needed, so that admiring cultural property and practising sports take place primarily in the real world rather than in the virtual world. In this context, the development of cultural projects (addressed to different target groups) is very important for the well-being of non-urban areas, small towns and rural communities. It will also be just as important to promote the participation of young people in civic and democratic life. Addressing these challenges will only be possible if the development policy has a strong pro-social orientation. The development process, based on the universal use of technologies, must put people at the centre and consistently emphasise their empowerment. Following the ongoing social transformation, all future reforms in the areas of education (see Challenge: Skill-oriented and awareness-raising education), health care (see Challenge: Mitigating the effects of the ageing population), housing and the labour market (see Challenge: Harnessing opportunities from technological acceleration) must also take into account the perspective and expectations of the current and next generations in order to offer them attractive prospects for living in the country or encourage them to return from abroad. This task should be undertaken by public institutions and employers alike.

Mitigating the effects of the ageing population

The rising median age, declining fertility rates, shrinking working age population and declining overall population growth are currently the main demographic trends across the EU, including Poland. In a worst-case demographic scenario, Poland could lose 7.5 million people over the next 25 years. This decline means not only a smaller population, but also a significant ageing of the population. Both phenomena will negatively affect welfare, labour markets, productivity, public debt, the pension system, healthcare and social transfers, as well as construction, the availability of public spaces and transport. It also leads to labour shortages, a decline in economic dynamism and innovation. In order to counteract this, it is necessary to develop long-term public policies, especially pro-natalist, pro-family, labour activation, health, migration and also education policies.

Map 3: The old-age dependency ratio[4] in Poland in 2024[5] and the dynamics of the migration balance in 2014-2024

[4] Number of people aged 65 and older per 100 people aged 0-14.
[5] No migration balance data available for 2015

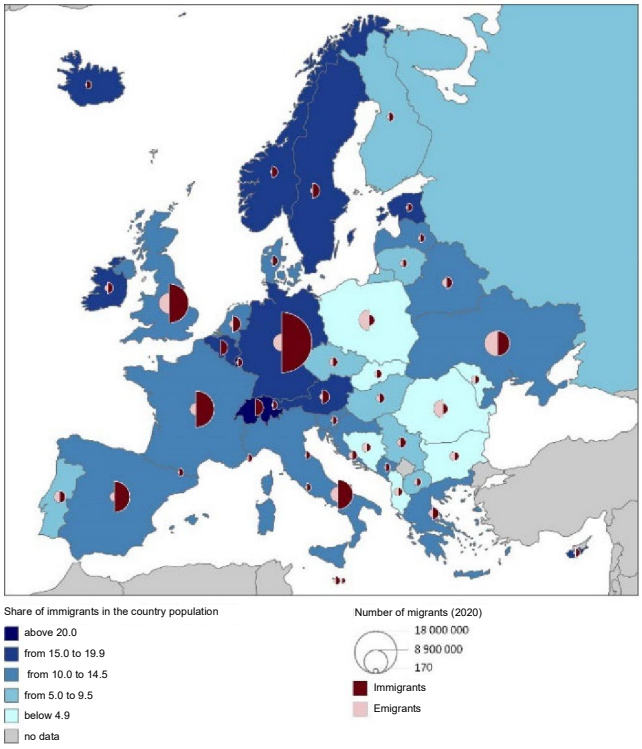


Source of data: own study based on Statistics Poland Local Data Bank (BDL GUS) data

In addition to a comprehensive pro-natalist and pro-family policy that takes into account various aspects of social, economic and cultural life (i.e. activities in the areas of benefits and financial support, creation and provision of infrastructure for institutional care of a young child, education, including as regards parenthood and healthy lifestyle, flexible working conditions, housing support, health care, gender equality, friendly parental leaves, psychological and care support), it is required to have a well-thought-out migration policy that supports the integration and settlement processes of foreign nationals, closely aligned with labor market needs and social expectations (Map 4).

One aspect that needs to be addressed in the context of the ageing population is thus a socially and politically agreed migration doctrine oriented towards filling the gap caused by the shortage of human resources in key sectors of the economy and in deficit occupations, which will take into account the issue of social and cultural inclusion. Organisational efforts in public policies should focus on long-term integration. Public institutions and regulations concerning legalisation of residence, labour market, social security, health care, integration and education system should therefore be adequately prepared to encourage the settlement and integration of migrants closely linked to labor market shortages. Moreover, the migration policy should address such areas as citizenship and repatriation, contact with the diaspora, border protection and asylum policy. It will be particularly important to create room for the involvement of immigrants in the social and civic life of the country through NGOs, community initiatives and volunteering. Maintaining a stable share of the immigrant population in the total population is strategically important in order to maintain proper relations in the society and mitigate negative effects on public order.

Map 4: The volume of foreign migration and the share of immigrants in the population of European countries in 2024.



Source of data: own study based on UN data

In view of the continuing decline in the working-age population and the shortage of human resources, attention must be paid to the low working participation of certain social groups. It is therefore becoming necessary to improve labour market participation across all age and social groups. New schemes are needed to motivate people to enter the labour market and to support them in staying there for a longer in their lives, and to accompany them in acquiring skills and competencies in a constantly changing working environment. In this respect, it is necessary to develop and exploit the potential of, among others, the social economy sector where older people can continue to work under conditions that are tailored to their needs, and can actively participate in the life of their local communities. An important part of resolving this problem involves also the transformation of the social benefit system so that it does not demotivate people from employment. In parallel, changes are needed in the system of benefits and care services for those in need of support, and in the area of the promotion of egalitarian, economically active parenting in line with the family life phases.

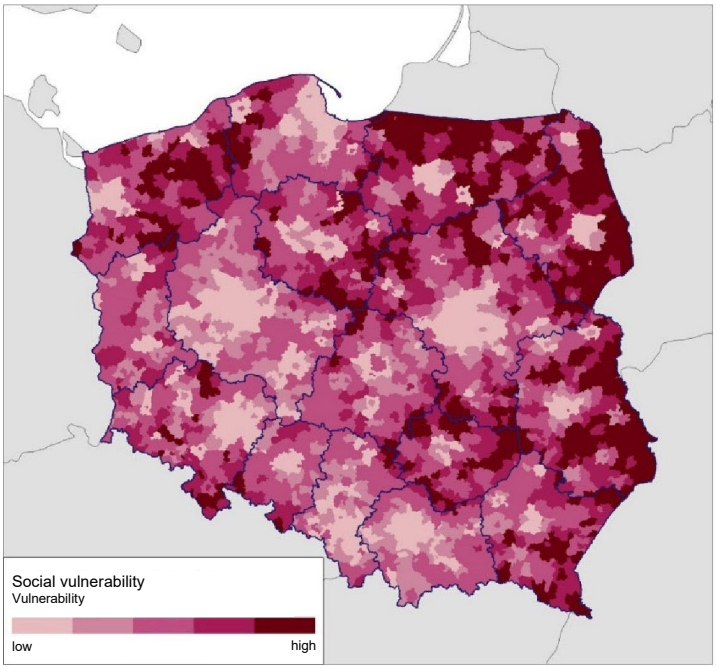
The pension system needs to be remodelled for the same reasons. It should comprise emerging new models of work (i.e. types of work other than permanent, full-time employment), promote longer working lives and offer stable, secure and non-public tools for accumulating capital for retirement.

In parallel, it is necessary to include promotion of active and healthy ageing in all policies, and to ensure access to the necessary support for seniors and their families. The elderly generation (60+), including the growing number of senior citizens (80+) and very senior citizens (90+), should have good access to tailored public spaces, education and health care services and the possibility of using leisure or 24-hour care facilities when support at home is insufficient. It is crucial for the process of development and de-institutionalisation of social services to engage social economy entities, which, by being locally based, can respond well to the needs of the community of people benefiting from the support.

Furthermore, it will be important to dynamically develop the services of the silver economy and to ensure that its offer is broadly accessible (not only for wealthy older people) and enables them to participate in social life as actively as possible. Efforts must be made to exploit the potential of automation and robotisation in the care for seniors and people with disabilities, and to make the education system open to developing the competencies needed in care professions. Furthermore, harnessing the dynamic development of modern medicine through new technologies is an important part of promoting healthy lifestyles. Fundamental changes are therefore needed in, among others, the health care system - including health promotion and disease prevention, diagnosis, treatment and rehabilitation, as well as R&D (see Challenge: *Harnessing opportunities from technological acceleration*). Cross-sectoral coordination of activities aimed at meeting the needs of the elderly and their relatives is also important. It will be

essential to create a safe environment for remote diagnosis and treatment. This will contribute to a significant improvement in the accessibility of primary healthcare, especially in peripheral or depopulated areas, as well as to reducing the need to travel long distances. Another crucial element is the issue of the accessibility of the rapidly developing the human enhancement technologies (HETs) aimed at enabling people with disabilities to operate beyond their limitations (e.g. bionic implants, exoskeletons). The attention of public policies should be directed towards developing this aspect of HET and ensuring its accessibility to the widest possible range of patients, so that the development of this technology does not exacerbate social inequalities. At the same time, changes in lifestyles, excessive exposure to social media and digital distribution of information, as well as increasingly dynamic changes in the working environment that contribute to the rise in the number of people with addictions, social isolation, depression and other types of crises, are triggering the need to improve the quality and accessibility of psychological and psychiatric support. Given the growing mental health challenges and their social and economic implications, mental health should become a major public health issue. It is becoming essential to develop effective policies that result in better access to adequate and effective disease prevention, high-quality and affordable psychiatric and psychological healthcare and treatment, and social reintegration programmes. No less important will be measures to reduce the availability of addictive products and substances.

Map 5: Social vulnerability



Source of data: own study based on Statistics Poland (GUS) data

The social vulnerability map (Map 5) presents a synthetic indicator that takes into the data on demographics (birth rate, migration and old-age dependency), poverty, unemployment, educational level and salaries. At the national level, the lowest sensitivity (the lowest vulnerability to changing conditions) is found mostly in the functional areas of the largest cities. In contrast, the most sensitive areas are those situated along the EU's external border, voivodeship boundaries and those most distant from large urban centres.

From the spatial perspective, examples of the potential effects of actions implementing the social transformation challenges will include:

- multifunctional space offering greater flexibility of use, e.g. buildings combining educational functions (e.g. laboratories and workrooms) and social functions for mental and physical health (e.g. spaces which encourage social integration, sport, recreation),
- recycling of lesser-used spaces (dormitories, schools in locations affected by demographic decline, university town centres) in connection with the observed depopulation or the trend of transferring various areas of life, including education, to the virtual sphere (e.g. remote learning),
- a greater emphasis in development planning on the creation of high-speed data transmission infrastructure,

- a change in the spatial accessibility criteria for services so that they are concentrated in close proximity (resident services calculated on the basis of new accessibility or distance parameters),
- development of the housing stock (construction of dwellings, adaptation of vacancies, revitalisation of the existing housing stock, adaptation of residential buildings to the needs of the elderly),
- development of social infrastructure to provide support services and organise activities for older people and people with special needs,
- adaptation of the technical infrastructure in connection with the development of remote working and remote services, including medical services, where accessibility and security will be of key importance,
- development of green spaces with expanded recreational offering and good quality environmental components,
- development of social infrastructure to provide support services and organise activities for older people.

With the increasing digitalisation, automation and robotisation of all areas of human life, the development and good quality of life are hinged on preparation for the current and future technological changes, i.e. the ability to make good use of the opportunities arising from these changes and to install efficient safeguards against their potential negative consequences (see Trends: Progressive digitalisation of the economy, Increasing automation of work and flexibility of employment, Increasing popularity of the Internet of Things and increasingly powerful artificial intelligence, Intensifying competition in the area of innovation). New solutions in the labour market, revised professional competencies and change management in business, fiscal system and cybersecurity (see Challenge: State resilient to threats) are becoming necessary.

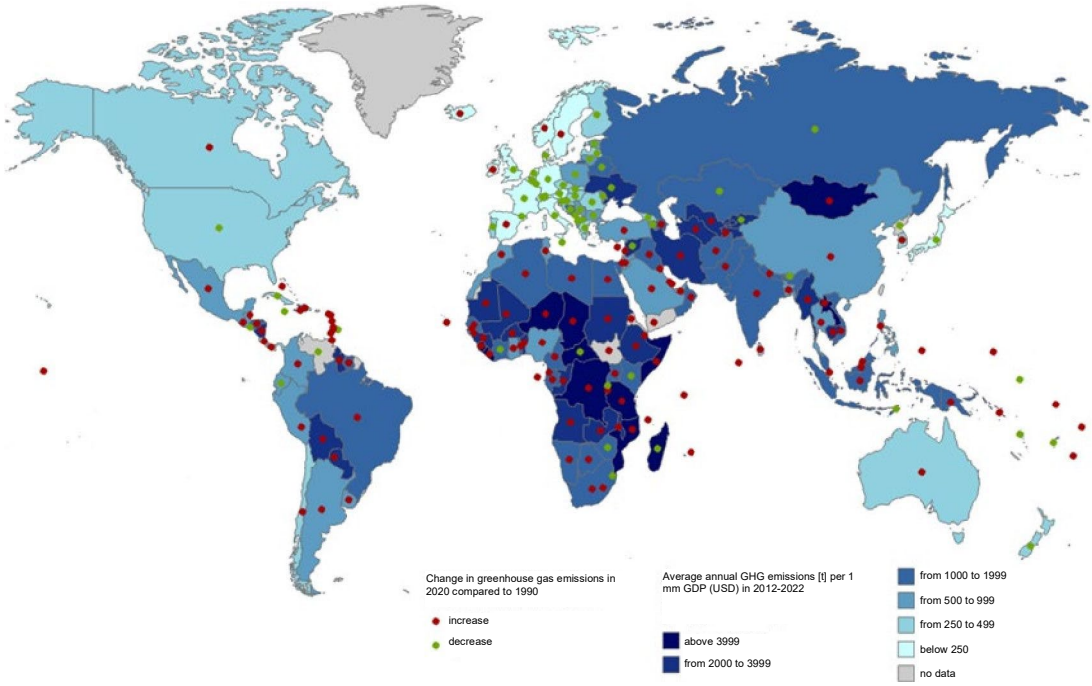
At the same time, the growing pace of environmental change, including climate change, is observed around the world, across Europe and in Poland. Citizens of the world are leaving a growing ecological debt to future generations. The cascading effects of anthropogenic climate change and the progressive development of civilisation based on consumerist, material- and energy-intensive patterns pose a significant threat to the stability of the entire natural environment and the existence of humanity. In many regions of the world, environmental changes are adversely affecting people's living conditions and economic activities, especially in agriculture. Human activity must be adapted to the changing circumstances. For the planet to remain habitable, it must be recognised that the natural capital is of fundamental value and a change in development patterns is imperative. The world can no longer rely on unconstrained growth because the Earth's resources are finite and some of the current processes are irreversible. The key issues are therefore: the energy transformation and the reduction of resource consumption (natural, energy, production, consumer resources) within a moderate and circular economy, as well as the restoration of natural resources (see Trends: Progressive transformation of the Earth's climate system, Increasing degradation of the natural environment, Declining biodiversity, Unsustainable use of raw materials and waste management, Energy transformation, Transformation of agriculture due to climate change, technological change and new consumption patterns). Sustainable development of the transport system with a high share of branches considered environmentally friendly will also be required.

Energy transformation

Energy transformation is a prerequisite for Poland's development, ensuring a high quality of life to its population and tackling the economic challenges. At the same time, directions of the energy policy development are central to the protection of the climate, natural environment and human health.

A key challenge is to strive towards climate neutrality. Climate objectives must be tied to economic objectives so that the security and competitiveness of the Polish economy is ensured and sustainable development is assisted. Energy reforms must systemically address all sectors of the economy. It is needed to step up the reduction of greenhouse gas emissions (Map 6) by changing the structure of energy generation through decentralisation and diversification of generation sources based on sustainable use of largely renewable resources. This will require renewable and alternative energy sources in the energy mix, including RES (e.g. wind farms, photovoltaic installations), the use of biomass, hydrogen and nuclear energy. At the same time, reducing the energy sector's emissions should not be an end in itself, and with all the changes implemented, it is crucial to maintain and ensure the future stability of the energy supply.

Map 6: Change in greenhouse gas emissions [t] per 1 million GDP [USD] globally in 2022.[6]



Source of data: own study based on UN data and Our World in Data portal

Changes in the energy sector carry a number of social and economic consequences. It is important to maintain the competitiveness of the national economy and the stability of revenues to ensure that transformation activities can be financed. The process must essentially engage the regions that have been the foundation of the country's energy security. In order to develop, these regions require a systemic support based on the assumptions of *Just Transition* as a pillar of the *European Green Deal* strategy and future pan-European arrangements in this area. Particularly important will be specific actions to support the most vulnerable groups in society who may need help to adapt to change, especially in terms of the energy sources they use and mobility.

The energy transformation also requires increasing energy efficiency, energy savings in all sectors of the economy and human activity and enhancing the resilience of the energy sector to climate change (see Challenge: *A state resilient to threats*). It is therefore necessary to modernise the energy system and to make greater use of the constantly evolving modern, smart technologies for the generation, transmission, distribution and storage of energy. It is critical to build a new structure of the energy market components (taking into account Poland's participation in the international energy market) that will induce a shift away from centralised large-scale fossil-based energy and bring the sector closer to the European model (Chart 1 and Chart 2).

