Polish Economic Institute

Responsible Development Index

GDP is not enough...

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Responsible Development Index in numbers

3 pillars	current wellbeing, creating future wellbeing and non-wage factors
8 indicators	based on World Bank and World Health Organisation data
162	countries covered global rank
29th	Poland's rank globally
+2 places	higher compared to 2015
Portugal and China	some of the countries behind Poland
Switzerland, Norway and Sweden	the countries at the top of the index

Key findings

Leading international experts on economics and social sciences have spent the past decades debating ways to measure economies' development. The most popular became Gross Domestic Product, which is easy to read, but has many flaws. The most significant include its failure to account for income inequality and the lack of direct information on factors not encompassed in national accounts that affect quality of life, such as safety or contentment. Stiglitz highlights that GDP is more a measure of supply in the economy than of quality of life. Others note that GDP does not consider the economy's environmental impact. Researchers and international organisations have proposed a series of alternative measures, which vary in popularity.

The Responsible Development Index is a Polish voice in this discussion and a response to other measures' failures. Limited universality, too many indicators, subjectivism or structural deficiencies are just some of the disadvantages of existing measures. The Index presented by the Polish Economic Institute is relatively resistant to similar criticism. Its three pillars measure current wellbeing, ability to create wellbeing in the future and non-wage factors. It is based on a relatively small number of indicators (eight) rooted in the literature. It is based on objective statistics from the World Bank's and World Health Organisation's databases, which span 162 countries worldwide.

In 2017, Poland ranked 29th globally and 30th, 51st and 23rd in individual pillars. It did best in the third pillar, influenced by high level of safety and high life expectancy. In this area, Poland even ranked above Finland and Belgium. In the pillars measuring current and future wellbeing, Poland ranked around 30th and has advanced in both pillars.

Switzerland opens the global ranking, claiming first place in the first and second pillars. Japan, which ranks sixth overall, came first in the third pillar.

Introduction

Beyond GDP

For years, the basic measure of economies' development and richness has been Gross Domestic Product, which started being used at the begining of the previous century. Eventually, it became apparent that GDP, and specifically its growth and pace, do not translate proportionally into an increase in richness and wellbeing for all citizens. Disproportions between citizens and states grew sharply. Moreover, the data collected to calculate GDP did not encompass the radical changes in economies' structure (Coyle, Mitra-Kahn, 2017), which translated into a lack of coherent methodology that considers all the economic changes in governments' policies.

Governments' increasing talk of wellbeing prompted a debate on the quality of GDP as a measure of wellbeing among a wide range of experts. Its main conclusions were unfavourable for GDP (Stiglitz et al., 2009; Coyle, Mitra-Khan, 2017). Many organisations and universities worked simultaneously on alternative measures. It was shown that GDP cannot be replaced by a single indicator reflecting quality of life and that focusing on the pace of economic growth is not the right approach to contemporary reality. Rising disproportions forced researchers to focus on even growth in wellbeing in society (Kosiedowski, 2016).

This broad conception of responsible development had broad aims, including reducing poverty and inequality, as well as restoring environmental balance. To achieve this, cooperation with political elites was necessary. The concepts of inclusive growth and inclusive development emerged in social thought to highlight the seriousness of the problem. The World Bank defines inclusive growth as that which reduces poverty and enables socially excluded people to participate in the benefits of economic growth (Ianchovichina, Lundstrom, 2009). According to the United Nations Development Programme, it refers to economic development that also encompasses the layer of socially excluded people regardless of gender, age, nationality, sexual orientations, physical ability and economic situation. Inclusive development seeks above all to mitigate inequalities, which is deepening worldwide regardless of economic growth, it adds (Kosiedowski, 2016).

Poland's strategy for the years up to 2030 includes the concept of responsible development, which more fittingly describes inclusive growth in Polish. According to the government's strategy, responsible development means "creating conditions for increasing Poland's inhabitants' income while increasing social, economic, environmental and territorial cohesion". The strategy is expected to make Poles richer while reducing the number of people at risk of poverty and social exclusion.

In search of a new indicator

As mentioned above, there is no international consensus on an indicator that could replace GDP. Table 1 presents some of the proposals that have appeared in the international debate.

The difficulty in finding a single indicator results from differences in how societies and cultures define wellbeing. Analysis of the literature on indicators "beyond GDP" shows that factors that make up a "better life" can be grouped into three fundamental categories:

- Standard of living broadly understood,
- Healthy living,
- Economic development, which determines the first two categories.

↘ Table 1. Some alternatives to PKB

Organisation	Name of the initiative
UN	The United Nations Development Programme
UN	The United Nations Research Institute for Social Development
UN	The System of Environmental-Economic Accounts
UN	Social Development Goals
UN	Social Development Goals Index
European Commission	The EU Sustainable Development Strategy
UN	Sustainable Development Indicators
OECD	The OECD Better Life Initiative
OECD	Green Growth Starategy
OECD	Inclusive Growth in Cities
UN	Human Development Index
European Commission	Horyzont 2020

Source: prepared by the authors.

Researchers were already working on alternatives to GDP in the 1960s. One of the first initiatives was the *United Nations Research Institute for Social Development*. The programme led by a Pole, Professor Jan Drewnowski, studied the interdependence of economic growth and social living conditions in Third World countries. Drewnowski's team worked on social indicators, measures of the population's standard of living, and tools for measuring social management effects and quantification of the degree to which the population's material and cultural needs were met (Drewnowski, 1970, Luszniewicz 2006, p. 10). In 1974, Drewnowski published a final version of an index measuring the population's standard of living (Drewnowski 1974, p. XIII, 148).

These efforts have been continued by the UN, which employed various expert groups, international agencies, regional organisations and national statistical offices. To aid the implementation of the Millennium Development Goals, the UN created standards for collecting statistical data from official sources. The *System of Environmental-Economic Accounts* (SEEA) was developed as a part of a broader set of international statistical standards (GUS 2016). The UN passed the "*The Future We Want*" resolution and in September 2015 its General Assembly adopted the Agenda 2030 (UN 2015), which sets out Social Development Goals (SDG) for the years up to 2030. These include ending poverty, improving health, protecting global resources, gender equality, peace and social justice. The resolution replaced the Millennium Development Goals. Progress in implementing the Agenda is monitored, compared and evaluated based on a special index based on 99 indicators, the SDG Index.

The European Commission joined the debate in 2000, when social goals appeared alongside

fundamental economic goals for the first time as necessary for realising the latter in the EU's development plan, the Lisbon Strategy. In 2001, the Commission adopted the EU Sustainable Development Strategy, which was renewed in 2006. The Strategy established the framework and key areas for the enlarged EU. As a part of it, Eurostat received the status of an office monitoring progress in realising the Strategy's goals and tasks, aided by Sustainable Development Indicators (SDIs). In a document entitled *A roadmap for action, GDP and beyond – measuring progress in a changing World* published in 2009, the Commission presented an action plan that aimed to supplement GDP with environmental and social aspects. The new Europe 2020 strategy adopted in 2010 sought to mitigate the consequences of the financial and economic crisis, as well as create jobs and increase living standards through intelligent, lasting economic growth fostering social inclusion. These would be supported by scientific research and innovation, as outlined in the "Horizon 2020" programme, which was key to the Strategy.

The OECD is also active in this area. In 2011, it launched an initiative aiming to develop statistics spanning all aspects of life that have a significant impact on quality of life in different economic systems, the *OECD Better Life Initiative* and the accompanying *Better Life Index*, along with an initiative supporting the introduction of tools and indicators for monitoring green growth and creating new jobs, the Green Growth Strategy. The OECD is also developing guidelines and programmes serving to improve indicators and measures of wellbeing, such as the *Guidelines on Measuring the Quality of the Working Environment* and the *Guidelines on Measuring Subjective Wellbeing*. In 2016, the OECD also initiated the Inclusive Growth in Cities programme, as part of which mayors of the biggest cities committed to combat inequality and promote economic growth that would benefit everyone. In 2018, it published a *Framework for Policy Action on Inclusive Growth*.

The World Economic Forum joined the debate, too. As part of the initiative for Shaping the Future of Economic Progress, it introduced a new framework for economic policy and indicators measuring its implementation. The results were published in its *Inclusive Growth and Development Report 2017*.