Another important direction of change is support for civic energy based on the model of development of energy democracy that is independent of large power generation units. Here, it will be of particular relevance to establish local structures focused on cooperation and mutual satisfaction of energy needs, e.g. energy cooperatives or other forms of social economy. This is a territorial model that builds on local resources, and local energy production and self-consumption (distributed and prosumer energy) are indeed more efficient and contribute to the strengthening of the local economy (see Challenge: An economy with stronger local connections). The development of such energy generation will also contribute to the eradication of energy poverty and will be part of the implementation of a human right of access to energy. These measures should be accompanied by improvements in energy efficiency of buildings, ideally in a comprehensive renovation formula.

[6] For countries: Afghanistan, Bhutan, Lebanon, Liechtenstein, Palau, Tonga data is available until 2021, for Cuba data is available until 2020.

Chart 1. Structure of electricity production by main energy source in the EU in 1992-2022

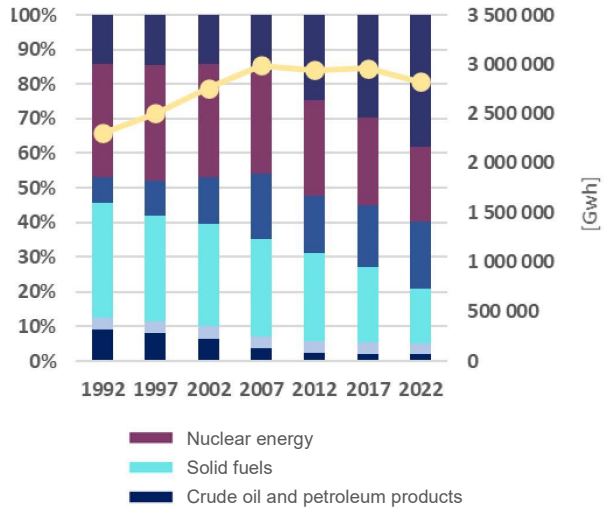
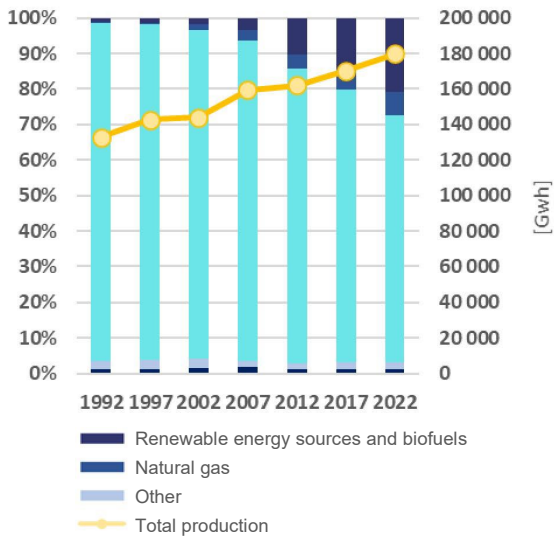


Chart 2. Structure of electricity production by main energy source in Poland in 1992-2022



Source of data: own study based on Eurostat data

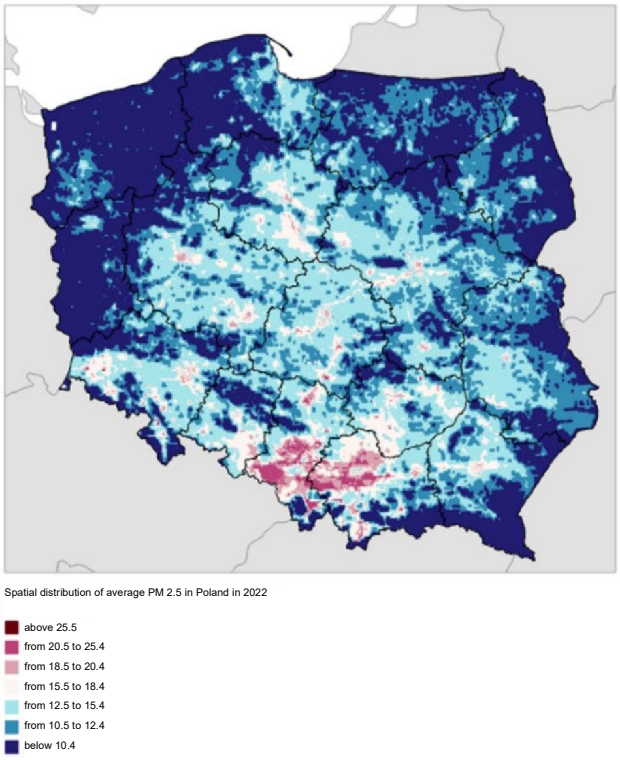
Transformation is also necessary in sectors other than energy, in particular transport, industry, agriculture, logistics and construction, as the energy and emission intensity of the economy determine the possibility of achieving climate neutrality. At the EU level, transport is one of the most carbon-intensive sectors where the current trend in emission reduction will not enable the achievement of the ambitious 2050 climate targets. It is therefore necessary to change the attitude towards mobility and transform transport and logistics systems. Determined actions are also required in the construction industry (including its support providers in mining, material production and heating), as its carbon footprint accounts for up to 40% of global emissions. These issues are also relevant in the context of environmental needs. It is necessary to reduce the pressure of the energy, transport and construction sectors on the environment, including in terms of emissions to air, which occur unevenly and are mainly concentrated around large cities (Map 7), and in terms of emissions to soil and water.

Protection of the natural capital and a moderate economy

Economic development that takes into account the protection of the natural capital - as a fundamental component of all socio-economic and spatial processes, aimed at restoring natural resources and building climate neutrality - is an absolute prerequisite for the security of the present and future generations (see Challenge: *A state resilient to threats*). Water management will be most affected by climate change. Therefore, it is necessary to develop water management systems in a river basin (catchment) system and to plan and manage water management problems in a natural system such as hydrological catchments. These processes should be implemented with broad public participation.

Concern for the quality of the environment and its resources requires the introduction of more conscious production and consumption allowing reflection on the spiralling growth, a reduction in the artificial creation of demand for goods and services, effective waste management and a reversal of the current trend (Map 8). What is needed is a more ambitious reduction of resource wastage in the economy and households, and therefore the introduction of a moderate economy. Such a resource-efficient and low-emission management practice is based on a circular economy where resources circulate through successive cycles of production and consumption and waste generation is minimised. Regrettably, recycling of raw materials is still on the decline in many countries, including Poland (Map 9). Implementation and preservation of a moderate economy requires technological, organisational, legal and fiscal solutions that will enable development of new operational mechanisms for the economy (see Challenges: *Harnessing opportunities from technological acceleration* and *A stable system of state governance and co-governance*). These solutions should take into account environmental costs, integrate the valuation of ecosystem services into development planning and decision-making processes, and strengthen the participation of citizens and NGOs in these processes. To this end, it is essential to establish systemic climate and environmental education aimed at developing individual and collective responsibility for the environment and prudent use of the Earth's resources (see Challenge: *Skill-oriented and awareness-raising education*).

Map 7. Spatial distribution of annual PM2.5 concentrations in Poland in 2022.



Source of data: own study based on Chief Inspectorate for Environmental Protection (GIOŚ) and Institute of Environmental Protection – National Research Institute (IOŚ-PIB) data

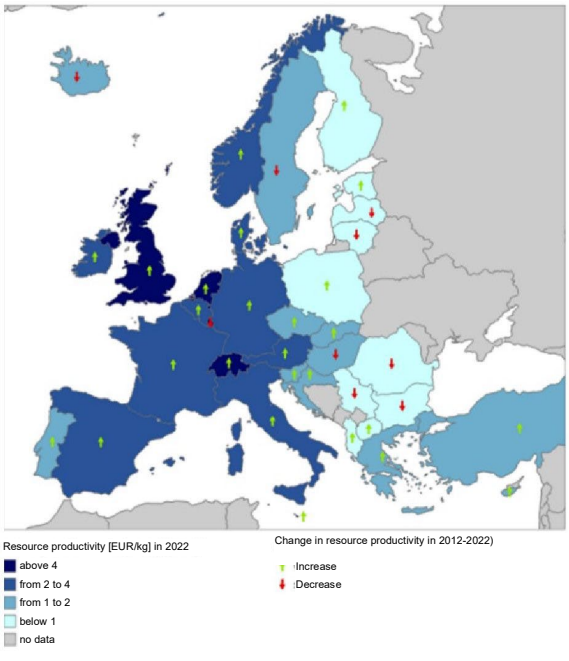
As a result of the change in the economic model towards a moderate use of resources, the natural environment should be systemically and effectively protected and made available to all residents in a balanced way.

The materialisation of a moderate economy implies also the need for greater efforts to use every component of the environment in a sustainable manner. Special conservation measures are required as regards resources such as water, the availability of which has been radically decreasing, especially under climate change conditions. It is necessary to increase the level of water retention, which is on the decline across almost half of the country (Map 10). It is necessary to ensure stable conditions for the efficient management and control of water resources (see Challenge: *A state resilient to threats*) to provide access to water to the present and future generations. It is becoming critical for blue and green infrastructure to be recognised as a critical resource by the state legal system, and to be developed systematically, e.g. through river renaturalisation, wetland reclamation and sustainable rainwater management in urbanised areas. It is also necessary to implement modern water-efficient technologies across all sectors of the economy and in municipal service management. The implementation of a circular economy should involve the protection of water against pollution, i.e. ensured treatment of all municipal and industrial sewage and reasonable use of fertilisers and plant protection products[7].

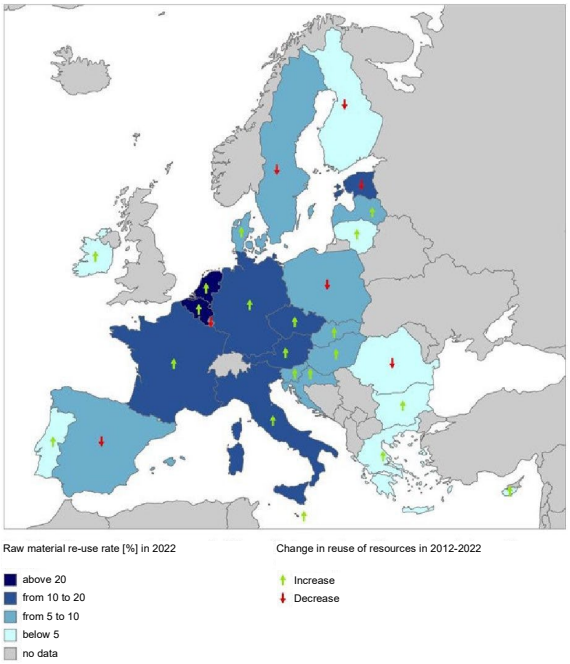
There is also a need for for sustainable planning and management in marine areas that will combine the protection and restoration of marine ecosystems and resources with their reasonable use (e.g. as regards fishing, installing cyber networks and building energy infrastructure).

[7] These measures are intended to contribute to achieving environmental objectives concerning surface water and groundwater.

Map 8: Productivity of resources[8] in Europe in 2022 and change in 2012-2022[9]

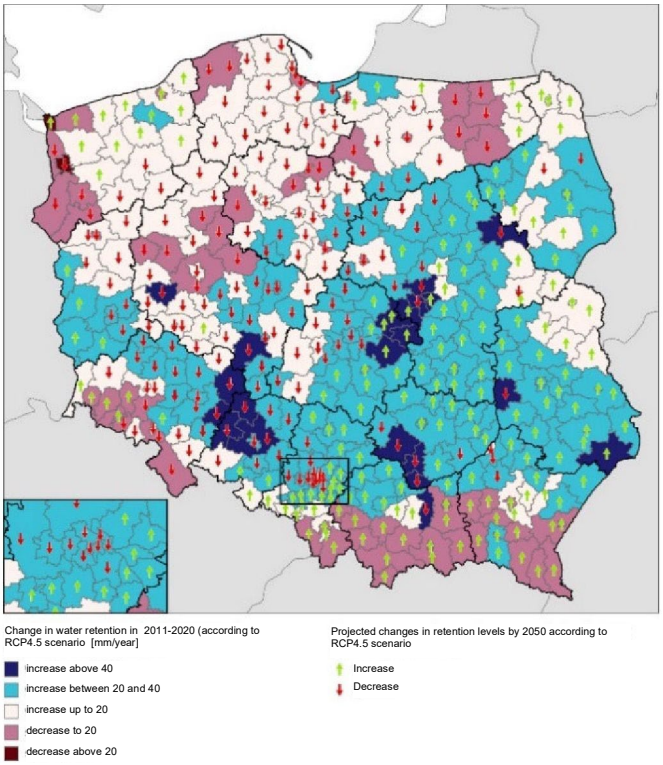


Map 9: Reuse rate of raw materials in Europe in 2022 and change in 2012-2022[10]



Source of data: own study based on Eurostat and OECD data

Map 10: Water retention levels in 2011-2020 and projected changes by 2050 according to RCP4.5 scenario [11]



[8] The indicator is defined as gross domestic product (GDP) divided by domestic material consumption (DMC). The DMC measures the total amount of materials directly used by the economy.

[9] The data for Albania, Turkey and the UK is for the years 2010 and 2019.

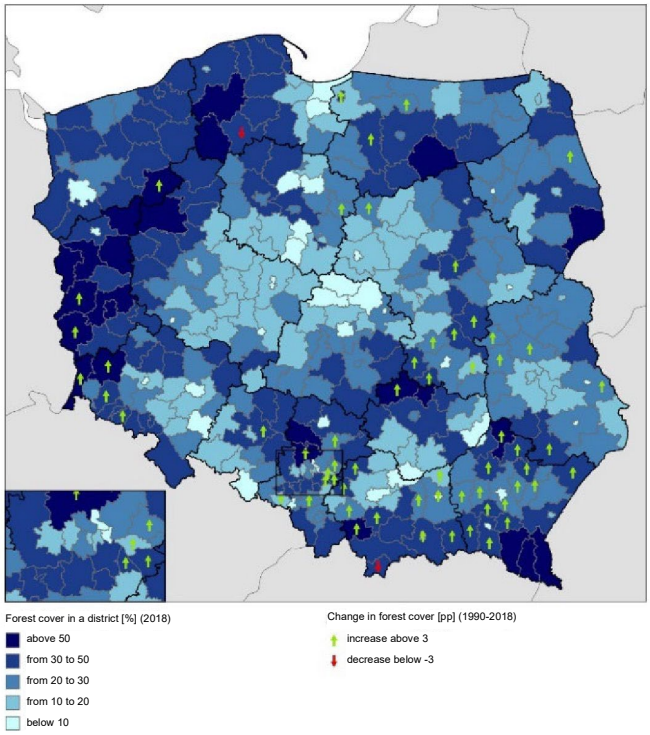
[10] For Map 9, no data is available for Greece, Luxembourg and Sweden for the year 2002, and no data for Iceland for the years 2004, 2010 and 2012

[11] RCP (*Representative Concentrations Pathways*) refers to the scenarios developed for the Fifth Assessment Report, which depend on the assigned values of the global radiative forcing in the upper atmosphere projected for the end of the 21st century (currently 3 W/m^2). This volume depends on the greenhouse gas content

Source of data: own study based on Klimada 2.0 project, IOŚ-PIB data.

With the continuously growing global population, the progressive effects of climate change and the declining health of the natural environment due to, among other things, deteriorated biodiversity, heat stress and water deficit, it is imperative to promote sustainable and regenerative agriculture that ensures food security. Production of healthy, nutritious and safe-to-eat food in adequate quantities should be oriented towards restoring and sustaining the natural potential while maintaining the profitability of agricultural production. Preservation of food security is hinged on family farms that are run according to sustainable farming principles. Small and medium-sized farms, which currently make up the majority of the country's agricultural sector, should continue to operate. The agrifood sector should use modern technologies, including resource savings and short supply chains. To this end, it will be important that the species and varieties used in agricultural production are adapted to changing climatic conditions (see Challenge: *A state resilient to threats*) and that livestock farming is sustainable and ensures animal welfare. In addition, it is essential to support agriculture in the use of new technologies - robotisation, automation and digitalisation of food production processes (see Challenge: *Harnessing opportunities from technological acceleration*). The conditions that accompany the progressive de-agrarianisation of rural areas must be taken into account in food security efforts. The decreasing share of people employed in agriculture in the overall rural population should be used as an opportunity in other economy sectors (see Challenge: *Mitigated effects of an ageing population)*. It will also be important to support rural areas in developing entrepreneurship, crafts, food production for local markets, farming-related services, renewable energy production, biodiversity enhancement and eco-tourism.