Teams of experts have also attempted to create an integrated and balanced model for growth and development that would promote a high level and quality of life for all. One example is the WWWforEurope research programme directed by Karl Aiginger, co-financed from EU funds. It focuses on identifying sources of growth at the company and country level, with emphasis on competitiveness in the context of a new growth past (with high priority assigned to social and environmental results). In March 2016, Aiginger's team presented a growth model encompassing the economic, social and environmental dimensions in a report entitled *New Dynamics for Europe: Reaping the benefits of socio-ecological transition* (WWWforEurope, 2016). The model was used to carry out simulations concerning political strategies for achieving three main aims: rapid economic growth, social inclusion and environmental sustainability.

Analyses of areas of poverty and social inequalities, which are linked to inclusive growth, are important for many governments, which is why they have been widely studied by public officials and academics. In Poland, the subject has been examined by Tomasz Panek (Panek, 2011) and Teresa Słaby (Słaby, 1990), among others. Research at the local level is also supported by international organisations' branches. In Poland, the United Nations Development Programme has carried out socio-economic research at the national level in cooperation with the Warsaw School of Economics. The report published in 2012 (UNDP, 2012), which proposed to measure local social development based on the Human Development Index's methodology, inscribed itself in the international debate on measuring development.

Why a Responsible Development Index?

Introducing the concept of sustainable development to global literature and policies, and linking competitiveness to goals that go beyond GDP, required appropriate measures of them. Many institutions rose to the challenge, resulting in a wide range of indicators that – to a greater or lesser extent – can be described as indexes of sustainable development. They include the Human Development Index (HDI), the Social Progress Index (SPI), the Global Competitiveness Index (GCI), the Inclusive Development Index (IDI), the OECD Better Life Index, the European Commission's Quality of Life Index and the UN's Indicators for Sustainable Development. Others have been designed in the past, such as Nordhaus and Tobin's Measure of Economic Wealth (MEW), Zolotas' Index of the Economic Aspects Welfare (EAW) and Daly and Cobb's Index of sustainable economic welfare (ISEW) of 1989. There is also a series of indexes describing various aspects of sustainable growth, such as Doing Business, which looks at ease of establishing a small company, or the Global Innovation Index, which measures innovation in each country.

The broad choice of indexes raises the question whether, with so many measures of inclusive growth, a new one is needed and, if so, what makes it better than the alternatives. The rest of this report will focus on this question.

Firstly, creating measures of sustainable growth is a theoretical academic undertaking. The previous chapter showed that this discussion is being conducted in different environments and at different levels, including national or regional decision-makers. Creating new measures of inclusive growth fosters greater understanding of this concept's multidimensional nature, which should either lead to a consensus on a single set of variables making up the ideal index of inclusive growth, or the selection of the best indexes from among those available. This Index is our contribution to this academic discussion.

Secondly, existing measures tend to share certain flaws, which can make them less universal or position countries in a way that is not fully objective. Although some subjectivism is unavoidable, there should be as little of it as possible. Existing measures' flaws can be grouped into a few areas:

1. **Limited universality.** Some indexes are limited to a certain group of states, such as OECD or EU countries. This affects their universality; for example, a measure for EU member states does not allow comparison with Japan, the United States or Brazil.
2. **Too many indicators**. A large number of indicators can be seen as an advantage, but also a flaw. Some indexes are based on almost a hundred indicators, which makes them more complex, but could also dilute their key components. Studying the literature carefully often allows two or three indicators that appear in most publications and are regarded as good measures of a given phenomenon to be identified. Including a dozen others can limit the influence of the indicators rooted in the literature. In other cases, there is significant

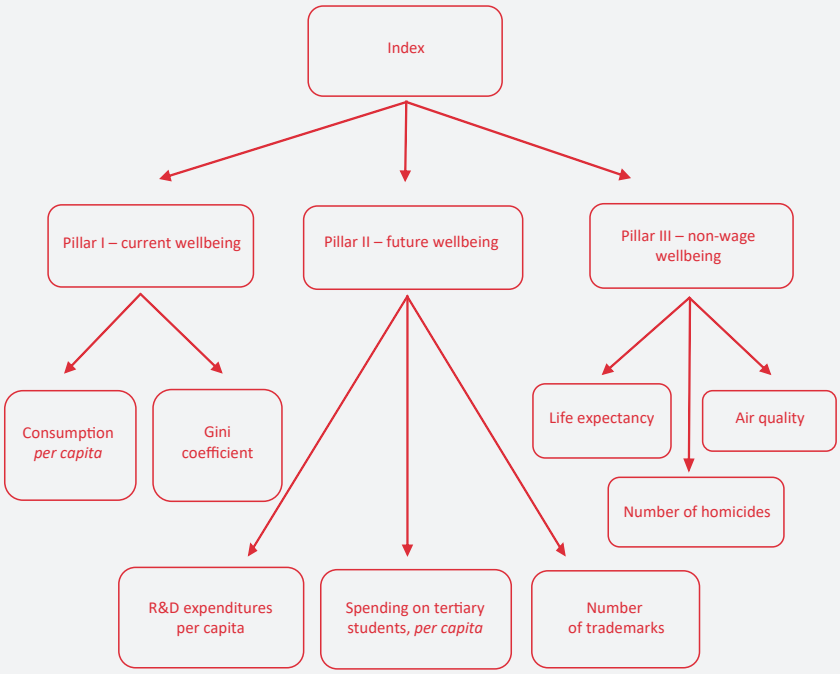
correlation between the indicators, which means that the result depends on a few key ones anyway, or that artificial "main components" are created with the help of statistical techniques. Moreover, indicators require data. For variables strongly rooted in the literature, this is relatively easy as most international and national institutions have them, but for rarer ones this can be more complicated.

3. **Subjectivism.** This problem often occurs for indexes with many indicators, but not only. Problems with obtaining data for concrete indicators can force researchers to carry out surveys. These studies often introduce an additional level of subjectivity that can influence the final results. For international surveys, there are differences in points of view. For example, respondents in countries A and B might assess the quality of education in their country completely differently, when it is objectively identical (assuming that there is a fully objective measure of the quality of education). For expert surveys based on a non-representative sample, the group of respondents can be very limited and respondents might know each other privately. This natural phenomenon can influence the final results. With surveys on a representative sample, there is the risk that some respondents will not have an opinion on the topic, reducing the survey to an expert survey or basing it on unverified information that can threaten objectivity. Some indexes use complicated statistical techniques to fight potential subjectivism, but the problem is best avoided by not using survey data.
4. **Structural shortcomings.** Although it is difficult to speak of structural errors when it comes to this type of indexes, problems of this kind occur in some cases; for example, using one of the index variables to indirectly explain the variance of this variable.

The Index presented by the Polish Economist Institute is relatively resistant to the criticism above, as will be presented in further chapters. Its three pillars measure current wellbeing, ability to create wellbeing in the future and non-wage factors. It is based on a relatively small number of indicators (eight), which are represented in the literature. These are objective statistics from the databases of the World Bank (seven) and the World Health Organisation one), which span 162 countries worldwide.

The three pillars

↘ Diagram 1. The structure of the Responsible Development Index



Source: prepared by the authors.

Pillar 1: current wellbeing

Why wellbeing?

Analysing responsible development, society's current wealth cannot be overlooked. The ranking of the best countries to live in cannot be based on visions of the future, even if the political will to implement them exists. Standards of living are part of the definition of inclusive growth; they are also included in many of the measures listed in Chapter 2. The income pillar is even considered by authors working on conceptions "beyond GDP" in their measures of international competitiveness (Aiginger, Vogel, 2015).

Why consumption?

Per capita consumption is a natural indicator of society's wellbeing. Alongside leisure time, it is a universally used explanatory variable in the

microeconomic utility function. Consumption should be understood in the real sense, after deflating using the indicator of consumer goods and services, which eliminates the money illusion. Although taking consumption into account is almost obvious, the choice of the set of goods and services included in consumption when analysing wellbeing is discussable. Two problems exist:

1. Firstly, some goods are socially undesirable: alcohol, nicotine, drugs etc. Yet because their consumption brings satisfaction, they are generally kept in the set.
2. Secondly, provision of consumer goods is funded in various ways. Most of the time, they are acquired directly by consumers from their personal income (private consumption), but some goods are funded from the state budget (public goods or socially desirable goods), which reach individual recipients in this way. For this reason, and influenced by the report by Stiglitz, Sen and Fitoussi, statistical offices in many countries (including GUS in Poland) started publishing data on adjusted consumption. According to the definition used by GUS, it amounts to the sum of private consumption among households and commercial institutions acting on behalf of households, along with individual consumption by national and local government institutions, i.e. spending on education, culture and national heritage, healthcare, social aid, sport and tourism.