Map 11: Share of forested area by county in 2023, and change in forest cover 2002-2023

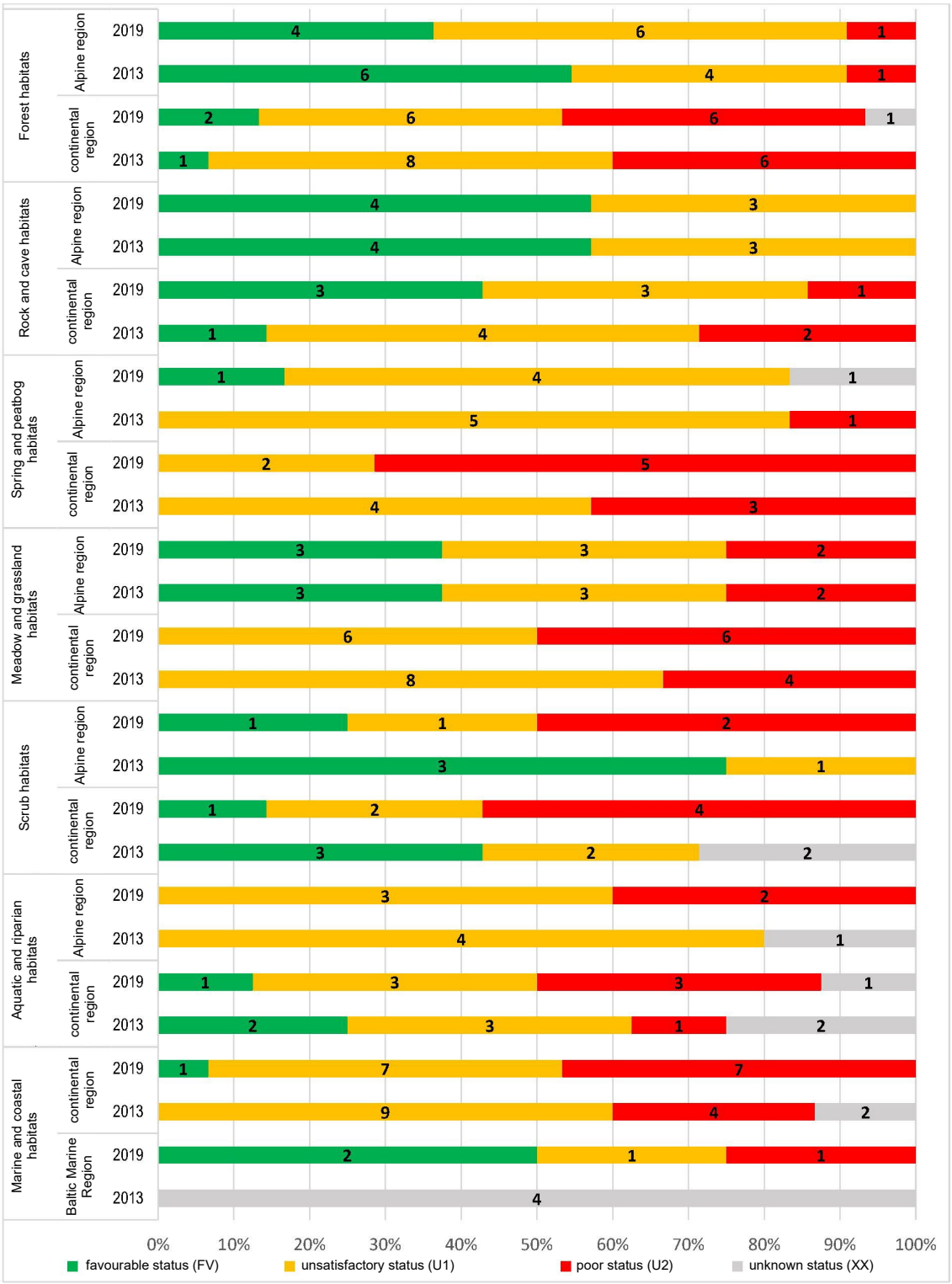


Source of data: own study based on Statistics Poland (GUS) data.

Development of a coherent network of blue and green infrastructure, including the sustainable protection of naturally valuable areas, especially aquatic and forest ecosystems, is a pillar of maintaining the natural processes necessary for human and economic functioning and, therefore, strengthening the natural capital. The level of forest ecosystems is improving slightly (Chart 3 and Map 11). It is necessary to safeguard open spaces effectively and to support local communities in protected areas to strengthen their commitment to nature conservation while enabling them to function in their neighbourhoods.

in the atmosphere (410 ppm CO_2 in 2020). scenario RCP4.5 - Introduction of new technologies to achieve higher GHG emission reductions than at present. A clear decline in atmospheric GHG content by mid-century is assumed, as well as achievement of CO2 concentrations of around 540 ppm and radiative forcing of 4.5 [W/m2] in 2100. The global average temperature will increase by approx. 2.5° by the end of the 21st century.

Chart 3. Conservation status of natural habitat groups in 2013 and 2019.



Source of data: own study based on Chief Inspectorate for Environmental Protection (GIOŚ) data

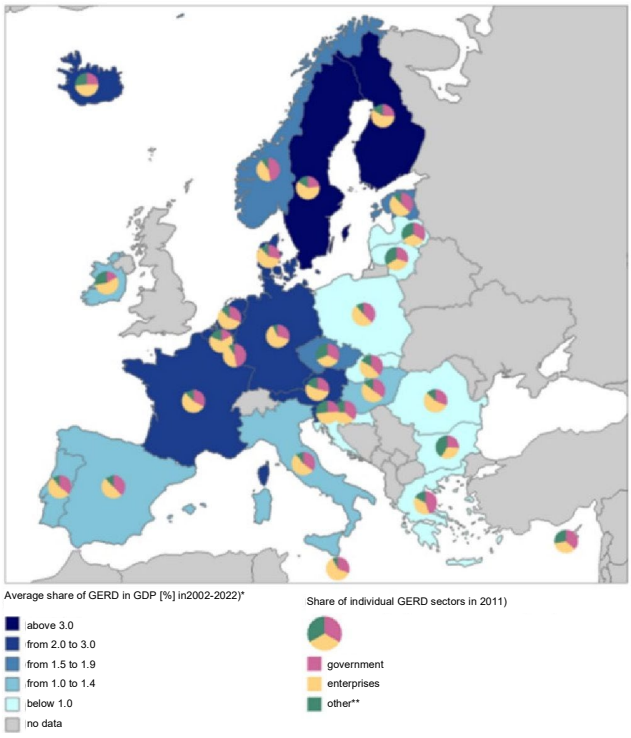
Furthermore, it is essential to maintain a coherent natural structure in the country. This requires shaping and protecting ecological corridors at European, national, regional and local levels. Preserving and restoring good quality natural habitats and ecological corridors is a prerequisite for protecting biodiversity and stopping the extinction of species. It is necessary to reverse the decline in the number of pollinating insects and to ensure growth of their populations until they reach a satisfactory level that will provide for the conservation of the species and increased resilience of ecosystems. Since biodiversity conservation efforts may not be sufficient in the context of

the progressive effects of climate change, it is necessary to prevent and monitor the spread of invasive alien species. Implementation of sustainable forest management counteracting the impoverishment of forests and promoting the management of Polish forests will ensure the preservation of their multifunctional character for the present and future generations.

Harnessing opportunities from technological acceleration

The pace of technological progress is and will continue to be very high and will intensely affect economic, social, environmental and spatial processes. Harnessing opportunities from technological acceleration in socio-economic development should be enabled first and foremost by remodelling of the innovation support and generation system. Innovation support policies should be accompanied by a strategic vision to support mission-oriented research and innovation, with the aim of expanding and strengthening the state's capacity to respond to global and local challenges and crises. The foundation for change is provided by creating a network of sustainable links between the actors in this system and linking them to the education and science sector. In this respect, it will be important to identify innovation potentials (e.g. with the use of big data), especially ones that can generate groundbreaking technologies, and support them through a profiled policy based both public and private funding (including corporate funding) (Map 12). At the same time, the SME sector, which is a significant part of the economy and often acts as a bridge between small start-ups and large corporations, will require support. In addition to financial support, it is also important to develop and promote Polish innovations in sectors of the future on international markets (technologies - especially dual-use, renewable energy, health and education, ICT). With the appropriate use of potentials, Poland could act as a specialised player in selected sectors, coordinate international cooperation and set new internationally recognised technological standards in these fields. This would also allow Poland to be more active in the European reindustrialisation process. The pace of economic development and Poland's economic position will therefore depend on actions taken in the area of innovation. The later they are taken, the more effort will be required to close the gap.

Map 12: Sources of GERD funding[12] in 2021 and the average share of GERD in GDP [%] in 2002-2022[13]



Source of data: own study based on Eurostat and OECD data

The accelerated development of technology manifested in automation and the digitalisation of work, manufacturing processes and services is causing structural changes in the labour market that are relevant both to employers and employees. Employers will need to rely on new, more flexible and largely digital management tools and systems to help increase their resilience to different types of change, and to seek employees with skills of the future, whereas

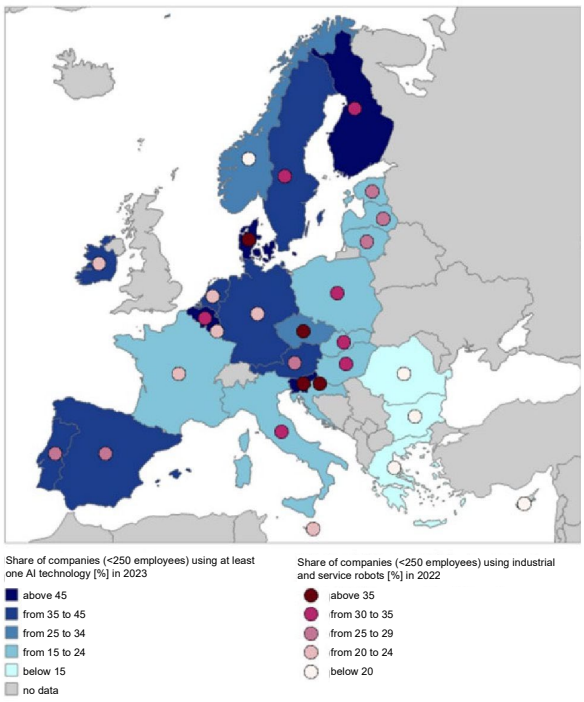
[12] Gross domestic expenditure on research and development.
[13] no data available for Greece, Luxembourg and Sweden for 2002, and no data for Iceland for 2004, 2010, 2012.

employees will have to allow for repeated retraining and ready for rapid evolutionary changes in their working environment (e.g. the constant need for adapting to new digital tools). A supportive counselling system should provide for anticipatory actions, rapid response and strengthening of employer-employee-trainer partnerships. The well-being of employees in the change process should be a priority. It is also necessary to strengthen the adult learning culture so that skill development could become a regular element of employer operations and a habit of employees at all stages of their careers. Continuous learning should be supported by a reliable system of information on development opportunities and a system of validation and certification of knowledge and skills. Effective incentives must also be put in place to retain workers in the domestic labour market, especially specialists in areas that require high qualifications, as well as programmes providing attractive conditions for return to the country. In parallel, it will be necessary to create special programmes supporting immigrant youth in gaining professional qualifications, learning the Polish language and skills necessary in the labour market.

The need to react quickly to technological change will cause increasing stress, uncertainty and frustration. The risk of anxiety disorders and depression will increase. Health promotion and disease prevention as well as the providing of psychological and psychiatric support will be necessary.

The progressing digitalisation will enable greater use of more flexible forms of work and working time systems. Automation and robotisation (Map 13) should be taxed to counteract the drastic income disparity between the capital and labour. Labour market and tax system regulations should therefore be harmonised accordingly.

Map 13: Share of companies employing fewer than 250 employees using industrial and service robots (2022) and artificial intelligence technologies (2023)



Source of data: own study based on Eurostat data

Technologies of the future (e.g. generative artificial intelligence, quantum technologies and virtual reality applications) offer opportunities for streamlining and increasing the efficiency of operations. The intensity of using new technologies is important not only in industry, but also in such sectors as education, health care, public administration, environmental protection or agriculture. Progress depends on the effectiveness of harnessing the opportunities provided by new technologies in the area of learning and education. Therefore, the education system should embrace the aspect of digitalisation, introduce new, alternative and informal ways of learning and provide for a more in-depth and immediate validation and certification of the acquired skills and knowledge. In the healthcare system, the opportunities offered by technologies should be harnessed to promote remote pre-diagnostics and disease prevention, perform simple care tasks and educate physicians, other health professionals as well as care and social service providers. Harnessing these opportunities will increase the availability of primary healthcare services and reduce costs in the health system in particular and in the economy in general. New technologies should also be used in the production of healthy functional food to prevent and treat civilisation diseases. In the agricultural sector, robotisation, automation and digitisation of production processes are essential for food security

(see Challenges: *A state resilient to threats* and *Multifunctional rural areas*). New technologies should also support environmental protection and animal welfare.

At the same time, technological acceleration should contribute to the restoration of natural resources, e.g. by making the economy more resource-efficient (e.g. in terms of water consumption) or by increasing the uptake of greenhouse gases by ecosystems. Modern solutions for real-time environmental monitoring and analysis of spatial environmental data should be used for more effective pollution prevention and control. In public administration, the use of digital technologies can contribute to increasing the efficiency and quality of services provided by that sector, leading to greater citizen satisfaction.

Another important trend involves transferring all financial activities to cyberspace (digital currencies, virtual banks, online currencies, tokenisation, cashless and impersonal transactions), A new type of economic zone is expected to emerge in the virtual world. It is therefore necessary to change business models and economic policies and to modernise the financial infrastructure through relevant regulations and security measures provided by the state (see Trend: *Progressive digitalisation of the economy*), and to ensure financial education of the public.

Consequently, new opportunities and risks to socio-economic and spatial development arise from the increasingly wide use of new technologies and the growing power of global corporations (especially technology ones) that have the potential to profoundly affect multiple aspects of social[14], economic[15] and political[16] life. They should not be treated only as tools to improve current activities. They can also be seen as a potential source of paradigm-shifting breakthroughs in many areas of the economy and society[17]. Insufficient utilisation of the opportunities offered by those technologies can hinder the important transformations, but their uncontrolled development and excessive reliance on them do entail risks. Misuse of modern technologies, as well as the monopolisation of markets by a few technology corporations, can have negative impacts on employment, competition and even fundamental rights (e.g. impacts on ownership, social control, privacy), safety and democracy, as well as entrepreneurship and innovation.

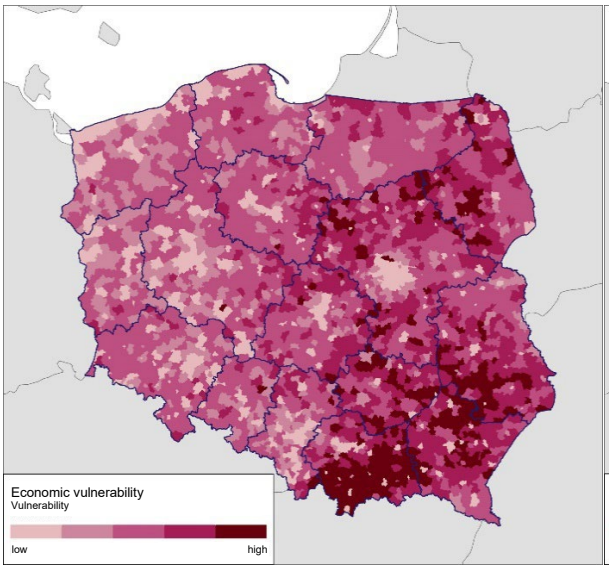
Community efforts should therefore be strengthened to develop balanced regulations concerning modern technologies which, on the one hand, provide a flexible framework for their development and, on the other, prevent their inappropriate evolution. The opportunities and risks associated with technological acceleration also require intensive efforts in the area of education and public awareness (see Challenge: *Skill-oriented and social awareness-raising education*).

It is also required to intensify efforts to counteract harmful online activity (hate speech, disinformation, hacking activist, algorithms of trauma), cybercrime and anti-democratic social engineering, and to step up actions to protect personal data and organisations operating in the virtual world (see Challenge: *A state resilient to threats*). It is becoming necessary to develop tools to counter the monopolisation of markets and services by global corporations, disinformation, regulate the rules of artificial intelligence, control algorithms and legal liability for them, ensure the security of transactions and communications, the security of user data and the protection of the right to privacy, as well as proactive legislative responses in digital markets and digital services.