Given the availability of international data, we used the aggregate of private consumption from personal income per one inhabitant, provided by the World Bank, to build a synthetic indicator.

Why adjust for income inequality?

The basic problem when constructing a social wellbeing function is accounting for income inequality. The so-called utilitarian additive function of social wellbeing, which is the sum of individual utilities (formula 1):

$$W = \sum_{i=1}^{i=n} U_i \tag{1}$$

does not take them into account, whereas John Rawls' so-called maximin function (formula 2) takes them into account to an extreme degree:

$$W = min_{1 \le i \le n}(U_i) \tag{2}$$

A compromise function on social wellbeing that is applicable is the so-called isoelastic usability function (formula 3):

$$W = \frac{\sum_{i=1}^{i=n} U_i^{1-e}}{1-e} \tag{3}$$

where: W – social wellbeing, U_i – the usefulness of the income of the i-th member of society, e – the (non-negative) coefficient of aversion to inequality.

For e = 1 this function takes the form (formula 4):

$$W = \sum_{i=1}^{i=n} lnU_i \tag{4}$$

Note that, for e = 0, the isoelastic function of social wellbeing is reduced to the additive utilitarian function of social wellbeing, while for e = + ∞ it is reduced to the function of social wellbeing in Rawls' approach. Its practical use therefore requires estimating the aversion to the inequality coefficient specific to a given society.

The relationship between the level of social welfare and the scale of income inequality in a synthetic approach captures the so-called shortened function of social welfare (Sen 1973), which does not require estimating the e-factor, just determining of the scale of inequality. It has the following form (5):

$$W(Y,G) = Y_{pc}(1-G) \quad (5)$$

where:
Y_{pc} – GDP per capita,
G – the Gini coefficient of income inequality.

This function grows relative to GDP per capita and decreases in relation to the income inequality indicator. When there is absolute equality of income (G = 0), the value of the social welfare function is (6):

$$W(Y,G) = Y_{pc} \quad (6)$$

and the more it decreases this level, the higher the income inequality measured by the Gini coefficient. This dependence is used in this index but, rather than GDP per capita, the level of private consumption from personal income per 1 inhabitant C_{pc} is used (formula 7):

$$W(C,G) = C_{pc}(1-G) \quad (7)$$

It should also be noted that the location of the isoquant for this function of social wellbeing depends on relation (8). The larger this fraction, the higher the level of social wellbeing achieved, in the sense of the shortened function of wellbeing.

$$\frac{C_{pc}}{G} \quad (8)$$

We follow this approach in the Index using World Bank's evaluation of find coefficient.

Pillar II: future wellbeing, the measure of innovativeness

Why creating future wellbeing?

Creating wellbeing is essential to maintaining and raising the standard of living in a country. Concentrating solely on existing wellbeing and non-wage factors favourises a policy focused on the present, which is not necessarily linked to plans for the future. Although short-term thinking is attractive from a political standpoint (the perspective of the next term), proper management of the economy requires a certain long-term vision of the country's economic development. That vision should remain relatively stable, regardless of which party is in power. Since rival parties' political attitudes often differ fundamentally, it should be based on universally accepted foundations of economic growth.

For a long time, models and conceptions of economic growth centred on production. It should not be confused with productivity, which is just one of the components of growth in production. Increasing production – or, more specifically, value added – is incredibly important for maintaining and improving quality of life relative to other parts of the world. Traditionally, technological progress, a consequence of R&D, is considered the driver of production.

Why innovation?

Innovation has been present in economic theories for a long time under various names. Joseph Schumpeter laid the theoretical foundations, showing a hundred years ago that innovation is at the heart of development. Since then, innovation has been incorporated into many economic models. The simplest example showing how innovation, called technological progress, is introduced into economic equations, is the Solow type growth function, where the production level is provided by the formula (9):

$$y(t) = F(K(t), A(t)L(t)) \quad (9)$$

in which the second argument is the product of work and level of knowledge. In general, the level of technology as a parameter of the production function also occurs in the Ramsay model or the Diamond model. In the Romer model,

which assumes capital stability at the level of the economy, knowledge is the only factor that economic growth depends on. In the Lucas model, the level of technology is constant, while the increase depends on labour, capital and human capital, which grows as employees accumulate knowledge and skills. The Aghion-Howitt model involves constant improvement of products' quality, manifested by technological progress. Technological progress and human capital are also present in the extended Solow model.

Beyond theories of economic growth, innovation is widely cited in Polish and foreign publications as a key factor in building economic competitiveness. Numerous international organisations also note the significance of innovativeness, making it a key aim of economic policy. This is visible in EU initiatives such as Horizon 2020, Horizon 2030 and Innovation Union, the OECD's innovation imperative, America's innovation strategy prepared during Barack Obama's presidency and aims set by the current US president.

In the international literature, there is a whole range of variables that can be used to measure innovativeness. They can be grouped (as by Lhuillery et al. 2015) into input related to research and development (such as spending on R&D), input unrelated to this but relevant to innovation (such as fixed assets) and intangible assets like knowledge. Based on this, three indicators that make up the pillar measuring innovativeness potential in this Index can be identified:

1. Spending on R&D per capita,
2. Spending on a PhD student per capita;
3. The number of local trademarks registered by a given country's inhabitants.

Why spending on R&D?

Based on various economic models and a whole range of publications on competitiveness and sustainable growth, technological progress can be broken down into appropriate progress linked to increase in technology and to progress linked to increase in knowledge. In our Index, we use both. To measure technological progress, we use spending on R&D per capita. Numerous publications emphasise the importance of spending on R&D as a percentage of GDP. For example, using a panel model with fixed effects, Sokolov-Mladenović et al. show the significant positive impact of spending on R&D as a share of GDP on real GDP growth (Sokolov-Mladenović et al., 2016, pp. 1005-1020). In their study on a sample of 19 developed and developing countries, Akcali and Sismanoglu show the significant impact of spending on R&D per capita on GDP per capita (Akcali, Sismanoglu, 2015).

The Index uses spending on R&D per capita, multiplying the value of spending on R&D as a percentage of GDP by GDP per capita. This avoids two potential distortions. Using just the percentage fails to consider the actual level of spending on R&D, which means that a country with a relatively low GDP, at an early stage of technological development, could find itself at the same level as a very technologically advanced country with a high GDP. Meanwhile, presenting spending per capita eliminates the distorting influence of the size of the country's population. If the value for the whole economy were used, a poorly developed but populous country could overtake a more developed country with a small number of inhabitants. This would have an unfavourable impact on small countries that are innovation hubs, such as Israel.

Why spending per PhD student?

The significance and impact of academia on innovation is particularly visible in the knowledge triangle, which illustrates the interaction between innovation, research and higher education. This conception is promoted by the OECD and the EU. The Innovation Union initiative

sought to promote complex action in all three areas; so far, it is a success (Weresa et al., 2018). The positive impact of spending on university education on both economic growth and revenue has been confirmed for the US by Aghion and others. They have also shown that spending on education has a particular effect in states that are not technological leaders (Aghion et al., 2009). This enthusiasm is mitigated by research by Benos and Zotou, who have shown that it is difficult to unambiguously measure the impact of education on innovation, mainly due to difficulties in measuring the quality of innovation. They criticise scholarisation coefficients, noting that they do not reflect graduates' actual level (Benos, Zotou, 2014).

For these reasons, the Index uses spending per PhD student per capita – arrived at by multiplying the share of GDP by the volume of GDP per capita – to measure quality of education. Doctoral studies are specialist studies aiming to educate the future academic elite, which, with the right funding, will create technological progress. In other words, funding a PhD student amounts to training a specialist. Spending on education at an earlier level was rejected because the level is either too early to influence innovation (e.g. primary school) or describes the same as doctoral studies, but with less stringent quality criteria for graduates (e.g. Masters studies, which also train specialists, but at a much lower level than doctoral studies). The argument above on the form in which spending is presented (real spending per capita) is applicable here, too. It is especially significant due to very high percentage values in African countries, where spending on a PhD student often exceeds 500% of average GDP per capita.

Why trademarks?

For many years, patents have been a measure of innovativeness, as studies by Furman et al. show (Furman, Hayes, 2004; Furman et al. 2002). Forty years ago, the role of patents in strengthening the position of monopolistic companies that patented their inventions was already being emphasised (Pavitt, 1982). Using British companies as an example, it was also noted that having a patent for an innovation with high marketing potential increases turnover from sales (Hall et al., 2012). At the same time, the shortcomings of patents were noticed, such as their inadequacy in very innovative industries (Mansfield, 1986), relatively high price (Hughes, Mina, 2010), how larger companies file patent applications more frequently (Hall et al. 2012) or how companies only apply for them when competition appears (Lee, 2017). As early as 1979, Soete noted that spending on R&D is a better measure of innovativeness (Soete, 1979).

In the literature, there is no clear answer as to whether using patents to measure innovation is good or bad. Many economists recognise patents' shortcomings, but still choose to use them to measure innovativeness. As the second pillar of the Index is composite, we decided to include a certain patent indicator. Trademarks were chosen for several reasons, mainly linked to patents' shortcomings. In addition to those listed above, patents are inherently limited to product innovations. Trademarks eliminate this problem, as they are used to differentiate one product from another. Moreover, the difference may stem from any kind of innovation. The data on trademarks that we used only includes trademarks that residents of a given country applied for at the local patent office. This eliminates the problem of price and patent applications by people who are not members of a given society, which is significant for this Index. Naturally, using trademarks also measures entrepreneurs' dynamism, rather than innovativeness strictly speaking, but both these ideas fit the conception of the second pillar.

Pillar III – non-wage wellbeing

Why non-wage factors?

Money is important, but it is not the only factor influencing the quality of life in a country. Of course, levels of pay have always formed the heart of migration models, but recently a growing number of researchers have started to recognise the role of factors unrelated to wages. We believe that this cannot be forgotten when studying inclusive growth. For this reason, this Index includes a separate pillar made up of factors linked to fulfilling the needs in Maslow's hierarchy. Our Pillar III spans fundamental non-economic factors: safety, health and the state of the natural environment, which makes it a measure of non-pay quality of life. Its composition echoes the elements of other composite indicators, such as the HDI or EU structural indicators. It was created using elemental variables reflecting the factors above: the frequency of deliberate homicides, life expectancy at birth and air pollution. The first and third are destimulants, which means that a higher value lowers the composite index. In the Index, the problem of combining stimulants and destimulants was solved by appropriate transformations, as described in the chapter on data processing.

Why life expectancy?

Life expectancy reflects both the quality of life *per se* and the impact of a society's dominant lifestyle and living conditions. In Maslow's hierarchy of needs, a long life can be interpreted as the expression of having both one's basic physiological needs and one's safety needs satisfied.

Life expectancy is the average life expectancy of cohorts of people of a given age, assuming that the probability of people above that age dying will remain at the levels observed in the year of the study. The following formula is used (formula 10):

$$e_x = \sum_{k=0}^{T} kPr(K(x) = k) = \\ = \sum_{k=0}^{T} k \, {}_kp_x \, q_{x+k} = \sum_{k=1}^{T} {}_kp_x \tag{10}$$

where: $Pr\,(K(x)=k)$ is the probability that a person at age x will still survive k years, ${}_kp_x$ the probability of surviving from age x to age $x + k$, and q_{x+k} the probability of death at age of $x + k$, and T the maximum number of survivable years (T = 120 years was used).

The indicator's most popular form of the indicator is the life expectancy at birth, where x equals 0. This indicator is part of the composite Index presented.

Why air pollution?

The air pollution indicator was chosen to represent a broad spectrum of indicators measuring the pollution of the natural environment. This group also includes data on water pollution, soil pollution, threats to biodiversity and waste management.

This measure reflects the concentration of air pollutants that have a negative impact on the health of members of a given society. It links to the theory of the negative external effects of economic activity or fulfilling households' living and consumption needs. The indicator considers health and ecological aspects linked to preserving a clean natural environmental. In Maslow's hierarchy of needs, it can be included among safety needs, but also in the higher group of belonging and acceptance needs; the need to realise aims that matter for the whole community, which are public goods. In various forms, it is also treated as an important dimension of sustainable development. One example is the EU's "Europa 2020" Strategy; one of its main aims is reducing CO_2 emissions by at least 20% compared to 1990.

The indicator we used expresses the annual average concentration of particulate matter with a diameter of below 2.5 microns (PM2.5) in towns and smaller settlements. Air pollution is made up of many pollutants, including solid particles. These particles can penetrate deep into our respiratory tract, which makes them a health threat, increasing mortality from infections and respiratory tract illnesses, lung cancer and some cardiovascular diseases. The annual average concentration of particulate matter with a diameter of less than 10 or 2.5 microns is universally used to measure air pollution.

Why intentional homicides?

The indicator representing intentional homicides is not only a basic measure of safety in a society, but also of social tensions. Directly, it reflects the threat to human life (and therefore personal safety; indirectly, it illustrates the scale of internal frictions in a community, since some intentional homicides are linked to family, ethnic or economic conflicts. In Maslow's hierarchy of needs, it is the ultimate measure of whether safety needs are being met. According to Eurostat data, perception of physical threat various between countries based on the level of urbanisation and poverty.

Eurostat defines an intentional homicide as a targeted killing, including murder, euthanasia and infanticide. The category does not encompass death caused by driving dangerously, abortion, supporting suicide and attempted killing. Data on homicides is considered one of the most comparable criminal statistics because it always registered (due to its seriousness) and there is not much room for differences in definitions between countries, compared to other types of crime.

In the World Bank's database, the indicator is presented as the number of homicides per 100,000 inhabitants overall, as well as divided by gender, corresponding to the number of female victims per 100,000 women and the number of male victims per 100,000 men. As part of the composite index, the indicator for the general population was used.

Preparing the data and calculating the Index

Every team creating an index needs to prepare the right dataset. Obtaining the data is as important as creating the theoretical framework that the index is based on.

Above all, the data needs to exist. In practice, this seemingly obvious statement is not at all straightforward. For example, the discussion on measuring innovation has repeatedly highlighted patents' shortcomings (some of them were outlined above), yet critics have often been unable to provide an alternative. The data also needs to exhibit good quality; ideally collected by a respected institution (unless the researchers are using their own data), relatively up to date and without larger gaps for individual indicators. The authors of the Responsible Development Index managed to eliminate this problem; nevertheless, it is important to write on as many complete cases as possible.

The geographical (for indexes comparing different regions) or temporal scope (for indexes portraying the rate of change in a region) needs to be established, too. This usually determines which international database the index's authors will rely on. In most cases, they choose one of three: the World Bank, the OECD or Eurostat. The latter two offer high-quality data that is often broken down into regions (based on NUTS-2). Their flaw is the limited number of countries that can be analysed. Eurostat mainly collects data on EU member states and a few others in Europe (around 30 in total) and OECD publishes data on its members and a few others (around 40 in total). In contrast, the World Bank has data on over 260 separate countries and territories. Of these, around 50 need to be discounted because they concern autonomous regions or aggregates of a few states, such as Arab countries.

For this study, the World Bank's database was used to give the index a broad geographical scope. Since the Responsible Development Index is not based exclusively on material factors, it should not be limited to, say, OECD countries, which are among the most economically developed; it could turn out that countries outside this group are also good places to live or even overtake some OECD countries. Meanwhile, using the Eurostat database would force researches to limit themselves to European countries, without countries such as Japan, China, the US and Israel. Insofar as possible, the index should be based on data from a single database (especially for economic data) to avoid variation in how data is collected or how individual indicators are calculated.

After the database and the set of potential indicators were selected, the database was reviewed and the appropriate variables extracted. After that, missing values were addressed. They were filled in using linear trend (accepted with R squared above 0.75 and in the absence of a clear trend slump), logarithmic trend analysis (mainly when there were only two data points; any curve could be drawn through two points, but

long-term economic variables are characterised by convergence to a certain level, which is guaranteed by the logarithmic function, as opposed to, for example, the linear function) and supplementation with a three-period movable average with weights of 0.6 for the t-1 period, 0.3 for t-2 and 0.1 for t-3. Simple analysis[1] shows that the moving average can be used as a relatively reliable replacement of the linear trend, especially in the case of small directional coefficients that occurred in the data. What is more, the moving average is much more responsive to sudden changes. There are cases where the trend line can be derived and R-squared is high, which indicates a good fit, but, for example, the last two periods diverge significantly from the line. In this situation, the moving average allows the impact of the last drop to be considered. If three consecutive periods were not available, the data was filled with a moving average of 0.65 for t-1 and 0.35 for t-2. If there was no data at some point, but data from both adjacent periods were available, the arithmetic mean was used. For major gaps, the so-called hot deck imputation, based on comparison with other countries with a similar GDP, culture, location, etc., was used.