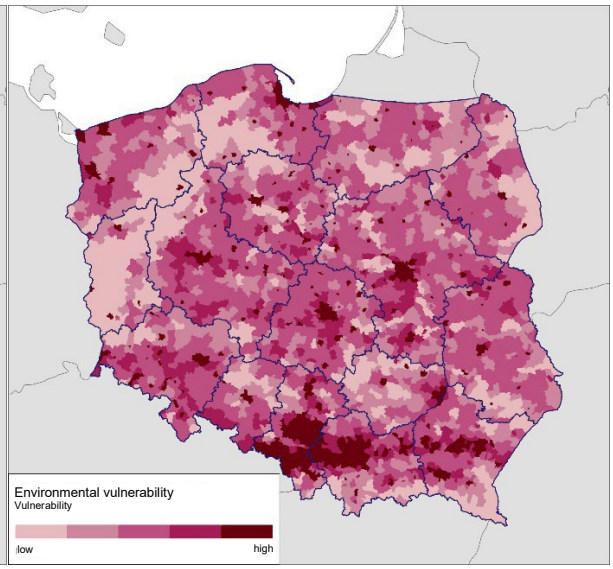
Map 14: Economic vulnerability

Map 15: Environmental vulnerability

[14] More personalised experience in such areas as health, education, entertainment and shopping, changing the way of working, learning and communicating in more immersive environments.
[15] More efficient production processes, advanced engineering solutions, new business models.
[16] Greater risk of disinformation through the generation of false content and manipulation of virtual realities, cyber threats.
[17] https://pie.net.pl/kontrola-technologicznych-gigantow-i-efektywne-e-uslugi-kluczem-do-rozwoju-cyfryzacji-w-polsce/ (accessed: 16 April 2024)



Source of data: own study based on Statistics Poland (GUS) and Energy Regulatory Office (URE) data



Source of data: own study based on Statistics Poland (GUS) and the Klimada project data

The economic vulnerability of territories indicates the potential ability of individual territories to respond to emerging challenges and changes in the economic sphere (the higher the vulnerability, the lower the potential capacity), e.g. energy transformation, automation, digitalisation or reduction of the resource intensity of the economy. This vulnerability will translate into the magnitude of potential losses in the case of risks, or into the amount of gains in the case of new economic potentials and opportunities. The economic vulnerability map (Map 14) presents a synthetic indicator based on the level and structure of businesses, foreign capital, employment level, financial condition of municipalities, circular economy and energy transformation. At the national level, the lowest vulnerability (i.e. the best conditions) can be seen mainly in the functional areas of the largest cities, the Baltic coast and western Poland.

The environmental vulnerability (Map 15) refers to the surface area and condition of ecosystems and the quality of environmental components. On that basis, conclusions can be drawn concerning the country's potential vulnerability to a variety of negative phenomena, as well as living conditions and development resources. The vulnerability was illustrated with indicators relating to protected areas, ecological corridors, flood and drought risk, air quality, vulnerability of ecosystems and sodded areas. Greater vulnerability can be seen in large cities with their functional areas, with a higher risk of negative impacts of climate change. In areas with a high proportion of protected areas and ensured natural connectivity through ecological corridors, the potential for ecosystem services is greater, and this is reflected in opportunities to regulate the hydrological cycle, including surface runoff, regulate air quality, greater biodiversity and important social functions. These areas are more resilient.

The energy transformation, a change in the economic model that takes into account the need to protect the natural capital and moderate economy, and the increasing levels of innovation will have significant spatial impacts, with examples of potential effects including:

- preservation of strategic mineral deposits as emergency reserves (e.g. by not developing the land above them),
- reclamation or (where feasible and environmentally sound) rehabilitation of degraded land, including that previously used for fossil fuel mining and processing,
- occupation of land for new and modernised energy infrastructure (renewable energy production facilities, nuclear power plants, transmission networks and energy storage) and preservation of land reserves for future energy needs and the related landscape changes,
- adaptation of developed spatial structures or occupation of new land for the development of low and zero-emission transport and logistics networks (e.g. high-speed rail and infrastructure, electromobility for autonomous devices or innovative air mobility), extension/adaptation of the traditional infrastructure by adding elements that enable seamless zero-emission and autonomous transport, and based on environmentally friendly branches,

- adaptation of urban and rural arrangements to the development of sustainable mobility (e.g. development pedestrian route networkss, infrastructure for micromobility vehicles) and a parallel increase in the share of green spaces,
- improved quality and functionality of spaces, implementation of new architectural and urban standards, and development of blue and green infrastructure, including greening of urban areas, AI-augmented design,
- limitation of land for new development and reduction of unnecessary land infrastructure,
- potential relocation of economic facilities and occupation of new areas for business activities - relocation of companies closer to new energy sources,
- increased surface area of naturally valuable and protected areas, and preservation of ecological corridors,
- expanded catalogue of functions of smaller urban centres and rural areas, including the spread of economic activity beyond large cities,
- occupation of more open land for economic purposes, e.g. due to reindustrialisation,
- development of data transmission network infrastructure across the country.

A RESILIENT STATE WITH A STRONG POSITION IN EUROPE AND WORLDWIDE

In an era of extraordinarily dynamic geopolitical change and the global effects of climate change, the resilience of the state to threats and crises, and the security of the state and its population take on a particularly alarming importance (see Trends: Transformation of the global order, Increasing pace of environmental and climate change, Growing importance of cybersecurity). It is important for the state to act as a "security guarantor" and to ensure the resilience of its territories at different levels of development management, and for public policies to be able to better mitigate threats and crises with the use of the right tools. The capacity to anticipate, adequately respond to and eliminate threats within the framework of resilient security, crisis management and civil protection systems ensures internal stability and enhances the quality of life of the population.

Resilience-building requires strengthening Poland's position internationally through, e.g. active cooperation within the existing international alliances and constructive participation in building a strong European Union and NATO.

In parallel, it is necessary to strengthen local economic ties and to balance the "state-corporate" relationship due to the shift towards a regionalised world (see Trend: The tension between globalisation and locality).

Furthermore, the state's resilience and strength depend on its social capital and stable state governance by professional and sustainable institutions at all levels of development management (see Trend: Weakening democratic mechanisms). The country's security and stability environment includes also a transparent legal system and mechanisms that curb the undermining of democracy.

A state resilient to threats

Increasing confrontations between superpowers, increasingly numerous potential armed conflict hotspots and deglobalisation have an impact on the global and regional economy, technological progress, social inequalities and sentiments and the condition of democracy. They can also directly threaten world peace and security. Rising powers are engaging in global cooperation in their own way and on their own terms. New categories of states are emerging, the so-called emerging markets and the Global South. BRICS has expanded to include new countries. The African Union has been included in the G20. They are becoming more powerful politically, economically and strategically in opposition to the Western order. These developments have resulted in a new position of China (and the so-called authoritarian league) as the informal leader of the entire anti-Western bloc. This powerful bipolarisation and socio-economic and political fragmentation of the world is of key importance to the military balance, or lack thereof, to the resilience of states and societies to peace threats, and to the life and aspirations of societies firmly grounded in a value system underpinned by democracy.
The Western order, now confronted with a new and rapidly growing illiberal order, is undergoing a process of transformation. An effort is needed to maintain a policy in international relations that emphasises the promotion of European normative standards. At the same time, there is an urgent need to develop and implement a development paradigm focused on building European and national resilience which will take into account social, economic, technological, environmental (including climate) and security aspects.

Effective multilateralism within the framework of pan-European and transatlantic alliances or the development of cooperation with partners in the immediate environment, e.g. within the Baltic Sea region, is one response to this state of affairs. It is imperative for Poland to actively participate in the European and global work on strengthening Europe's subjectivity and on the future of the security architecture in all its dimensions. To this end, it is necessary to consolidate and strengthen Poland's presence in the system of international security cooperation, based on respect for international law, providing guarantees for the country's further development. In this context, it will be fundamental to continue to enhance the credibility and effectiveness of NATO, as well as the strengthening,

deterrence and defence of the Alliance against enemies. Resilience also requires a system of universal defence, based on the effort of the whole country. The military potential should be developed evenly and oriented towards the challenges of the modern battlefield on land, water, in air and in cyberspace. It is necessary to continually improve the level of training and technological sophistication of the armed forces (e.g. through the widespread use of AI-based solutions, including unmanned assets, with the respect for the principles of warfare ethics and cybersecurity). In addition, it is necessary to develop non-military defence links, such as transport, energy, logistic and manufacturing infrastructure, targeted pro-defence training and the development of a universal crisis management and civil protection system (including education on defence and manners and a danger information system) which must be based on coordinated procedures of the national and regional administration, as well as local extreme event warning and threat response networks. The system must take into account the capacities offered by civil society organisations in the education and work of security-related experts. It will be also necessary to strengthen procedures for the provision of humanitarian aid, medicinal and medical products and first aid supplies, the organisation of evacuation and psychological support for people affected by crisis.

Under such conditions, it is also necessary for Poland to provide solidarity-based development assistance and to promote and strengthen democracy and the rule of law and respect for human rights and fundamental freedoms, including addressing the difficult task to promptly mitigate the impact of external shocks and ensure a long-term improvement in the economic and political situation in the affected regions. From the climate crisis perspective it will also be important to provide solidarity assistance to poorer countries in their adaptation to climate change and their transition to zero and low-emission economies. It is essential to keep establishing multilateral strategic partnerships and free trade agreements with Asian partners and other emerging markets within European cooperation networks that bring together private investors, national and international institutions and development banks. Moreover, strengthening of Poland's position on the international arena should involve active participation in international cooperation in the fields of space exploration, development of space technologies and the IT sector (where competition is now becoming one of the areas of geopolitical rivalry) and agriculture, as well as strengthening the country's cultural reputation. Technological cooperation is also crucial due to the absence technological sovereignty of Poland and the EU because many critical technologies are produced outside Europe. In this context, it will be important, among others, to ensure access to the shrinking deposits of rare earth metals which are located outside Poland. This will be difficult because a significant proportion of these deposits is under the control of non-democratic states. Support for the resilience of the Polish economy should also come through the implementation of a circular economy, in which the reuse of raw materials will contribute to independence from external suppliers.

Furthermore, the risk of new types of incidents, including hybrid ones (accidents of unknown origin, escalation of conflicts caused by state and non-state actors, "deniable" wars, disinformation etc.), and armed conflicts demonstrates the need to strengthen the state's resilience in many fields, including state security and public order, crisis management and civil protection systems, and to renew strategic objectives in this regard.

Other issues that require attention are cybercrime and cyberterrorism[18] which can effectively disrupt the continuity of state operations or cause public panic by producing and disseminating false information to mislead the audience, causing damage and costs. Cyber threats and their new varieties are set to grow in numbers as a consequence of the continued technological progress, growing number of networked and wirelessly controlled devices and unstable geopolitical situation. Therefore, cybersecurity concerns the entire digital space and all its users. Large cities are particularly vulnerable to cyber attacks as they are areas where large numbers of users, devices, public institutions and businesses, including critical infrastructure operators, are concentrated, and where communication hubs and internet service providers operate. However, the physical spatial effects of cyber attacks, e.g. disabling of critical infrastructure, can be much broader. Adequate protection of IT networks, devices, systems and data against attacks, damage or unauthorised access is key to avoiding attacks and other threats.

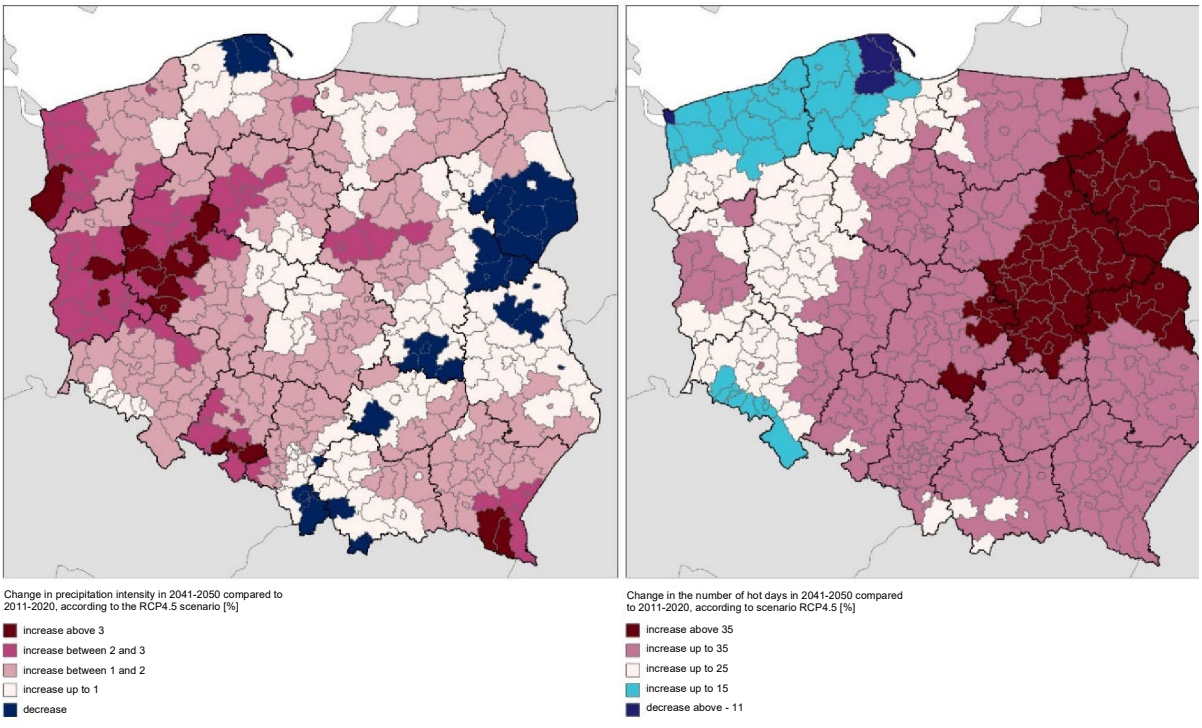
[18] Top 10 cyber threats to occur by 2030, according to the EU Cyber Security Agency (ENISA): (1) Malware attacks on supply chains; (2) Sophisticated disinformation campaigns; (3) Digital surveillance and loss of privacy in cyberspace; (4) Human errors and exploitation of legacy systems in cyber-physical ecosystems; (5) Targeted attacks amplified by data from smart devices; (6) Threats to space infrastructure due to lack of application of adequate security; (7) Emergence of advanced hybrid threats combining online and offline worlds; (8) Hacking attacks on organisations lacking cyber-security skills and competencies; (9) Cyber attacks on cross-border ICT service providers resulting in unavailability of critical infrastructure; (10) Abuse of artificial intelligence and manipulation of AI algorithms.

An important aspect of ensuring citizen security is public health. It depends, among other things, on being well prepared for various types of crises (e.g. pandemics, disasters) and on the ways implemented to monitor the health status of the population and the strength of the impact of lifestyles on this status (prevention of civilisation diseases, addictions, avoidance of compulsory vaccinations). There are increasing challenges to public health from an ageing population, new diseases, climate change. An opportunity for improving public health lies in coordinated internal action by countries and within international organisations, including new technologies, data management or monitoring and warning systems.

Important aspects of state security include also build-up of climate change resilience. In all types of areas, the development of blue-green infrastructure will be an important component (see Challenge: Protection of the natural capital and a moderate economy). The increasingly frequent occurrence of extreme events and natural disasters such as heat waves, torrential precipitation, droughts, floods, hurricanes, earthquakes and fires is brought about by climate change and brings ever greater natural, social and economic losses (Map 16, Map 17, Chart 4 and Chart 5). The most vulnerable sectors include agriculture, energy, as well as housing and public health.

Map 16: Change in precipitation intensity in 2041-2050 compared to 2011-2020, according to the RCP4.5 scenario [%]

Map 17: Change in the number of hot days between the decades 2041-2050 and 2011-2020, according to the RCP4.5 scenario [%]



Source of data: own study based on Klimada 2.0 project, Institute of Environmental Protection – National Research Institute (IOŚ-PIB) data.

Chart 4. Share of voivodeships in losses in infrastructure caused by extreme events in Poland in 2001-2019

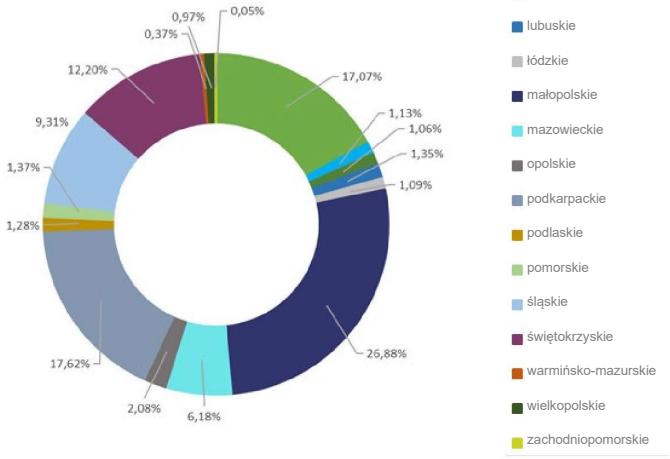
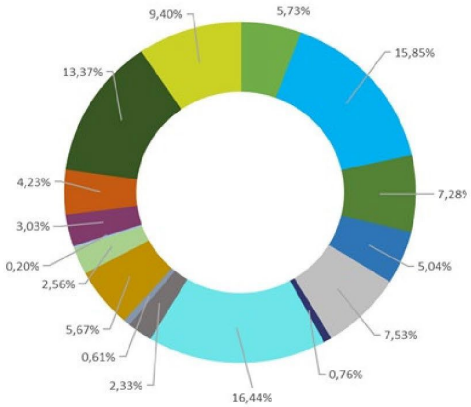


Chart 5. Share of voivodeships in agricultural losses due to extreme events in Poland in 2017-2019

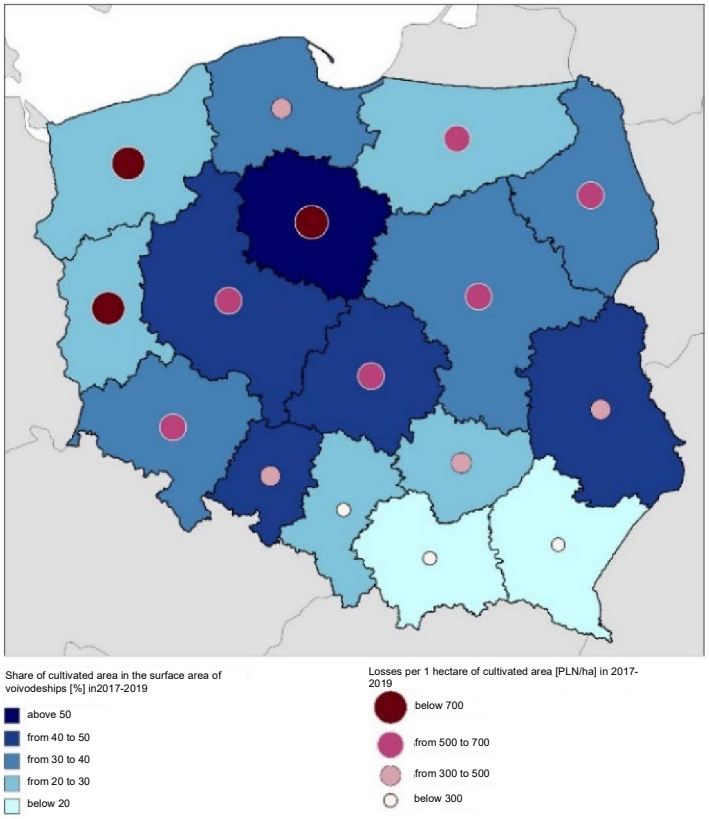


Source of data: own study based on Klimada 2.0 project, Institute of Environmental Protection – National Research Institute (IOŚ-PIB) data.

It is therefore necessary to introduce a systemic approach to climate change. Adaptation to climate change should be based on the knowledge of spatially differentiated forecasts concerning changes in climatic factors and the effects of climate change on individual sectors and areas. Adaptation must take into account the various solutions available, chosen to suit extreme climatic events, which will be described by current reliable data. In all types of areas, it will be important to develop a blue-green infrastructure (see Challenge: *Protection of the natural capital and a moderate economy*) in order to restore ecosystem services. In urbanised areas, it will also be necessary to carry out comprehensive and decisive actions to minimise the occurrence of urban flash floods, heat islands and their effects. Furthermore, coastal areas should be subject to strong measures to reduce the effects of rising Baltic Sea water levels and increased frequency of storm floods.

Adapting agriculture to climate change and ensuring food security by reducing agricultural losses, which are already high (Map 18), will require implementation of a comprehensive protection of natural ecosystems and biodiversity, by paying attention to ecosystem services in the management of natural systems and the restoration of ecosystems. This should be pursued through the adaptation of crop types, development of monitoring and early warning systems, provision of adequate food storage systems and ensured efficiency of agri-food infrastructures in the event of natural disasters, and through ensured access to water, including water of adequate quality (see Challenge: *Protection of the natural capital and a moderate economy*). Building the new and maintaining the existing energy market architecture (see Challenge: *Energy transformation)* will require ensuring that it is resilient to the effects of climate change.

Map 18: Share of cultivated area by voivodeship and average losses for agriculture in 2017-2019



Source of data: own study based on Klimada 2.0 project, Institute of Environmental Protection – National Research Institute (IOŚ-PIB) data.

An economy with stronger local links

The last decades have seen growing interdependencies between a number of countries and national economies. However, the geopolitical uncertainty and fears concerning a possible escalation of the current armed conflicts, the outbreak of a global armed conflict or the growing power of global corporations make the issues of security, resilience and stability increasingly present in the risk analyses and economic calculations carried out by states and enterprises. One can observe relocations of production facilities closer to sales markets as well asregionalisation or bipolarity of the world, which could entail the end of the relations and ties we are familiar with and a turn towards deglobalisation.

The conditions for development have so far been determined by participation in global arrangements. However, excessive reliance on international economic relations can have the opposite effect and undermine the flexibility and resilience of the domestic economy. The strategic orientation of the economy towards the circular model and a sustainable environment and the high pace of geopolitical change that triggers various deficit crises, all further indicate that strong local economic links, in addition to global ties, should become an important element of resilience-building policies.

In this context, it is important to support the micro, small and medium-sized enterprise sector, which is more vulnerable to the effects of global shocks and crises as its financial and organisational resources are poorer compared to the capacities of corporations. At the same time, the sector has relatively poor links with global economic networks and is strongly embedded in local economies. Given the very high share of micro, small and medium-sized enterprises in the country's economic structure, application of the right support mechanisms can enable the sector to increase the flexibility and resilience of the national economy in the changing global environment. Strong and coexisting local and global economic arrangements will help ensure flexibility and stability of the economic and financial system. It is therefore essential for the state to provide the necessary support to strengthen the participation of companies controlled by Polish citizens in global economic networks and maximise the effectiveness of the Polish business presence in supply chains, combined with diversification and shorSng the supply chains of raw materials, resources, goods, value and services in order to ensure an enhanced strategic

autonomy within the framework of international, European and national cooperation. It will be critical to ensure independence of various, including agricultural products, critical raw materials, semiconductors, pharmaceuticals and health products, heavy industry. In this context, it will also be important to create conditions that support the development of the social economy and grassroot efforts to build links between local communities and create territorial partnerships as organisational networks. Strong and dense social networks facilitate self-organisation, individual business activity and coordination of access to the required resources, including natural ones. It will therefore be important to strengthen the local social capital, local identity and social ties that foster trust, cooperation and exchange of resources among people. The cooperative economy, based on the principles of solidarity, participation and democratic governance, supports the long-term and sustainable development of local businesses and communities.

In doing so, it will be equally important to avoid the insularity of the state through active engagement in international relations (diplomacy, economic, cultural, scientific or political cooperation) in order to address barriers that stand in the way of innovation, solving international problems or building political stability. In this context, it is important to strengthen Poland's investment appeal on the basis of strong local ties created so far. The current geopolitical situation and the related changes have made Poland an even more attractive destination for foreign investors. This is due to the opportunities currently offered by the country's diversified economy, stability of the political and legal system, skilled workforce and good quality infrastructure – which are better than in some of the countries in our region, combined with business costs that are still lower than in Western Europe. Attracting investors will require highlighting these assets and seeking further ones. In this context, Polish regions and metropolises need to strengthen their competitive position and attractiveness in international arena and reduce inequalities through the use of knowledge, creativity and innovation and cooperation within networks of regions and cities, also in foreign directions.

A stable system of state governance and co-governance

Given the increasing pace of change and uncertainty, the term-based development planning model funded according to the availability of the sources of financing carries a high risk to the stability of the country and its development prospects. It is becoming increasingly urgent to improve strategic planning and public management methods through, among other things, an increasingly reliable provision of data (e.g. big data from the public and private sectors), new management tools (e.g. digital twin and the related simulations of specific processes and investments in the virtual world), strategic foresight methods and a more frequent use of endogenous potentials of territories and own resources.

Particular attention will be required to strengthen the public data collection and sharing system (data-driven governance) so that it can provide accurate, complete and reliable information needed by politicians, officials and planners and other stakeholders to comprehensively analyse and understand the changes taking place in the world and in the Polish society, economy, environment and space, to plan long-term development and to make decisions at all levels of governance. In doing so, it will be important to ensure that data is managed ethically and securely, and to put in place other arrangements to support a data culture.

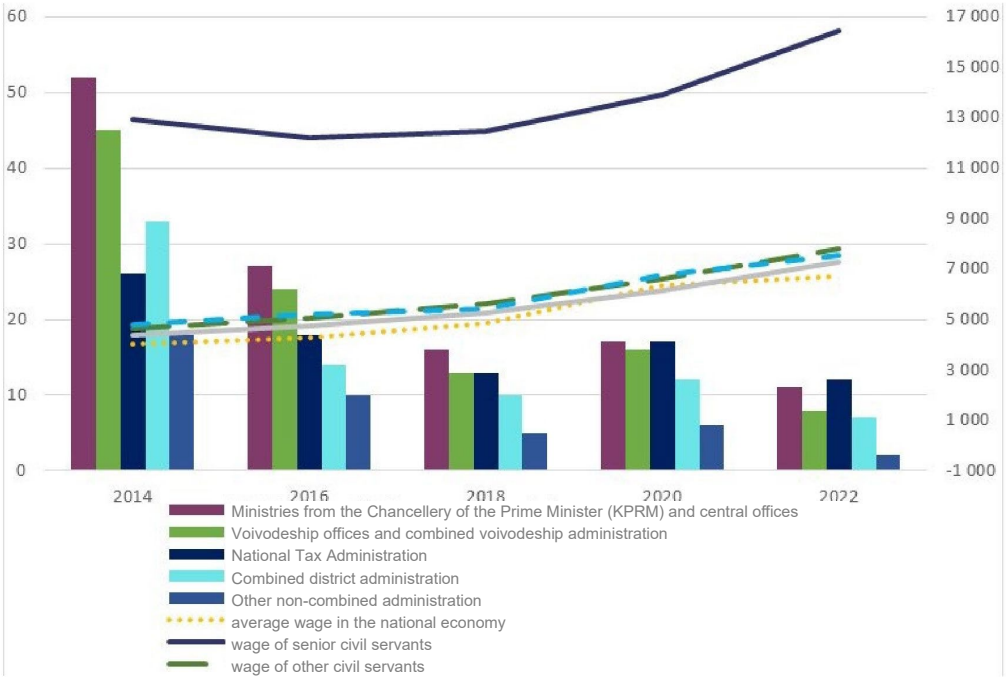
Promotion of the use of strategic foresight methods will allow continuous verification of the validity of the strategic long-term planning assumptions, planning of public policy interventions that are as resilient as possible to unforeseen future events, and design new out-of-the-box and ground-breaking solutions that might be trivialised or overlooked during traditional preparation of development strategies. It will also be important to strengthen the expert capacity of public institutions and to support the development of knowledge centres that will provide a platform for expert discussions and public debates in an age of rampant disinformation.

In this context, it is becoming essential to better empower local authorities and modernise their system of functioning in order to enable them to implement a truly integrated development policy based on their territorial capital and using modern mechanisms to finance their activities and monitoring development (e.g., digitized urban planning acts). Efficient execution of local government tasks will also be facilitated by a functional approach and the implementation of joint activities for the benefit of local communities by cooperating local government units.

Another prerequisite for the stability of the state is an efficient public administration that enjoys - thanks to the renewal of the civil service ethos - widespread trust and bases its activities on modern technologies, management

methods and a culture of institutional decision-making, i.e. the implementation of decisions in an accountable, transparent, reliable manner and in accordance with established norms and values. Increasing the attractiveness of this profession may encourage highly qualified professionals to take up a job in public administration, enabling it to responsibly plan and consistently pursue long-term and strategic development goals (Chart 6).

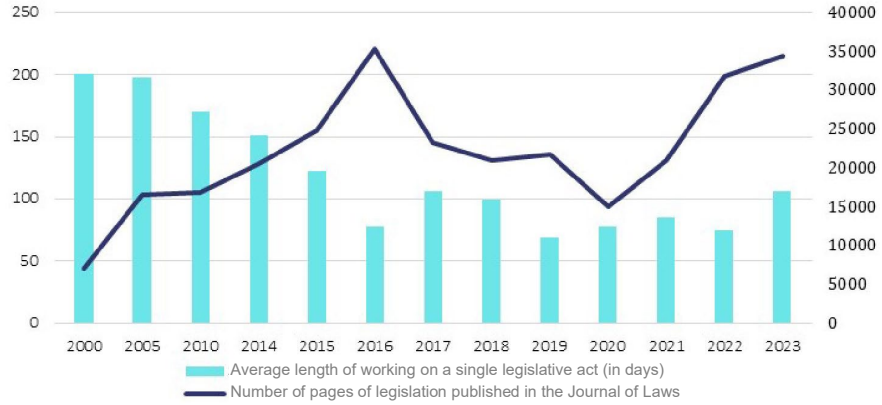
Chart 6. Number of candidates per one civil service position by office group (left axis), and average gross monthly wage [PLN] (right axis) in public administration (including civil service) in 2014-2022



Source of data: own study based on Chancellery of the Prime Minister of the Republic of Poland (KPRM) and Statistics Poland (GUS) data

To function efficiently, the state also requires an effective legal system and an efficient judiciary, that have a direct impact on the shape and condition of the economy, civil society and all individuals residing in Poland. The law-making process should be more closely based on the principles of sound legislation, which include legislation based on reliable analyses and data, limited use of special purpose laws, legislation based on the principle of the non-retroactivity of laws, adequate *vacatio legis* and legislation drafted in a clear and understandable manner (Chart 7). Furthermore, legislative changes that increase the number of cases in common courts require a corresponding increase in the staffing of the professional groups responsible for hearing them. It is also necessary to ensure proper law-making procedures that take into account participatory law-making through public consultations. Application of this model makes it possible to create good regulations that come into force in sufficient time for institutions and citizens to prepare for change, including the development of effective implementation mechanisms and tools. At the same time, well-functioning anti-corruption tools must be created to ensure the stability of democracy, social justice and the integrity of the functioning of the state.

Chart 7. Average length of work on a single legislative act and number of pages of legislation published in 2000-2023



Source of data: own study based on Law Barometer data

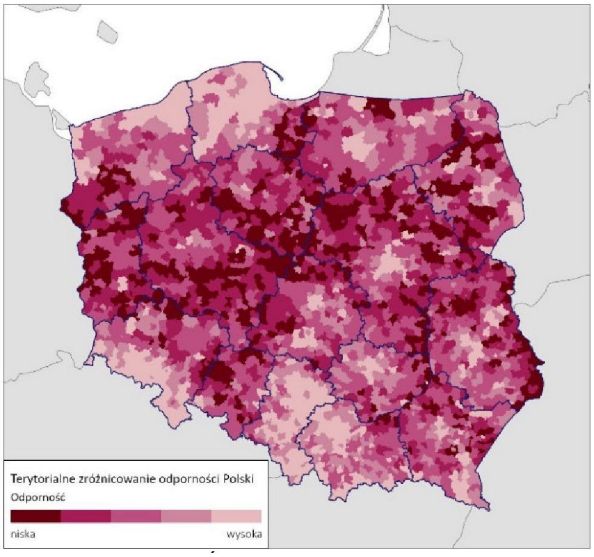
Civil society organisations form an integral component of an efficient state. Their activity in many aspects of public life is clearly on the rise. It is worth utilising this public involvement through harnessing innovative techniques and tools of participatory planning in the spirit of consensus-seeking. This is crucial given the increasingly evident trend towards a greater polarisation of views, growing radical attitudes, increased susceptibility to manipulation, and movements building on strategies aimed at arousing public frustrations. It is therefore necessary, among others, to review and support the conditions for the development of organisations that combat inequality, disinformation and corruption, defend human rights, advocate the rule of law and promote appropriate use of the media, so that they can effectively influence public discourse, political and business decisions, law-making processes and policy implementation. Civil society organisations are key partners in social stabilisation, consensus-building and the formation of committed civic attitudes. No less important will be harnessing society's achievements and creativity and developing them through cultural processes, in particular by creating and shaping a culture that strengthens the capacity of the state and society.

The stability of the state governance system is also dependent on the power of new non-state actors with a global reach that have emerged in socio-economic life through globalisation – media or global corporations which are becoming increasingly competitive and are continuously strengthening their position vis-à-vis states (e.g. by offering services that are competitive in terms of accessibility, flexibility or cross-border character). In order to prevent corporate domination , the state-corporate relationship needs to be defined properly. Interactions between the public sector and corporations should be based on cooperation based on the the principle of social responsibility to offer mutual benefits while ensuring the stability of public institutions. In this context, it will be particularly important to strive to offset the state's economic dependence on corporations and their influence on the state's decision-making processes, and to ensure the balance between public and private interests and the lawfulness of corporate operations so that they do not harm the society or the environment and preserve fair competition. It will be equally important to implement modern operational methods for public institutions to increase their efficiency, effectiveness, flexibility and competitiveness vis-à-vis corporations.

In the wake of the growing power of global corporations and their potential takeover of selected public functions, it is becoming particularly important to foster citizen identification with the state. Citizens should feel that the state serves their needs in both the real and virtual worlds, and that public institutions act in their best interests. This will increase citizens' involvement and willingness to work together to build a better and more stable state in a rapidly changing world of global corporations and technological progress. Thus, a positive environment can be generated to promote civic patriotism understood as responsibility and commitment to the common good. In this context, the increasing concentration of ownership (of both tangible and intangible assets) in the hands of multinational corporations is also important. States transfer the provision of some services to the private sector, which raises the need to ensure that the state has control over key tangible (e.g. transport, critical infrastructure, medicines) and intangible assets (e.g. data, information, servers) so that lack of ownership of those goods cannot be used against their users (e.g. by restricting the use of transport or telecommunications infrastructure). It will also be important to develop specific models of state-corporate cooperation so that corporations contribute to the development of local communities and the protection of the environment.