To add air quality to the Index's database, WHO data on the concentration of PM2.5 in the air in 2016 was based. For this data, interpolation was not used, based on the assumption that the values had not changed significantly by 2017.

All the data was collected in a single table. After that, it was processed so that the pillars based on the indicators could be calculated. For example, the Gini coefficient ranges from 0 to 1 (the World Bank presents this as 0-100). The greater its value, the greater the inequality in society. To combine it with per-capita consumption in a meaningful aggregate, it needed to be reversed. In other words, rather than the actual value of the Gini coefficient, a new variable was used. Data which was presented as a percentage of GBP was multiplied by GDP per capita to obtain the value per inhabitant. Before these operations, all the remaining missing data were replaced with a value of 10^{-5} to avoid technical problems. This also allowed the Index for countries with missing data, which would otherwise had been removed from the set, to be calculated.

Before the Index was created, data on some countries and territories was removed, which reduced the number of countries and territories from 264 to 162. The following procedure was used:

1. Firstly, only those regions for which a numerical value for GDP per capita in 2017 in existed were kept. The methodology of completing data based on analysing the series since 2000 means that if there was no data in 2017 there must have been data missing over the past eighteen years, too. The researchers decided that countries that had not reported GDP per capita over the past eighteen years were unlikely to have provided reliable data for the other indicators either.
2. Secondly, only regions with over 500,000 inhabitants were retained. This was done to eliminate outliers, especially tax havens, where wealth does not depend on good economic and political practices, but rather on low taxes for companies and people.
3. Finally, aggregate regions created by the World Bank, such as the Arab world, EU and

[1] Let us assume that the value of a variable can be perfectly described by a linear trend relative to the time of the character $y_t = at + b$, where t is time. In the period $t + 1$, the variable will take the value $a(t + 1) = at + a + b$. Let us assume that we have data from three consecutive periods ending at period t. If a moving average with weights like those provided above is used to predict values from period $t + 1$, we have $y_{t+1} = 0.6y_t + 0.3y_{t-1} + 0.1y_{t-2}$. Because we assume that the value can also be provided using a trend, we will convert the previous equation: $y_{t+1} = 0.6(at + b) + 0.3(at - a + b) + 0.1(at - 2a + b)$, which gives $y_{t+1} = at + b - 0.5a$, causing a level of error of $0.5a$. For small values of a, like those in the database, this error is marginal.

OECD countries, were removed. Although they are an elegant way of presenting certain variables across an entire region, they are unnecessary for this Index. Moreover, keeping them would have caused problems when standardising the indicators later. Only the aggregates were removed; the countries within them were kept.

To sum up, the eight variables described above were used to create the Index:

- R&D spending per capita,
- spending per PhD student per capita,
- the number of trademarks per capita registered at the national patent office by the country's residents,
- consumption per capita,
- the reversed Gini coefficient,
- the reversed concentration of PM2.5 in the air,
- the reversed number of homicides per 100,000 inhabitants,
- life expectancy in years.

The variables' quality was first evaluated by examining the pairwise correlation for point data for 2017 in around 160 countries. If most of the variables were correlated to a significant degree, this would mean that the choice should either be limited or radically changed. The results of this correlation check are presented in Table 2.

↘ **Table 2. Values of correlation coefficients for the Index's components**

Specification	R&D	Education	Trademarks	Gini coefficient	Air quality	Consumption	Life expectancy	Homicides
R&D	1.00	0.76	0.45	0.17	0.20	0.88	0.54	0.43
Education	0.76	1.00	0.46	0.09	0.12	0.75	0.46	0.46
Trademarks	0.45	0.46	1.00	0.01	-0.04	0.59	0.61	0.49
Gini coefficient	0.17	0.09	0.01	1.00	0.20	0.05	0.09	-0.14
Air quality	0.20	0.12	-0.04	0.20	1.00	0.10	0.14	-0.08
Consumption	0.88	0.75	0.59	0.05	0.10	1.00	0.69	0.56
Life expectancy	0.54	0.46	0.61	0.09	0.14	0.69	1.00	0.50
Homicides	0.43	0.46	0.49	-0.14	-0.08	0.56	0.50	1.00

Source: prepared by the authors.

The correlation between spending on R&D and consumption may raise doubts. Yet it is logical to assume that richer countries, in which citizens are richer, spend more on R&D. Private spending on R&D usually accounts for a significant percentage of a country's total spending on R&D and readiness to invest (including on R&D) depends on the current level of wealth. It would be unreasonable to expect countries with poor citizens to spend large

amounts on R&D. Moreover, in the database, both R&D and consumption are presented as amounts per capita. The rather high correlation between R&D and spending per PhD student can be justified by an aforementioned relation between innovativeness and professional knowledge.

After checking for correlation, in accordance with the procedure recommended by the OECD, the value of Cronbach's alpha statistics was calculated for pre-selected indicators to check whether all of them measure the same hidden variable, responsible development. A low Cronbach's alpha value for any indicator would indicate that it cannot be used with the others to measure responsible development. Before proceeding with the analysis, a "low value" needs to be defined. Cronbach's alpha ranges from 0 to 1. in his frequently-cited article, Nunnaly mentions several accepted values, starting from 0.7 for the initial analysis, via 0.8 and even 0.95 in cases when the value of the indicator is used to make important decisions (Nunnally, 1978). This was not the case with this Index, which serves to inform and educate, rather than determine a state's economic policy. The total alpha value for the Index was 0.81; the values for individual indicators are presented in Table 3.

↘ Table 3. **Cronbach's alpha value for the Index's individual components**

Indicator	Cronbach's alpha
R&D	0.74
Education	0.76
Trademarks	0.78
Gini coefficient	0.84
Air quality	0.84
Consumption	0.73
Life expectancy	0.76
Homicidess	0.79

Source: prepared by the authors.

Table 3 shows that the value of alpha for individual components exceed 0.7, and in some cases 0.8. Moreover, it should be remembered that they served to measure the rather unclear concept of wellbeing, rather than a well-defined variable. For this reason, the authors decided that the values of Cronbach's alpha do not justify removing one of the indicators from the Index.

Before calculating the Index, all the indicators above were standardised using the min-max method. For the minimum in the vector of observation of a given indicator, the value assigned to data gaps was used, i.e. 10^{-5}. For the maximum, the result of the leader for each indicator was multiplied by 1.25. Multiplying by this coefficient allows progress by individual countries over

time to be compared, as it is unlikely that any of the leaders will improve by 25% within a year or two. Of course, this maximum threshold will not last forever and will need to be revised a few years later. When it is revised, older versions of the index need to be converted. The minimum value after standardisation was 1 and the maximum was 10.

After standardisation, the Index's individual pillars were calculated using the arithmetic average. They were then given equal weights, added together and multiplied by 10, so that the result was out of 100 points.

As a final measure of the Index's quality, its ability to explain the variance of added value per capita in industry and services was examined. Value added is a relatively good measure of productivity, wellbeing and how advanced the economy is in technological terms. In contrast to net exports, it also includes production for domestic consumption and is less dependent on fluctuations in the exchange rate. Before modelling, countries where the value added was unknown were removed. The analysis was carried out using a panel model over three seasons, for which the Index was calculated (2013, 2015, 2017). The dimensions of the panel were the country and the year. Parameters were estimated using the so-called "between" estimator, taking the average of estimation using fixed effect models. The model's basic equation is shown below; va means value added and p with a subscript refers to the pillar:

$$va = a_0 + a_1 p_1 + a_2 p_2 + a_3 p_3 + \varepsilon \qquad (11)$$

In the model, R^2 of 68% was obtained, which means that the Index explains that percentage of volatility in value added per capita in industry and services. This is comparable to results achieved by World Economic Forum's team, which compared Global Competitiveness Index to GDP per capita (about 67% using the old methodology; see, for example, the 2014-15 edition), despite more than ten times fewer indicators and despite WEF directly linking the weight of the GCI pillars to GDP per capita. In the latest edition, the WEF significantly changed how the GCI is calculated. It explains around 67% of the variability in the level of life satisfaction, which is again similar to the relationship between the Index and value added. Of course, it should be remembered that the Index was not created as a tool for modelling value added, but rather for inclusive development. This comparison merely served to check whether the Index's structure is correct.