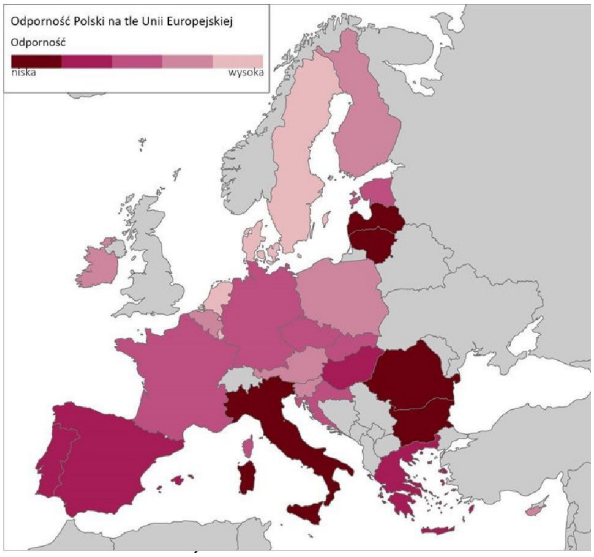
Similarly to the social transformation and economic and environmental challenges, for which vulnerability maps were developed, Maps 18 and 19 present the guiding theme of this challenge: resilience. Due to the different specificity of resilience and the high degree of complexity of the issue, it was decided not to analyse the internal differentiation of Poland's resilience (at the level of municipalities), but to present the resilience of our country against the background of other EU member states. Resilience Dashboards developed for the European Commission were used to illustrate Poland's resilience against the EU countries. They examine resilience issues in two dimensions: vulnerability (Map 18) and resilience (Map 19). Poland ranks 17th among the analysed countries in terms of vulnerability and 23rd in the case of resilience. This places Poland in the group of Member States with the lowest resilience in both of these analysed dimensions.

Map 19: Vulnerability of EU countries to threats



Source of data: own study based on EC, Resilience Dashboards data

Map 20: Resilience capacity in the European Union



Source of data: own study based on EC, Resilience Dashboards data

Building a state resilient to crises and threats can carry examples of potential spatial effects:

- developed, low-cost land which is attractive to small-scale businesses, using brownfields,
- spread of economic activity beyond large metropolitan areas, new functions of smaller urban and rural centres,
- expansion of transport infrastructure, especially railways, including public transport,
- emergence of multi-storey underground facilities and multi-functional buildings designed to meet potential needs in case of various shocks and crises (natural disasters, armed conflicts, health crises),
- new production areas in connection with the location of supply chains in Poland (use of brownfields), change in the profile of use of certain areas such as ports, river networks, airports and aerodromes, including civilian (military-transport purposes) and in border areas (military-defence purposes),
- physical and spatial/functional isolation of a part of Poland's eastern and part of northern border,
- increased area of land occupied by military infrastructure and civil defence facilities,
- reduction and fragmentation of open space, disruption of ecological corridors,
- preservation and protection of agricultural land, adapting it to the effects of climate change,
- development of blue-green infrastructure in open and built-up areas,
- deployment of new offshore critical transmission infrastructure,
- protection of areas at risk of flooding, including from the sea, urban flash flooding, as well as areas at risk of landslides, by limiting the degree of development in these areas.

SUSTAINABLE SPACE THAT TAKES INTO ACCOUNT HUMAN AND ENVIRONMENTAL NEEDS

The condition of space is a consequence of systems of values, implementation of policies, individual choices, and processes beyond human control.

The low awareness of the society and decision-makers concerning the role of spatial planning, and the lack of spatial education translate into indifference and misunderstanding of the significance and consequences of subordinating the spatial policy to individual interests and putting individual interests over the public interest.
Space must be treated as a common and limited good.

Spatial management should be based on long-term participatory planning that takes into account access to technical infrastructure, public services and landscape values, including cultural ones. It is necessary to limit the spread of uncontrolled development and encroachment into areas in need of protection. Space in Poland needs to be better prepared for and adapted to climate change (see Megatrends: Reorganisation of space, Increasing pace of environmental and climate change; see Challenge: A modern economy that respects the natural environment and climate).

Since the early 1990s, as a result of the system transformation, and later as a result of the integration with the EU, significant changes in the socio-economic and institutional development conditions have been observed in Poland, which have caused effects in the spatial management of individual territories that are hard to reverse. Highly productive economic activities and modern services are concentrated within a limited group of settlement centres, mainly urban, and in their functional areas. Spatial polarisation between the largest cities and their functional areas and less prosperous medium and small towns and rural areas must be reduced. The polycentric layout of the functional and spatial structure, based on an expanding transport network and functional links between centres in the country and within international systems, needs to be strengthened. Areas where the role of agriculture and the development of new economic activities are on the decline require special attention. The attractiveness of those areas must be increased in order to offer the residents better income conditions and opportunities to meet their basic needs and develop. In the spatial context, the development policy requires a comprehensive approach that takes into account the cause-and-effect relationships between the ongoing trends, development factors and the current development vision. The spatial consequences of development processes within the framework of the identified trends allow identification of key challenges that should constitute important areas of a long-term, integrated and territorially sensitive national development policy.

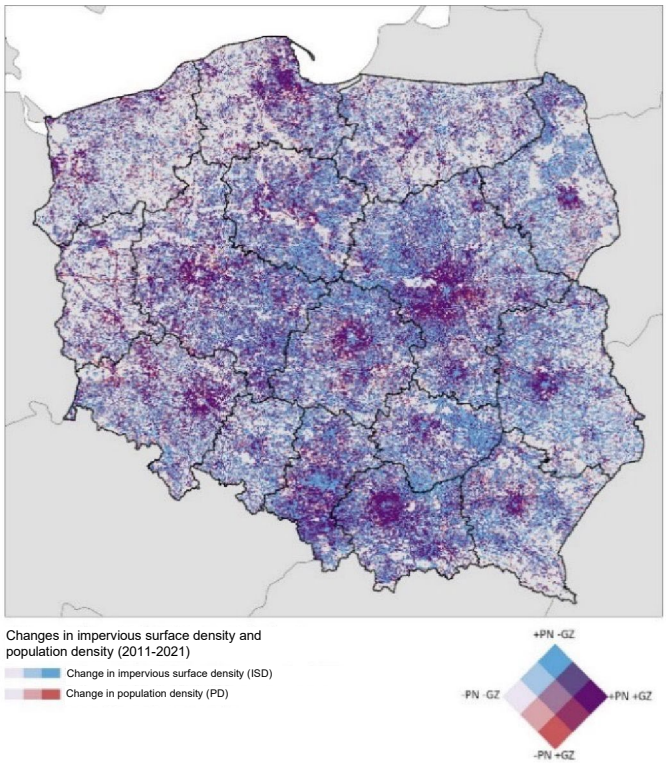
Well-planned and functional space

Reversing the adverse spatial changes requires the recognition of space as a common good and a limited good. Space and its diversity should be taken into account in the planning and implementation of all public policies. There is a need for education in this area and improved awareness among decision-makers and the public, including children and young people, concerning the perception of space as a rare resource and the necessity to protect and manage it in a reasonable manner (see Challenge: *Skill-oriented and social awareness-raising education*). The recognition of space as a common good requires emphasising the public interest vis-à-vis the individual and the development of mechanisms for balancing private and social interests as a sustainable element of the state policy. Understanding the sense of and rationale behind social interest-oriented spatial planning is essential to carry out the process of spatial organisation and increasing acceptance of planning decisions.

Awareness of the importance of the space and the benefits of proper spatial management are prerequisites for improving the quality, resilience and living standards of its users. Responsible land use planning and development reduce the pressure on the natural environment, protect open and undeveloped land, eliminate spatial conflicts and ensure the spatial coherence of natural systems (Map 21). At the same time, local communities living in protected areas, including landscape conservation areas (priority landscapes), should be supported in order to strengthen

their commitment to nature and landscape conservation while enabling them to function in these areas. This can also be among elements that facilitate better implementation of investments, ensure optimal access to public services and have a positive impact on the financial situation of local authorities and residents.

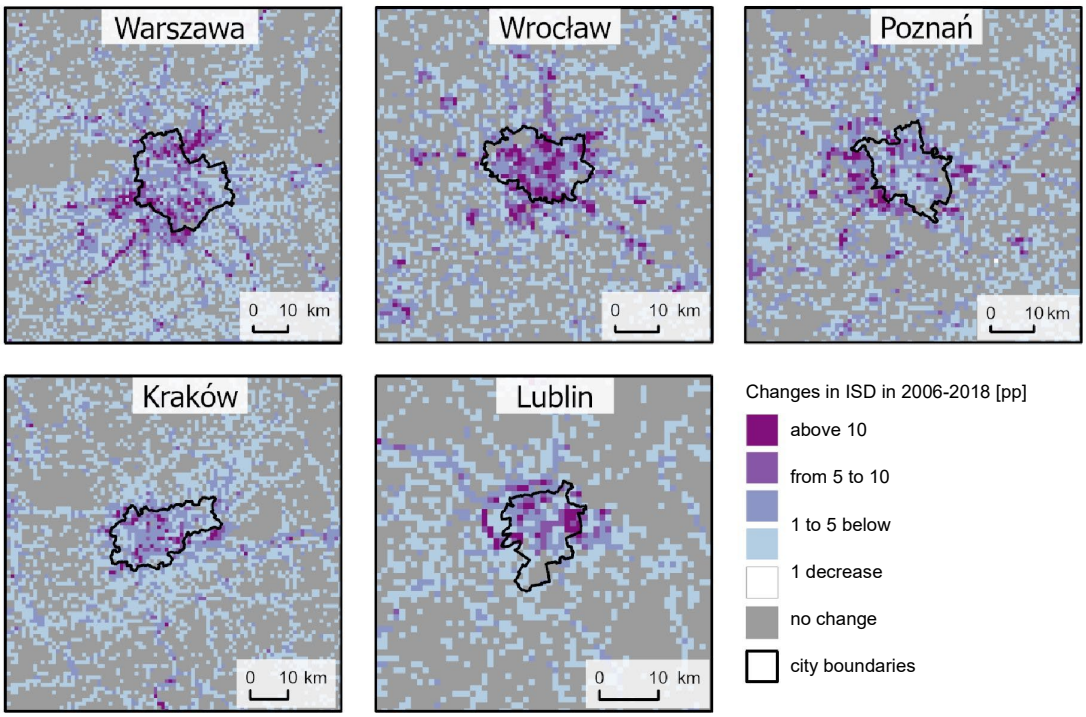
Map 21: Change in impervious surface density (ISD) and population density (PD) in 2011-2021



Source of data: own study based on HRL Imperviousness - Changes 2006-2009, 2009-2012, 2012-2015, 2015-2018 data

Development planning requires an integrated approach - treating spatial planning as a mandatory part of development planning. Spatial conditions and spatial processes should determine socio-economic development, and socio-economic development should be considered in terms of its impact on changes in the environment, space, resources. Spatial management should take greater account of the prevention and mitigation of risks arising from geopolitical, socio-economic and climate changes (see Challenge: *A state resilient to threats*). This requires considering a number of factors, including the protection of valuable soils and water resources, blue and green infrastructure, limitation of floodplain development, enhancements in the critical infrastructure and development of transcontinental and trans-European transport links, including seaports. Local governments should develop and implement climate change adaptation strategies and plans, including through urban greening and the use of blue-green infrastructure, embedding these measures in the conduct of their development policies. At the same time, urban areas should be saturated with infrastructure for energy production and storage, keeping in mind the need to preserve the functionality and aesthetics of urban spaces at the same time. It is necessary to achieve urbanisation control by making realistic links to the current and projected population numbers, development needs, access to infrastructure and the protection of valuable natural and agricultural areas. As a first step, brownfield sites should be redeveloped to complement the existing settlement structures. Only then can investment land be released gradually and in a planned manner. The current spatial effects of suburbanisation through changes in the impervious surfaces around selected provincial centres are presented in Map 22.

Map 22: Change in impervious surface density (ISD) in selected cities in 2006-2018



Source: Łachowski W., Łęczek A., Jastrzębska B., Banaś J., Rozwój przestrzenny miast i regionów Polski w świetle trendów europejskich. Analiza z wykorzystaniem danych Copernicus, Integrator Danych Miejskich IRMiR

It is necessary to continue to organise the development planning system, to strengthen its role and to make it coherent and holistic. The efforts that have already been made to amend development planning regulations should be finalised, and an analysis of the spatial conditions and effects of specific legal actions and solutions should be integrated into the law-making and decision-making processes. It is also important to redefine the main actors and objects (at national, regional, functional and local levels) in the development planning system, and rethink how they relate to each other and influence the shaping of space. Effective spatial management should engage local communities in the spatial development process as much as possible.

Polycentric nature of the settlement network

The challenge for Poland is to maintain and strengthen its polycentric nature at every level of settlement units, as well as its balanced structure across the country, not only in the sense of population distribution, but also in the sense of economic and social activity. It is also crucial to ensure a satisfactory standard of living for residents, wherever they live, through the availability of housing, modern infrastructure (e.g. access to 5G networks), access to good quality public services, access to leisure facilities, including forests, and the availability of public transport, which determines many other processes. As the effects of climate change continue to advance, ensuring continued access to water resources in areas at risk of long-term drought and desertification, while ensuring flood safety, is becoming a new challenge. In order to ensure attractiveness of individual cities and their surroundings, it is necessary to nurture a high-quality human capital and business-friendly environment. Creating the conditions for development will provide an opportunity to improve the level of professional activation of local communities and to strengthen the competitiveness and attractiveness of individual urban centres (see Challenges: *Attractive development prospects for the younger generations*, *An economy with stronger local links*, *A stable system of state governance and co-governance*). Shaping Poland's polycentric spatial structure and counteracting the increasingly pronounced polarisation processes within the country's territory require territorial balancing of development, coordination of spatial planning and taking e.g. mobility and flows into account.

Current trends (demographics, concentration of capacities to participate in the new economic model, including assimilation of and active participation in technological and social changes) show that metropolisation processes have accelerated. In the first place, it is necessary to ensure that metropolitan areas are able to organise and

operate and that their self-governance is enhanced. Metropolises need to be perceived and operated on a functional basis and opportunities for coordination and real cooperation in the execution of public tasks need to be ensured. At the same time, there is an increasing pressure to restructure borderlands and areas where energy and labour-intensive economic sectors based on fossil fuel energy are located (see Challenge: *Energy transformation*), which may weaken their developmental dynamics (see Challenge: *Multifunctional rural areas*). It will be important to stabilise the polycentric settlement structure in such a way that acceptable access to and standard of services are ensured everywhere. In this respect, an important role should be played by the social economy sector, including the cooperative sector, which can meet the key needs of local communities (see Challenges: *Attractive development prospects for the younger generations, Mitigated effects of an ageing population, An economy with stronger local links*).

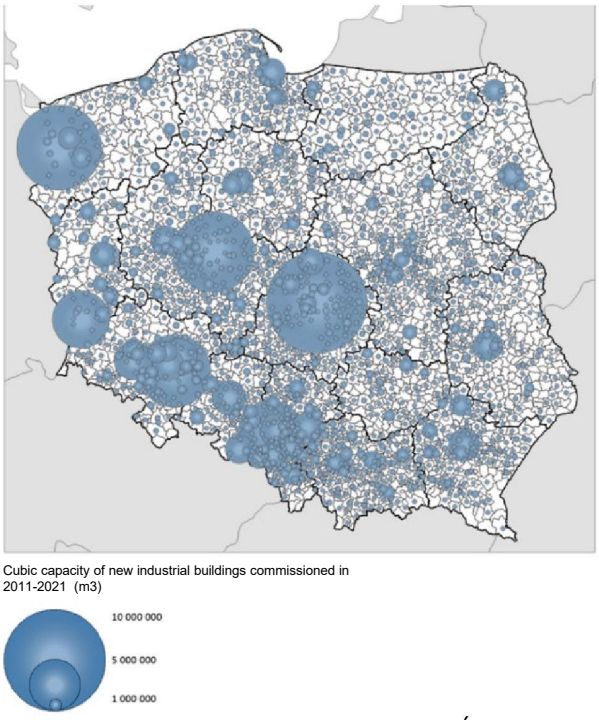
The majority of the Polish population is concentrated in urban centres and their functional areas, including metropolitan areas. At the same time, many cities are experiencing developmental difficulties, reducing the range of available public and market services and losing their socio-economic functions. As it transpires from demographic forecasts, maintaining polycentricity requires counteracting the marginalisation of cities through e.g. strengthening local and regional labour markets and creating opportunities for lifelong acquisition of new competencies (see Challenge: *Harnessing opportunities from technological acceleration*), developing modern infrastructure, and ensuring a good quality system of public services and conditions for the development of market services. It is important to provide systemic support for small and medium-sized cities, which have an important function in building the polycentric structure of the regions. Opportunities for cities in socio-economic crisis will be created by strengthening their cooperation with strong urban centres, particularly through economic linkage, transfer of knowledge and information (see Challenge: *An economy with stronger local links*), and a low and zero-emission transport system (see Challenge: *Energy transformation)*. The spatial deconcentration of some of the public services and entities will provide these centres with an additional development boost. The development process of smaller cities and their functional areas must take into account their natural and cultural assets which represent their important potential and possible competitive edge. Development opportunities for those areas should also be sought in modern technologies, however, this requires the ability to adapt to new solutions and technologies.

Smaller urban centres and rural areas, including ones affected by depopulation, can function well and attract residents by providing them with cheaper housing, technical conditions that to enable them to work remotely, and an opportunity to settle down to a relatively high standard in an aesthetic and functional space of a smaller scale.

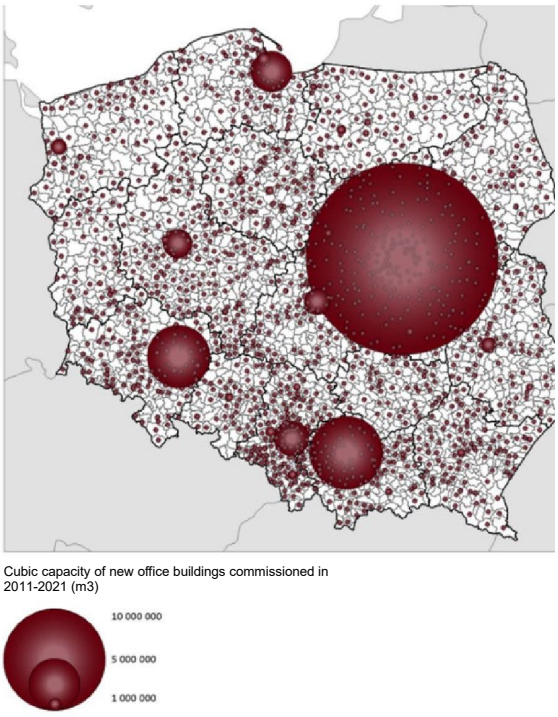
Polycentricity within the metropolises themselves and their functional areas also needs to be strengthened. Their extended structures need multifunctional local centres to bring together residents and offer accessible and good-quality public services. This will facilitate satisfaction of social needs close to home, including needs that arise from the progressive ageing of the population and technological change (see Challenge: *Mitigated effects of an ageing population*).

Polycentric development requires strong transport accessibility and organisation, notable as regards public transport, which at present is either insufficiently efficient or not adapted to the needs of residents in many towns and rural areas. The challenge is to develop an integrated, convenient, accessible and environmentally friendly transport system that takes into account specific regional and local circumstances. Target solutions should be selected and implemented on the basis of analyses, and should foster environmental protection and meet the needs of the residents. Railway, as the least emission-intensive mode of transport, should be a priority in the state's transport policy, and should be accessible to as many people across Poland as possible, and integrated with other modes of transport. Complete, up-to-date, integrated and well-organised passenger information should also be provided to facilitate access to public transport.

Map 23: Cubic capacity of new industrial buildings commissioned in 2013-2023 [m^3]



Map 24: Cubic capacity of new office buildings commissioned in 2013-2023 [m^3]



Source of data: own study based on Statistics Poland Local Data Bank (BDL GUS) data

Preserving polycentricity requires creating conditions for the development of centres of different sizes, as well as mechanisms for generating wider benefits for these centres. The development of the economic and service sector is one of the conditions for ensuring polycentric development (Maps 23 and 24). The present-day transformation of development factors caused by such phenomena as the adjustment of the globalisation model (see Challenge: *An economy with stronger local links*), the social revolution influencing human spatial behaviour, the increased importance of environmental protection in the context of climate change (see Challenge: *Protection of natural capital and a moderate economy*), changes in the sources of energy production (see challenge: *Energy transformation)*, and the technological revolution offer a special opportunity to peripheral areas. Most of these phenomena will have a major impact on the different elements of the country's spatial development (settlements, infrastructure, environment) and the development opportunities in individual territories.

The structure of the national settlement network can be viewed through the prism of administrative division, and the administrative map of Poland can be used as its commonly accepted and relatively static visualisation. It can also be seen in a much more dynamic functional perspective[19]. In the latter case, the city and its role in the settlement system are considered in terms of their functions. Likewise, the city's area of influence is determined by functional links with the surrounding areas rather than by the boundaries of administrative units. When applying the functional approach, it is important to bear in mind that the position and role of cities are constantly changing under the influence of many external and internal factors.

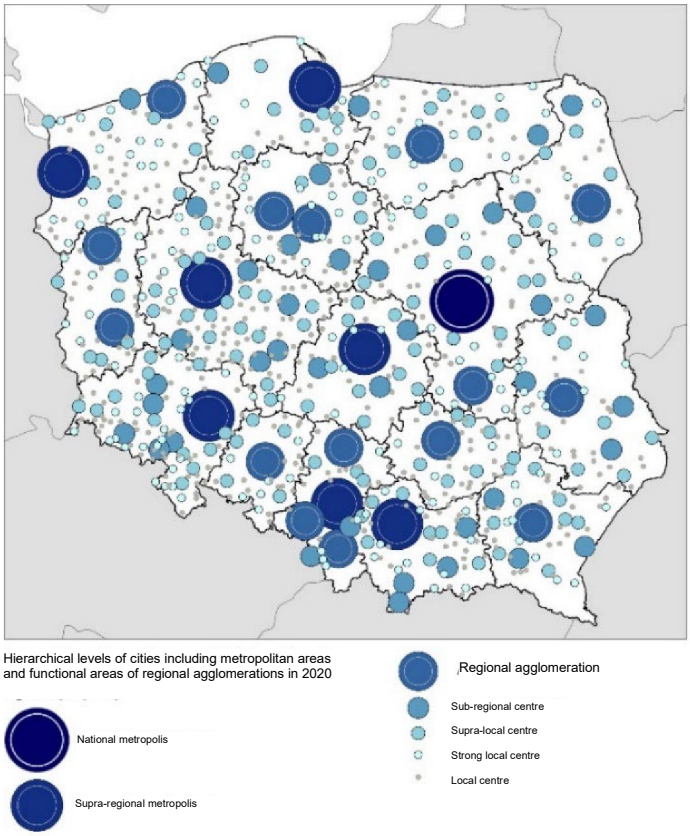
The application of the functional approach in development policies is more difficult than relying on administrative division, but when used well, it allows better definition of policy objectives and the adaptation of instruments for their

[19] Eberhardt, P. "Krajowy system osadniczy." *Czasopismo Geograficzne* 57.1 (1986): 21-45; Swianiewicz, P. *Społeczno-ekonomiczna typologia miast i gmin w Polsce*. Vol. 19. Wydz. Geografii i Studiów Regionalnych UW, Instytut Gospodarki Przestrzennej, 1989; Korcelli, P. "System osadniczy Polski-tendencje i uwarunkowania przemian." Studia. Polska Akademia Nauk. Komitet Przestrzennego Zagospodarowania Kraju 122 (2008); Kaczmarek T., 2008, Zmiany struktury funkcjonalnej średnich miast w Polsce, Biuletyn KPZK PAN, Warszawa, 182, pp. 177-196; Panecka-Niepsuj M., 2012, Miejsce miast średnich w systemie osadniczym Polski, [in:] A. Zborowski (ed.), Człowiek, społeczeństwo, przestrzeń. Volume 2, Instytut Geografii i Gospodarki Przestrzennej UJ, Centrum Kultury Ekumenicznej, Myczkowce-Kraków, pp. 85-106; Runge A., 2013, Rola miast średnich w kształtowaniu systemu osadniczego Polski, Wydawnictwo UŚ, Katowice; Komornicki T., Korcelli P., Siłka P., Śleszyński P., Świątek D., 2014, Powiązania funkcjonalne pomiędzy polskimi metropoliami, IGiPZ PAN, Wydawnictwo Akademickie Sedno, Warszawa; Śleszyński P., 2016a, Delimitacja miast średnich tracących funkcje społeczno-gospodarcze, ekspertyza wykonana dla Ministerstwa Rozwoju na potrzeby Strategii na rzecz Odpowiedzialnego Rozwoju, Instytut Geografii i Przestrzennego Zagospodarowania PAN, Warszawa

implementation with regard to the specific characteristics of specific areas, thus increasing the dynamics and effectiveness of development processes. Due to the high dynamics of change, the country's settlement structure in functional terms was visualised in a map (Map 25) taken from from the study *Hierarchia funkcjonalna miast w Polsce i jej przemiany w latach 1990-2020* (Sobala-Gwosdz, Czakon, Janas, 2024). The typology of the country's settlement network structure presented on the map illustrates the state in 2020. Such an approach may be valuable to public administration also because the boundaries of functional areas are taken from one of the delimitations used in public strategic planning.

The map shows the differing potentials of urban centres and their functional areas. It does not determine the possibilities for future development of individual city centres or their future position in relation to other cities. It is intended to be an impulse for the verification of the functions of urban centres that need to be strengthened first in order to systematically improve the quality of life of the inhabitants (both of the urban centre and its functional area). An important element in maintaining a resilient polycentric network is also the cooperation and strengthening of functional links between cities in order to increase the attractiveness of larger agglomeration areas or entire regions and to attract new residents or investors.

Map 25: Typology of main centres

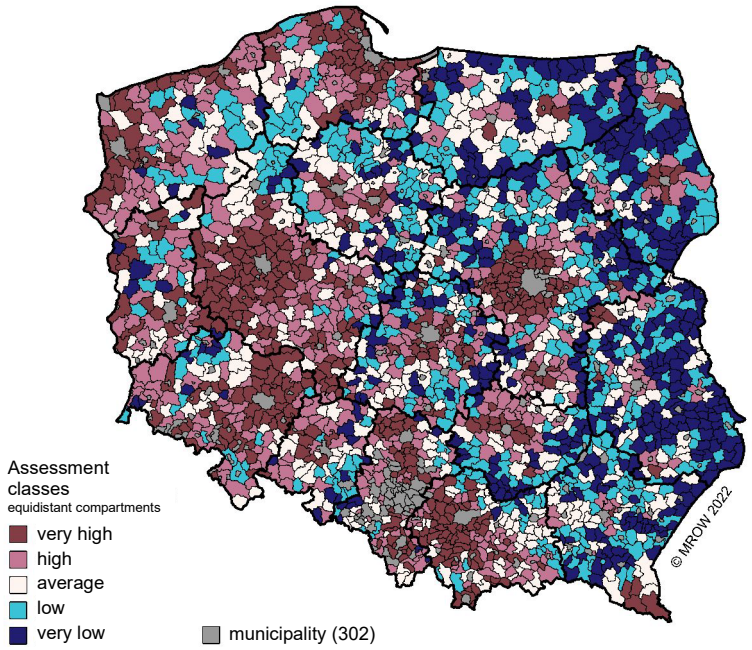


Source of data: Compiled by OPMR IRMiR based on Sobala-Gwosdz et al. 2024

Multifunctional rural areas

Rural space is multi-faceted and very diverse regionally, with non-agricultural land uses, often inconsistent with the rural landscape, taking up an increasing share of that landscape. The challenge is to reorient rural areas, especially peripheral ones, as areas with attractive conditions for living, working and doing business. An opportunity for the development of these areas lies in a further implementation of the concept of rural renewal, and increased level of rural multifunctionality and endogeneity (Map 26).

Map 26: Synthetic measure of assessment concerning the development of non-agricultural functions



Source: Monitoring rozwoju obszarów wiejskich. Etap IV, Monika Stanny, Andrzej Rosner, Łukasz Komorowski, Fundacja Europejski Fundusz Rozwoju Wsi Polskiej, Instytut Rozwoju Wsi i Rolnictwa PAN, Warszawa 2023

The application of solutions based on knowledge and innovation with respect for the natural environment and enhancing the importance of natural resources can improve the quality of life, provide high quality services and jobs, which will contribute to solving various rural problems, including depopulation.

In order to ensure territorial cohesion, it is necessary to eliminate disparities in the living conditions and quality of life of the Polish population. This requires multifaceted and coordinated actions related to the development of infrastructure, labour market and access to public services. There is a need for ensuring basic standards in education, health care, social welfare, public transport and telecommunication infrastructure based on quantitative as well as qualitative criteria.

An opportunity for rural areas lies in the development of a service sector with the use remote and mobile services. Improved accessibility of many services and the labour market can be provided by proximity to cities, including small towns. An opportunity for non-urban areas is also provided by a wider promotion and greater use of remote working, which can have a positive impact on employment in rural areas. It also gives rural residents the opportunity to specialise in occupations suited to remote working (see Challenge: *Well-planned and functional space*). In areas with unique environmental and landscape values and cultural heritage, opportunities for the development of various forms of tourism and recreation should be exploited. The energy transformation and further development of technologies based on distributed, renewable energy sources can provide a major boost to rural development.

The further transformation of rural areas into multifunctional areas is a considerable challenge in terms of spatial planning. The decline in the number of agricultural holdings, the development of non-agricultural functions and the consequent increase in the area occupied by non-agricultural land uses, as well as residential and commercial areas, infrastructure elements related to renewable energy (see Challenge: *Energy transformation*) and ecosystem services (see Challenge: *Protection of natural capital and a moderate economy*) require strengthening of the spatial conservation, planning and management in order to *inter alia* preserve agricultural functions and maintain food production (see Challenge: *Protection of natural capital and a moderate economy*).

There are still areas in the countryside which need regeneration and identification of new social and economic functions for them. This mainly applies to former state-owned agricultural holdings that have not been redeveloped. Areas where villages are shrinking or disappearing require a special approach. The process must first and foremost take into account the endogenous functions of the countryside. Borderlands represent a special type of rural areas that require a separate approach due to their specific characteristics. A freeze in cooperation with Russia and Belarus is a barrier to the development of the borderland areas in the Warmińsko-Mazurskie and Podlaskie Voivodeships and areas that have to date been oriented towards economic cooperation with these countries. The cross-border functional areas of these areas have lost their importance. Areas bordering Russia and Belarus are beginning to perform new functions related to building resilience to military and hybrid threats, including uncontrolled forms of migration and cross-border crime. The initiated accession process of Ukraine to the EU will also have an impact on the further increase in flows across the Polish-Ukrainian border.

Changes to the functional and spatial structure can carry examples of potential effects:

- improved access to the labour market,
- improved accessibility of public transport and other public services,
- development of technical infrastructure, including broadband networks,
- reduced commuting between towns, thanks to better accessibility to basic public services and the labour market,
- reduction of uncontrolled suburbanisation, improved functionality and aesthetics of spaces,
- preservation of environmentally valuable areas and ensured protection of ecological corridors,
- development of blue-green infrastructure,
- protection of agricultural spaces,
- rehabilitation and redevelopment of degraded land,
- intensification of functional and spatial links between Poland and Ukraine,
- improved functionality and aesthetics of spaces,
- adaptation of metropolitan housing and functional areas to dual-use functions (multifunctionality),
- change in the functions of rural areas (mostly in depopulated areas) - development of tourist infrastructure, development of renewable energy infrastructure, disappearing buildings.

KEY CONCLUSIONS

The key conclusions of the NDC aim to identify the most important issues requiring public policy intervention and support in the long term. They provide a basis for focusing the state's actions over the next decade within the goals and priorities of the medium-term strategy.

Based on data analyses, they are intended to support the best decision-making by government and local government administrations and the efficient allocation of resources, as well as to increase the effectiveness of development policies. The conclusions also create a room for dialogue and cooperation between the public sector, private sector and NGOs.

From the trends, scenarios and challenges identified in the NDC, there is a need to:

1. Strengthen the state governance system through: a) introduction of a new model of forward-looking thinking that enables continuous and objective anticipation and evaluation of opportunities for and threats to the country's development, and thus timely development of policies in the context of major transformations, b) integration and improvement of the system for collecting, analysing and interpreting data from public and private sources in order to provide a comprehensive picture of the country's situation, c) introduction of departmental cooperation mechanisms to move away from acting in sectoral terms towards the efficient development of joint solutions, d) greater empowerment of local government units and modernisation of their financing system to enable them to implement an integrated development policy, e) utilisation and enhancement of the potential of civil society for development and organisation of social partners representing the interests of employees and employers, and their wider inclusion in public decision-making processes.

2. Adapt the country's development paradigm to the global challenges whose effects are and will be most crucial for shaping the future of the planet through: a) changing the fundamental principles and approaches used in the formulation and implementation of public policies so that they can make a real contribution to generationally, socially and environmentally fair use of resources and are not focused solely on GDP growth, b) raising the natural environment and space to the status of critical resources in all areas of life and decision-making processes, c) strengthening social equality, solidarity and human rights within the established set of state governance values, d) sustainable implementation of moderate use of resources, reduction of the environmental pressure, including specifically limitation of greenhouse gas emissions, in industry, agriculture, transport and construction, e) increased public awareness of the impact on the planet and promotion of responsible consumption, f) active participation in international initiatives and agreements aimed at addressing global challenges.

3. Strengthen the state's resilience to threats and crises in an era of increasing geopolitical, economic, climate instability through: a) investing in research and development of breakthrough technologies (particularly dual-use technologies) within the framework of international alliances to enhance the country's economic strength, moderate economy, social cohesion, natural environment and the stability and security of the country and the EU and its people, b) ensuring a stable, efficient and sustainable energy system, diversifying energy sources and improving energy efficiency, c) protecting biodiversity, ecosystems and natural resources, d) ensuring the resilience of critical infrastructures such as energy, transport, ICT, and strengthening the crisis management and civil protection system focused on crises related to climate change, public health, terrorism and cyber attacks and espionage, e) increasing the state's activity in international cooperation and diplomacy, strengthening the country's position in European and transatlantic alliances, and building other alliances that can enhance the state's ability to respond to potential threats, f) participating in European and global work on the future of the EU and transatlantic security architecture in all its dimensions, and systematically increasing the state's defence capabilities, g) carrying out activities to enhance food security.