In five comparisons, volume variables were (consumption, spending on R&D, spending per PhD student) adjusted for differences in price and exchange rate to enable comparison between periods. The base year was 2017. As the price deflator, the level of inflation provided by the World Bank for local currencies was used. The exchange rate deflator was added by dividing GDP in current prices for the local currency by GDP in current prices in dollars. Both variables came from the World Bank database. On this basis, the ratio between the exchange rates in the initial year and in 2017 was calculated. Finally, the values from the initial year were multiplied by the inflation deflator and divided by the exchange rate deflator. The adjusted values were then used to calculate the Index's pillars in 2015 so that they could be compared with the values obtained in 2017.

Presentation of the results

The full Index can be viewed in the appendix, along with the values for individual pillars. It was calculated for 162 countries and territories, after removing territories as outlined above. Poland came 29th. Table 4 presents the top thirty countries in the Index in 2017.

The top thirty countries in the Index are mostly very wealthy states. Their average GDP per capita is around USD 45,000; in just four of them, it is below USD 25,000. Switzerland ranks first. The country regularly opens rankings of inclusive growth and competitiveness (4th place in the GCI, 2nd in the HDI, 3rd in the SPI). It came first in pillars I and II, and 4th in pillar III, which shows that it is not only a very prosperous country, with excellent prospects, but also safe and a good place to life.

Norway and Sweden follow in second and third place. Two other Nordic countries, Denmark and Finland, rank 5th and 10th. These countries' high position is unsurprising. Many studies present the Nordic countries as an excellent place to live. In the GCI, countries in this region regularly rank in the top ten or shortly after, and similarly in the HDI and SPI (Norway comes first in both indexes). In the Responsible Development Index, their main strengths are pillar I and II. Interestingly, none of them made it into the top ten for pillar III; Norway is 12th and Finland 27th, with neither Denmark or Sweden in the top 30. This could stem from a relatively high number of homicides for developed countries, though safety has improved markedly in Denmark over the past decade.

Two Asian powers, Korea and Japan, rank 6th and 9th, though their level of GDP per capita is slightly different from that of the other countries in the top ten. Unlike the Nordic countries, Korea and Japan's advantage does not come from pillar I. Japan's main strength is pillar III, which it leads, but in terms of current wellbeing and ability to create it in the future, it ranks 16th and 17th. Korea's strength is neither nonwage wellbeing nor current wellbeing, though it achieves decent results in both these pillars. Its main advantage is the creation of future wellbeing, measured as spending on R&D and training specialists. Despite the lowest GDP per capita of all the countries in the top ten for pillar II, it successfully competes with and overtakes countries like the US, Sweden and Denmark, taking second place.

Poland fares well in the general ranking, finishing 29th (two places higher than in 2015) and overtaking countries such as Portugal and China. Its main strength is pillar III. Poland is a safe country with a high life expectancy; for this reason, it ranks 23rd in this pillar, ahead of some countries in the Index's top ten, like Finland and Belgium. In pillars I and II, Poland is at the end of top thirty and at the beginning of top sixty, but has improved in both. In terms of progress in 2015-2017, Poland ranks 20th in pillar I and 27th in pillar II, which suggests that Poland's position will improve soon.

After standardisation, Poland did best in the following indicators: the Gini coefficient (6.98) and life expectancy (7.62). It needs to be remembered that the min-max method of standardisation used

set the maximum at 8.2. There is less inequality in Poland than in countries at the top of the index, such as Germany and Japan, which may have been influenced by the introduction of new social benefits. In terms of life expectancy, Poland has not yet caught up with the index's leaders, but, within the Visegrad Group, it is only slightly behind the Czech Republic.

The three indicators measuring the creation of future wellbeing are at the opposite end of the spectrum. When it comes to spending on R&D per capita, spending per PhD student and the number of trademarks per inhabitant, Poland fares very poorly, with less than 2 points after standardisation. In Poland, R&D and higher education are significant barriers to innovativeness. Nevertheless, its efforts to improve the situation should be noted. In terms of progress in pillar II, Poland ranks 27th.

Analysing the Index, it is worth following countries' recent progress. Table 5 shows which thirty countries have improved the most since 2015. This list differs visible from the Index's top 30 in 2017, which was presented in Table 4.

As Table 5 shows, Poland ranks 18th in terms of overall progress in 2015-2017, which enabled it to advance two places. GDP per capita was included in the table to enable comparison and show countries' level of development, measured the traditional way. Usually, economists assume that the rate of growth declines over time. Yet because the Index uses absolute measures of certain values (such as spending on R&D), an increase of just a few percent in this spending in countries with high GDP per capita can be significantly larger than an increase of over a dozen percent in countries with a low GDP. In practice, this means that differences between countries are difficult to level and that even a rapid rate of growth over a certain time will not necessarily equalise the standard of living in two countries quickly. At the same time, there can be significant changes further down the Index, whereas it is relatively difficult for countries near the top to change places.

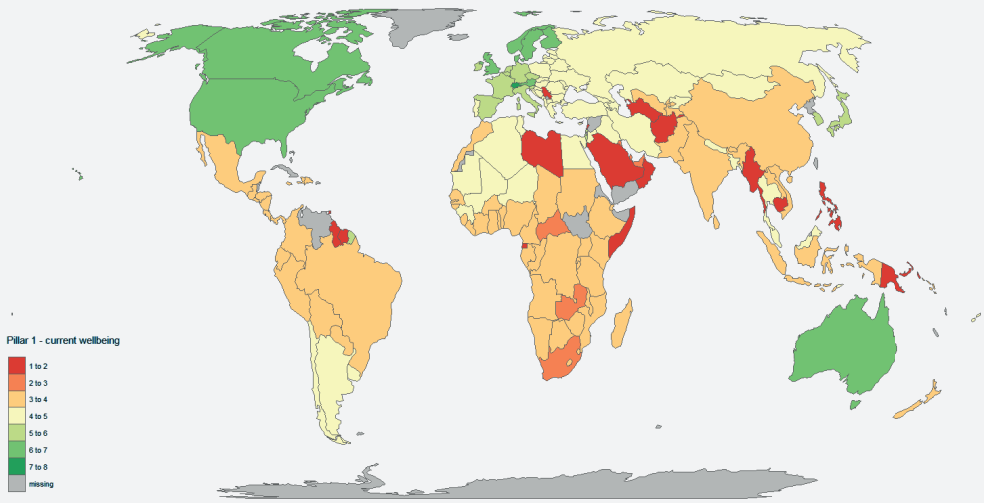
In the top 30, Poland is one of the few countries in which GDP per capita did not exceed USD 20,000 in 2017. The average among the top 30 is around USD 30,000. This shows that Poland is capable of developing as quickly as significantly richer countries, such as Germany or Spain. Nevertheless, countries with a much lower GDP per capita to that in Poland have made similar progress in the Index. The following sections present the results in each of the three pillars.

Pillar I – current wellbeing

Table 6 shows that the countries with the highest level of current wellbeing are mostly countries developed in the traditional sense as well. The average GDP per capita is over USD 40,000. Poland ranks 30th, one of the five countries with GDP per capita below USD 20,000. Progress in pillar I in 2015-2017 is presented in Table 7.

Progress in the 1st Pillar in the domain of relatively rich countries, but the average GDP per capita has fallen to USD 30,000, lower than in Table 6. There is also more variation, with rich countries like Germany and Israel mixing with poorer ones, such as Guatemala, Mali and Georgia. Poland ranks 20th, ahead of Germany and close behind France. Consumption increased and the Gini coefficient decreased. This indicates that government spending on social benefits has increased the level of wellbeing in Polish society. This confirms microsimulations on the impact of 500+ based on the Household Budget Survey, which showed that the programme would reduce poverty significantly and increase income per household member. These simulations also suggested that much of the programme would go to the poorest people, which ought to reduce the Gini coefficient (Brzeziński, Najsztub, 2017; Szarfenberg, 2017).

↘ **Map 1. Pillar I globally**



Source: prepared by the authors.