4. Raise the status of spatial planning and management based on cooperation of local government units (functional approach) in the country's management system in order to better plan space so that it can foster socio-economic development, respect the environment, enable easy and quick access to public services at home avoid generating additional service costs through: a) further integration of spatial planning into the

development policy, b) deepening the integration of sustainable development principles into spatial planning, including environmental, landscape, social, economic and functional aspects, so as to minimise spatial conflicts and the negative effects of spatial management on the environment, while supporting the development of local communities, c) introducing innovative functional management solutions, d) making a greater use of advanced technologies to better understand development patterns and make more effective planning decisions.

5. Ensure the continued development of the state requires a multi-domain transformation, primarily in terms of: a) education, so that teaching curricula emphasise the need to develop skills of the future, support the development of students' talents, develop students' ability to use modern technologies, to increase their own capacities and opportunities in the labour market, and so that the adult learning system could enable learners to adapt to the dynamically changing labour market, b) energy transformation, so that the state's energy security is enhanced and convenient and fair development conditions are created for local communities, c) the economic development model, so that the state's participation in the economy, dictated *inter alia* by concerns about its economic security, could be conducive to increasing the competitiveness of the economy and building the state's empowerment vis-à-vis corporations whose influence on economic processes is now on the rise, d) implementation of modern technologies in a number of areas important for the functioning of the state and its economy - in particular, education, health, energy transformation, public administration, transport, agriculture, construction, spatial planning, decision-making processes, including the mechanisms of democracy, and also for building the capacity to create modern technologies, so that Poland can steadily climb up the sector-specific value chain, e) directing the research activities of entities within the higher education and science system by defining objectives arising from strategic challenges, while ensuring flexibility for these entities in choosing the most appropriate research methods and technological solutions.

6. Prioritised and multidimensional approach to building the social cohesion, so that the various challenges in the political, social, cultural, economic and technological area do not exacerbate inequalities, as this could lead to the atomisation of the state and the society. Counteraction measures in this respect should include, but not be limited to: a) preventing any kinds of exclusion, b) maintaining the social character of the market economy in the context of technological transformations that may lead to an increased socio-economic and spatial polarisation by *inter alia* supporting the development of the social economy, c) equalising development opportunities among and within regions, d) continuing a just transition and building state competence in this area, e) building a sustainable adult learning culture.

7. Achieve the country's strategic objectives and development priorities in a multi-year perspective requires the design and implementation of changes in the area of public finances that take into account the short and long-term economic conditions of Poland's development. These mainly involve: a) creation of mechanisms for development and public finance management that simultaneously ensure the implementation of the state's strategic objectives, creation of conditions for short and medium-term balance of public finance and for sustainable and balanced economic development in a long-term perspective, bearing in mind the decrease in the volume of the cohesion policy funds allocated to Poland as the country's social and economic condition improves in the future, b) ensuring stability, security and sustainability of the system of public finances, which means striving to reduce the imbalance between public revenues and expenditures, in particular by generating public revenues at a level necessary to fulfil the main functions and tasks of the state, as well as streamlining public expenditures and increasing their efficiency, c) ensuring transparency of the financing of strategic objectives and development priorities, which translates into *inter alia* the ease of monitoring of the functioning of both the entire system and its components, by ensuring transparency and consistency of applicable classifications and information standards, d) introducing effective tools to enable efficient allocation of public funds in successive budgets to support the implementation of the state's strategic objectives and development priorities.

GLOSSARY OF TERMS

Climate change adaptation	the process of adapting to and mitigating effects of the expected and actual impacts of climate change, including extreme meteorological and hydrological events and long-term changes in climate conditions.
Algorithms of trauma	the mechanisms of algorithms on social media platforms such as Facebook that suggest content based on users' emotions, often exploiting their fears and insecurities and providing stressful content.
Civilisational aspirations	long-term goals, ambitions and desires that relate to the progress, social, cultural, economic and technological development of a given civilisation, society or group of people. These are high-level goals that go beyond current needs and focus on creating a better future and achieving a higher level of civilisational development.
Social atomisation	the process of the disruption of social ties and the decline of social integration.
Automation	the reduction or replacement (a process of replacing) of human physical and mental labour by the work of machines that operate on a self-regulating basis and perform certain activities without human intervention.
Energy security	a condition where a country or region has assured access to reliable, stable and diversified sources of energy that are sufficient to meet its economic, social and military needs, with a minimum risk of supply disruptions and with ensured sustainable development.
Food security	a condition where the inhabitants of an area have assured regular physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences necessary for an active and healthy life.
Big data	huge datasets of disparate data that are generated in real time from diverse sources, such as social media, sensors, IoT devices or transactional systems. Big data analysis allows for more precise modeling of social, economic and environmental trends, supporting better strategic decision-making, especially in the areas of urban management, environmental protection or urban planning.
Blockchain	a decentralized data storage system that enables secure, transparent and tamper-proof storage and transmission of information in the form of a chain of blocks. The technology can support digital transformation, providing secure transactions and data exchange in the public sector, finance and other key industries.
Brownfields	degraded industrial, post-military or post-mining sites that have been abandoned or are underutilized, and may be difficult to redevelop due to environmental contamination or the need for remediation. Brownfields represent a potential resource of space for revitalization and reuse, which fits in with sustainable development and a circular economy. The transformation of these sites can contribute to urban development, improve the quality of life and protect the

	environment, while reducing pressure on the development of green and open spaces.
Blue and green infrastructure	a multifunctional network consisting of areas covered by vegetation or water and solutions based on natural functions, designed and managed to provide a wide range of ecosystem services.
Climate goals	commitments and targets set within the UN framework to combat climate change and global warming. These goals include reduction of the average global temperature increase, carbon neutralily and greenhouse gas sustainability, strengthened climate change adaptation, financial and technical support for developing countries, reduction of greenhouse gas emissions, protection of forests and ecosystems.
Vector-borne disease	a type of infectious disease that is transmitted between organisms, especially humans and animals, by living organisms (vectors) such as insects or microorganisms. Vector-borne diseases are particularly dangerous because they allow pathogens to spread over considerable distances.
Cybersecurity	a set of activities, policies and mechanisms aimed at protecting assets such as information systems, networks, software, critical infrastructure, and public and private data from threats emanating from cyberspace, such as hacking attacks, malware, data leaks and attempted interference by external actors. Cyber security also includes prevention, monitoring and incident response activities to ensure the integrity, confidentiality and availability of the country's digital assets. The goal is to promote the country's economic, social and political stability in the face of growing technological threats.
Digitisation	the process of transferring various aspects of human activity to digital platforms and using modern information technologies to improve the efficiency, innovation, competitiveness and quality of services and products.
Deglobalisation	the process of diminishing the degree of global economic, political and cultural integration among countries and regions, where countries seek to reduce their dependence on international markets, companies and institutions, often placing a greater emphasis on local ties.
Decarbonisation	the process of reducing or eliminating greenhouse gas emissions, especially carbon dioxide, mainly from human activities such as combustion of fossil fuels (coal, natural gas, oil) and industrial processes. The main objective of decarbonisation is to reduce the impact of human activity on the climate and curb global warming.
Participatory democracy	a form of democracy in which citizens actively participate in the political and social decision-making process, not only by electing their representatives, but also by taking an active part in debates, discussions, consultations and decision-making on public issues.

Disinformation	intentional dissemination of false or misleading information (distorting facts, creating false narratives or promoting false theories) in order to mislead, manipulate public opinion and influence the beliefs, attitudes or behaviour of the target audience.
Digital twin	a digital representation of a real object, system or process that enables simulation, monitoring and optimization of its performance in real time. Digital twin technology can support the efficient management of infrastructure, industry or urban spaces, allowing for the prediction of failures, optimization of resource consumption and better urban planning.
Ecological debt day	the day on which mankind has consumed the resources (i.e. soil, fossil fuels, forests, raw materials, water) attributable to an entire year to produce goods and services, thereby surpassing the Earth's capacity to renew them.
Effective multilateralism	multilateral cooperation among states and other international actors to achieve common goals and address global issues through dialogue, negotiations and interaction within the framework of treaties, international agreements and strategic partnerships.
Planetary diet	a way of eating that aims to both provide a healthy diet for people and minimize the negative impact of food production on the environment. It's a concept that has gained popularity in recent years because it combines human health with protecting the planet. The diet is plant-based and recommends limiting zoonotic products, especially red meat, the production of which consumes a large amount of the planet's resources and contributes to high greenhouse gas emissions.
Social economy	an approach to the economy that emphasises achieving social and environmental goals alongside economic ones. It is a form of economic activity based on social values, solidarity, social justice and sustainable development, aiming to improve people's living conditions and well-being and to protect the environment.
Sharing economy	an economic concept based on enabling individuals to share resources and services by means of, e.g. digital technologies in order to reduce the consumption of new resources and enable other users to reuse the existing ones.
Prosumer energy	energy generation by local communities, energy co-operatives or associations working to reduce dependence on fossil fuels, reduce greenhouse gas emissions and create local sources of sustainable energy.
Strategic foresight	the process of anticipating, investigating and analysing potential future events, trends and uncertainties. It involves understanding the complex interactions between various factors such as technological progress, social changes, economic changes, political dynamics and environmental trends, and then using this knowledge to make decisions and formulate strategies.

Circular economy	an economic model based on minimising resource wastage by maximising the use, recovery and regeneration of raw materials and products. CE seeks to maintain the value of products for as long as possible by repairing and reusing, recycling and recovering materials, and aims to reduce the environmental impact of the economy, reduce the consumption of natural resources and reduce emissions and waste production.
Moderate economy	the concept that assumes that economic growth should not be the only goal of the economy, but instead efforts should be made to achieve sustainable prosperity, improve the quality of life and protect the natural environment. The moderate economy focuses on curbing excessive consumerism, reducing social inequalities and ensuring sustainability.
Natural capital	environmental and ecosystem resources (forests, rivers, oceans, soils, biodiversity, air and other elements of nature) which provide economic, social and ecological benefits to humans and have a key role in sustaining life on Earth and in providing the raw materials and ecosystem services necessary for the economy and well-being of the society (provision of drinking water, air purification, pollination of plants, climate regulation and many others).
Competencies of the future	a set of competencies, skills and knowledge which are essential to function effectively in a rapidly changing socio-economic environment, to adapt to change, to acquire new professional opportunities and to cooperate and develop effectively in a dynamic world, and which are the key to success in a modern society and the labour market.
Territorial brands	the unique image and identity of a territory used for distinguishing it from its competitors and attract the attention of potential investors, businesses, tourists and other target groups.
Urban heat island	an area in a city where the temperature is much higher than in the surrounding areas, usually due to dense housing, lack of greenery, heavy traffic and other factors associated with urbanisation.
Mission-oriented research and innovation policies (MOIP)	a research and innovation policy aimed at solving global and local challenges.
Environmentally valuable areas	areas that are of particularly high natural, biological and ecological value. These are sites where unique fauna, flora, ecosystems or landscapes have been preserved and are essential for biodiversity conservation and sustainable management of natural resources.
Territorial resilience	the capacity of a territory to survive, adapt and recover rapidly in the face of shocks, crises or change/ the ability to minimise the negative effects of crises and return rapidly to stability and growth.
State resilience	the ability of a country (state authorities as well as the society) to effectively counteract and mitigate the adverse effects of diverse internal or external threats

	and crises and to maintain political stability, state security, social well-being and the integrity of its institutions and structures, as well as to adapt to related changes.
Micromobility vehicles	zero-emission single-person means of transport that are designed for short distance travel (bicycle, scooter, electric board, segway, electric trolley).
Polycentricity	a characteristic of the spatial system denoting that there are multiple centres within it around which (urban) structures emerge concentrically that are relatively autonomous in relation to each other, but at the same time remain interconnected.
Local food production	a food production process that takes place within a defined geographical area or region with the intention of supplying these products to the local community. It is characterised by minimising the use of long transport routes, which translates into lower environmental impact, fresher products and support for local economies and communities.
Robotisation	the process of introducing and using robots and automated systems in various areas of life, industry and services so that they can perform tasks that were previously performed by humans in order to increase the efficiency, accuracy and automation of various processes.
Development	a process of social, economic and environmental transformation that leads to an increased quality of life, strengthened social and intergenerational solidarity, sustainable use of resources (including space and the environment), a crisis-resilient and environmentally friendly economy, increased security, and strengthened democracy and the rule of law.
Development scenario	a description of a potentially plausible picture of the future created in the process of foresight analysis, along with possible public policy actions to implement the vision and respond to the transformation of the world and the country resulting from trends and potentially possible events that may occur in the future and affect the development of the country.
Key economy sectors	sectors that are of strategic importance to the economic development and well-being of the society and that contribute substantially to the generation of GDP and innovation and influence other sectors of the economy.
Silver economy	a response to the growing number of the elderly, covering a wide range of industries and services that meet their needs, including healthcare, well-being, leisure, housing, transport, finance, technology and many more. It covers not only products and services designed to meet the challenges and aspirations of older people, but also the wider economic and social implications of an ageing society.
STEM	science, technology, engineering, mathematics.

Dual-use technologies	technologies that can both generate benefits to the civilian economy and be used for the purposes of national defence and security.
Energy transformation	the process of changing the energy system to reduce greenhouse gas emissions, diminish dependence on fossil fuels and increase the share of renewable energy sources in energy production or transition from traditional polluting fossil fuel technologies such as coal, natural gas or oil to more sustainable and environmentally friendly energy sources such as solar, wind, hydro and geothermal and nuclear power.
Trend	the long-term directions of change and potential change in the global, European and national phenomena, the effects of which will have a significant impact on the social, economic, environmental, spatial and geopolitical spheres.
Ecosystem services	tangible and intangible benefits that people derive from the functioning of ecosystems. These benefits are generally divided into regulatory, cultural and supply-related.
Basic services	services necessary to meet the elementary needs of people and societies, including trade and repair services, basic education and health care, transport, basic public services.
Public services	publicly provided services aimed at the public interest and satisfaction of the needs of the population in the social domain (healthcare, education, social assistance, culture, sport, housing, labour market and public safety) and the technical domain (public transport, telecommunications, energy management, water management, waste management and environmental protection).
Vision	an inspiring picture of the country in the future, on the basis of which development challenges are set and public policies in the social, economic, environmental, spatial and geopolitical spheres are directed to achieve certain results and improve the quality of life of the country's residents.
Territorial vulnerability	a condition determined by physical, social, economic and environmental factors or processes which determines the susceptibility of a territory to the impacts of different types of hazards (as defined by United Nations Office for Disaster Risk Reduction). The greater the vulnerability, the greater the aforementioned susceptibility and therefore the potential losses if threats arise.
"Deniable" war	conflicts in which the states involved, or groups acting on behalf of those states, do not officially admit to destabilising activities while relying on complex propaganda tactics, disinformation and manipulation to maintain the impression that they are not carrying out the alleged activities or that they are only involved in defence or humanitarian assistance.

Challenge	a desirable change requiring a major organisational effort and the mobilisation of a variety of resources to formulate an appropriate public policy response to realise the country's vision, arising from previously identified trends and possible future effects outlined in scenarios.

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DATA SOURCES FOR MEGATRENDS

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1. Eurostat, 2022
2. The Global Innovation Index, 2024
3. *The Digital Economy and Society Index (DESI) 2022*, Poland 2022
4. The AI Readiness Index 2022, Oxford Insights, 2022
(5) Eurostat, 2020
6. Statistics Poland (GUS), 2020

Technological acceleration

7. United Nations Conference on Trade and Development, 2023
8. *The Government AI Readiness Index 2022*, Oxford Insights, 2023
9. Eurostat, 2023
10. *The Global Cybersecurity Index 2020*, International Telecommunication Union, 2021
11. Statistics Poland (GUS), 2023

The rise of global social problems

12. World Bank, 2019
13. UN, 2022
14. Eurostat:
a. Eurostat, 2021[20]
b. Eurostat, 2022
15. UN, 2021

Increasing dynamics of environmental and climate change

16. OECD DATA, 2019
17. IPCC, 2020
18. ESPON, 2020
19. WWF, 2020

Reorganisation of space

20. World Bank, 2020
21. Bartosz Bartosiewicz, Szymon Marcińczak, 2020, Policentryczność regionów miejskich w Polsce, Przegląd Geograficzny, 92, 4, 455-474
22. ESPON, 2018

Transformation of the global order

23. Institute for Economics & Peace, 2025, *The Global Peace Index 2025*
24. Statistics Poland (GUS), 2022
25. World Bank, 2021
26. Charron, Nicholas, Victor Lapuente, Monika Bauhr & Paola Annoni (2022) *Change and Continuity in Quality of Government: Trends in subnational quality of government in EU member states. Investigaciones Regionales-Journal of Regional Research*, 53, 5-23

[20] The lack of full comparability of the data from the period shown in the chart, resulting from numerous methodological changes and changes in the basis for generalizing the results of the survey conducted during this period.

27. *The Dooms Day Clock,* Bulletin of the Atomic Scientists, 2023