↘ Table 4. Top 30 countries in the Index in 2017

Country	Place	p1_17	p2_17	p3_17	index_17	GDP per capita (USD)
Switzerland	1	7.41	6.82	6.23	68.21	80189.70
Norway	2	6.97	5.33	5.88	60.59	75504.57
Sweden	3	6.02	5.03	5.73	55.91	53442.01
Austria	4	6.06	4.50	6.09	55.51	47290.91
Denmark	5	6.31	4.98	5.12	54.71	56307.51
Japan	6	5.74	3.68	6.93	54.51	38428.10
Australia	7	6.41	3.82	5.95	53.94	53799.94
Belgium	8	5.97	4.51	5.63	53.72	43323.81
South Korea	9	5.16	5.04	5.73	53.10	29742.84
Finland	10	6.24	3.98	5.61	52.77	45703.33
Germany	11	5.90	4.10	5.82	52.74	44469.91
United States	12	6.87	4.25	4.59	52.35	59531.66
Ireland	13	5.78	3.70	5.79	50.88	69330.69
France	14	5.65	3.81	5.77	50.80	38476.66
Britain	15	6.06	3.34	5.84	50.79	39720.44
Luxembourg	16	6.53	2.25	6.21	49.94	104103.04
Israel	17	5.47	3.40	5.58	48.18	40270.25
Italy	18	5.50	2.52	5.96	46.62	31952.98
The Netherlands	19	5.87	1.90	6.13	46.33	48223.16
Spain	20	5.06	2.65	6.16	46.24	28156.82
Slovenia	21	5.26	2.51	5.95	45.71	23597.29
Singapore	22	2.72	3.98	6.69	44.65	57714.30
The Czech Republic	23	5.01	2.26	5.87	43.78	20368.14
Macau	24	2.64	4.62	5.79	43.48	80892.82
Cyprus	25	4.88	2.33	5.66	42.88	25233.57
Canada	26	6.03	2.19	4.63	42.82	45032.12
Slovakia	27	4.98	1.81	5.58	41.26	17604.95
Greece	28	4.85	1.44	5.86	40.46	18613.42
Poland	**29**	**4.67**	**1.66**	**5.70**	**40.10**	**13811.66**
Lithuania	30	4.60	2.05	5.34	39.98	16680.68

Source: prepared by the authors.

↘ Table 5. Top 30 countries that improved the most in 2015-2017

Rank	Country	Change 15-17 (%)	Change 15-17	Rank in Index	GDP per capita (2017, USD)
1	Israel	5.01	2.30	17	40270.25
2	Japan	3.97	2.08	6	38428.10
3	Slovenia	3.55	1.57	21	23597.29
4	Denmark	2.87	1.52	5	56307.51
5	Finland	2.56	1.32	10	45703.33
6	Austria	2.38	1.29	4	47290.91
7	Ireland	2.20	1.10	13	69330.69
8	Italy	2.25	1.03	18	31952.98
9	Czech Republic	2.40	1.02	23	20368.14
10	Cyprus	2.36	0.99	25	25233.57
11	New Zealand	2.62	0.96	42	42940.58
12	Portugal	2.24	0.86	35	21136.30
13	Lithuania	1.91	0.75	30	16680.68
14	The Netherlands	1.39	0.64	19	48223.16
15	France	1.26	0.63	14	38476.66
16	Georgia	1.68	0.59	61	4078.25
17	Guatemala	1.74	0.57	82	4470.99
18	**Poland**	**1.41**	**0.56**	**29**	**13811.66**
19	Belgium	1.02	0.54	8	43323.81
20	Germany	0.99	0.52	11	44469.91
21	South Korea	0.95	0.50	9	29742.84
22	Indonesia	1.38	0.49	55	3846.86
23	Spain	1.07	0.49	20	28156.82
24	Hungary	1.26	0.48	37	14224.85
25	Luxembourg	0.93	0.46	16	104103.04
26	Bulgaria	1.25	0.46	46	8031.60
27	Macedonia	1.15	0.41	59	5442.61
28	Romania	0.99	0.37	40	10813.72
29	Croatia	0.88	0.34	33	13294.51
30	Brazil	0.90	0.32	56	9821.41

Source: prepared by the authors.

↘ Table 6. Top 30 countries in pillar I

Rank	Pillar I	Country	Rank in Index	GDP per capita (USD)
1	7.41	Switzerland	1	80189.70
2	6.97	Norway	2	75504.57
3	6.87	United States	12	59531.66
4	6.53	Luxembourg	16	104103.00
5	6.41	Australia	7	53799.94
6	6.31	Denmark	5	56307.51
7	6.24	Finland	10	45703.33
8	6.06	Austria	4	47290.91
9	6.06	Britain	15	39720.44
10	6.03	Canada	26	45032.12
11	6.02	Sweden	3	53442.01
12	5.97	Belgium	8	43323.81
13	5.90	Germany	11	44469.91
14	5.87	The Netherlands	19	48223.16
15	5.78	Ireland	13	69330.69
16	5.74	Japan	6	38428.10
17	5.65	France	14	38476.66
18	5.50	Italy	18	31952.98
19	5.47	Israel	17	40270.25
20	5.26	Slovenia	21	23597.29
21	5.16	South Korea	9	29742.84
22	5.06	Spain	20	28156.82
23	5.01	The Czech Republic	23	20368.14
24	4.98	Slovakia	27	17604.95
25	4.95	Portugal	35	21136.30
26	4.88	Cyprus	25	25233.57
27	4.85	Greece	28	18613.42
28	4.80	Azerbaijan	45	4131.62
29	4.72	Estonia	32	19704.66
30	**4.67**	**Poland**	**29**	**13811.66**

Source: prepared by the authors.

↘ Table 7. Top 30 countries in terms of progress in pillar I

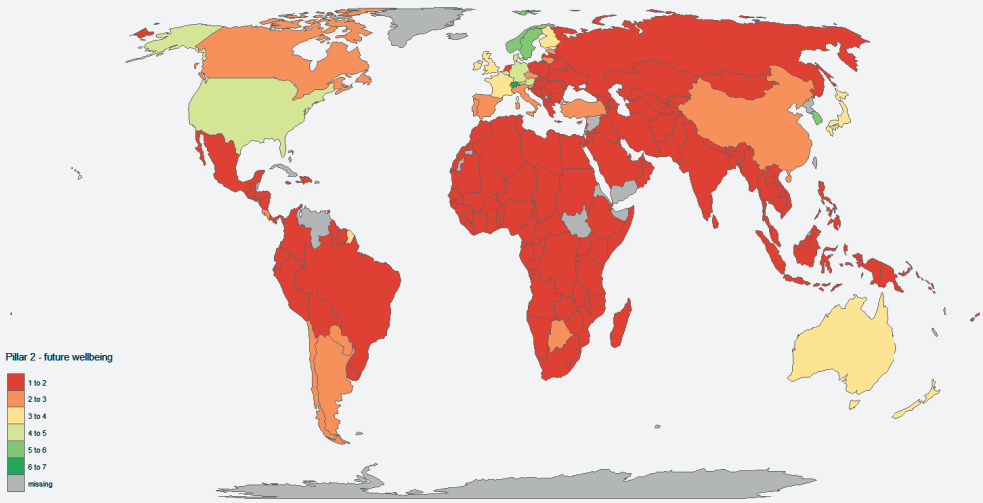
Rank	Country	Change 15-17 (%)	Change 15-17	Rank in Index in 17	GDP per capita (USD)
1	Israel	6.61	0.34	17	40270.25
2	Japan	4.71	0.26	6	38428.10
3	New Zealand	7.66	0.23	42	42940.58
4	Italy	3.32	0.18	18	31952.98
5	Guatemala	4.65	0.17	82	4470.99
6	Ireland	2.47	0.14	13	69330.69
7	Luxembourg	2.14	0.14	16	104103.04
8	Finland	2.12	0.13	10	45703.33
9	The Czech Republic	2.65	0.13	23	20368.14
10	Denmark	2.05	0.13	5	56307.51
11	Macedonia	3.00	0.12	59	5442.61
12	Lithuania	2.65	0.12	30	16680.68
13	Ecuador	2.96	0.11	57	6198.95
14	Hong Kong	3.11	0.11	36	46193.61
15	The Netherlands	1.78	0.10	19	48223.16
16	France	1.75	0.10	14	38476.66
17	Belgium	1.64	0.10	8	43323.81
18	Austria	1.60	0.10	4	47290.91
19	Portugal	1.92	0.09	35	21136.30
20	**Poland**	**2.02**	**0.09**	**29**	**13811.66**
21	Slovenia	1.75	0.09	21	23597.29
22	Latvia	1.99	0.09	31	15594.29
23	Georgia	1.92	0.08	61	4078.25
24	El Salvador	1.97	0.08	72	3889.31
25	Germany	1.27	0.07	11	44469.91
26	Albania	1.70	0.07	49	4537.86
27	Mali	1.77	0.07	95	824.52
28	Slovakia	1.47	0.07	27	17604.95
29	Croatia	1.58	0.07	33	13294.51
30	Brazil	1.95	0.07	56	9821.41

Source: prepared by the authors.

Pillar II – future wellbeing, or measuring innovativeness

Poland did not make it into the top 30 in pillar II; it ranked 51st. Such state of things is partially caused by years of neglect, noted in numerous studies on Poland's competitiveness over the years. One of the few areas that Poland did well in was scholarisation, which measures education in terms of quantity, rather than quality. In other areas, there were many weaknesses, such as difficulty in keeping talented Poles in the country, difficulty in attracting professionals and poor cooperation between companies, universities and government institutions. Although rich countries came first in pillar II and the average GDP per capita is over USD 40,000, the presence of countries such as Estonia and Costa Rica shows that innovativeness can be increased without a high GDP. The next table shows countries' progress over the past two years.

↘ **Map 2. Pillar II globally**



Source: prepared by the authors.

Although Poland ranks low in the general result for pillar II, it is 27th when it comes to progress over the past two years. Again, rapid progress in pillar two tends to be domain of rich countries, with GDP per capita above USD 32,000. This should not justify Poland, though, as poorer countries, like Iran, have also shown that rapid growth in this area is possible. The progress by two other countries in the Visegrad Group, Hungary and the Czech Republic, which are in 16th and 13th place, is worth noting. One of the key reforms in Hungary in 2015-2017 was the centralisation in 2015 of scientific and innovation policy in a single institution, which is responsible for designing it, implementing it and funding it. In the Czech Republic, the education sector was reformed significantly in 2016, focusing on results and measuring science's

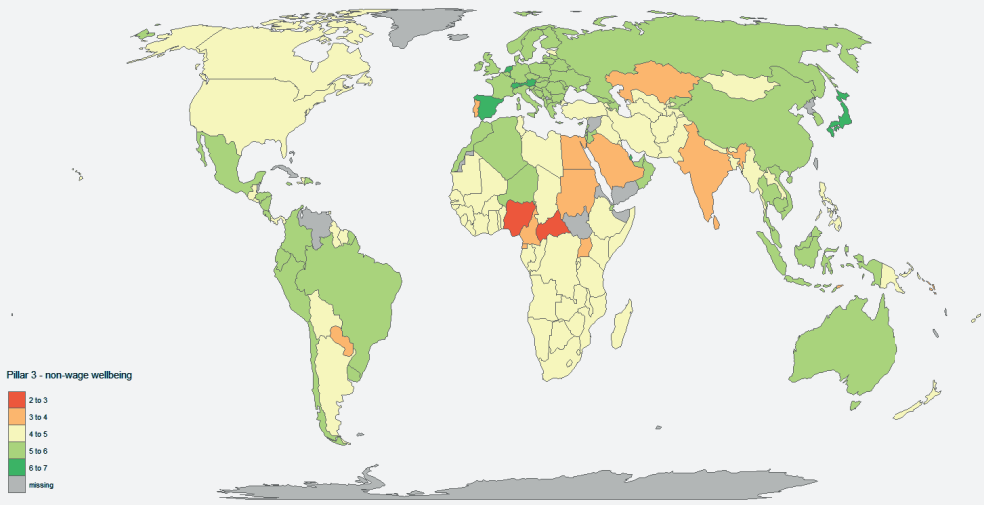
effectiveness. Poland has also designed significant reforms, including the Strategy for Responsible Development, with innovativeness as one of its guiding thoughts, and the Constitution for Science, a package of higher education reforms. These reforms, which are supposed to enter force soon, are likely to have a positive impact on the creation of future wellbeing in Poland, but this remains to be evaluated in the future.

Pillar III – non-wage wellbeing

Of the three pillars, Poland fares best in the third, finishing in 23rd place. Perhaps surprisingly, countries with a high GDP per capita, USD 42,000 on average, also top this ranking that is unrelated to monetary wellbeing. Poland is one of the six countries in the top thirty with GDP per capita below USD 20,000. The Czech Republic, which is often treated as the European point of reference for Poland, ranks very high. Poland mainly owes its position to its high life expectancy, low level of crime and lack of terrorism. Air quality could be a problem, though. The current calculations used the concentration of PM2.5, used in WHO data from 2016. Yet recently, air quality measured using PM10 emissions, has deteriorated sharply in Poland and exceeded EU norms significantly. These emissions mainly come from low emissions, often from households. Although the government has introduced a "Clean Air" programme aiming to reduce PM10 emissions substantially, it will only be possible to assess its effectiveness after some time.

In addition to its good result in pillar 3, Poland is also among the countries that progressed the most in this area. It ranked 11th, as Table 11 shows.

↘ **Map 3. Pillar III globally**



Source: prepared by the authors.

↘ Table 8. Top 30 countries in pillar II

Rank	Pillar II	Country	Rank in Index	GDP per capita (USD)
1	6.82	Switzerland	1	80189.70
2	5.33	Norway	2	75504.57
3	5.04	South Korea	9	29742.84
4	5.03	Sweden	3	53442.01
5	4.98	Denmark	5	56307.51
6	4.62	Macau	24	80892.82
7	4.51	Belgium	8	43323.81
8	4.50	Austria	4	47290.91
9	4.25	United States	12	59531.66
10	4.10	Germany	11	44469.91
11	3.98	Singapore	22	57714.30
12	3.98	Finland	10	45703.33
13	3.85	New Zealand	42	42940.58
14	3.82	Australia	7	53799.94
15	3.81	France	14	38476.66
16	3.70	Ireland	13	69330.69
17	3.68	Japan	6	38428.10
18	3.65	Hong Kong	36	46193.61
19	3.40	Israel	17	40270.25
20	3.34	Britain	15	39720.44
21	2.93	Portugal	35	21136.30
22	2.65	Spain	20	28156.82
23	2.60	Botswana	66	7595.60
24	2.59	Paraguay	91	4365.53
25	2.52	Italy	18	31952.98
26	2.51	Slovenia	21	23597.29
27	2.40	Costa Rica	39	11630.67
28	2.33	Cyprus	25	25233.57
29	2.32	Chile	38	15346.45
30	2.31	Estonia	32	19704.66

Source: prepared by the authors.

↘ Table 9. Top 30 countries in terms of progress in pillar II

Rank	Country	Change 15-17 (%)	Change 15-17	Rank in Index	GDP per capita (USD)
1	Austria	9.43	0.39	4	47290.91
2	Japan	11.35	0.38	6	38428.10
3	Israel	11.61	0.35	17	40270.25
4	Denmark	7.37	0.34	5	56307.51
5	Ireland	9.45	0.32	13	69330.69
6	Finland	6.85	0.25	10	45703.33
7	Cyprus	9.71	0.21	25	25233.57
8	Slovenia	8.19	0.19	21	23597.29
9	Germany	4.44	0.17	11	44469.91
10	Singapore	3.05	0.12	22	57714.30
11	South Korea	2.14	0.11	9	29742.84
12	Lithuania	5.11	0.10	30	16680.68
13	The Czech Republic	4.02	0.09	23	20368.14
14	Italy	3.35	0.08	18	31952.98
15	Spain	3.07	0.08	20	28156.82
16	Hungary	4.79	0.08	37	14224.85
17	Croatia	4.20	0.07	33	13294.51
18	Belgium	1.40	0.06	8	43323.81
19	The Netherlands	3.31	0.06	19	48223.16
20	New Zealand	1.61	0.06	42	42940.58
21	France	1.61	0.06	14	38476.66
22	Portugal	1.88	0.05	35	21136.30
23	Iran	3.32	0.05	70	5415.21
24	Mauritius	2.60	0.04	43	10547.22
25	Russia	3.15	0.04	60	10743.10
26	Luxembourg	1.92	0.04	16	104103.04
27	**Poland**	**2.29**	**0.04**	**29**	**13811.66**
28	Chile	1.60	0.04	38	15346.45
29	Estonia	1.55	0.04	32	19704.66
30	Bulgaria	2.10	0.03	46	8031.60

Source: prepared by the authors.

↘ Table 10. Top thirty countries in pillar III

Rank	Pillar III	Country	Rank in Index	GDP per capita (USD)
1	6.93	Japan	6	38428.10
2	6.69	Singapore	22	57714.30
3	6.62	Qatar	67	63505.81
4	6.23	Switzerland	1	80189.70
5	6.21	Luxembourg	16	104103.00
6	6.16	Spain	20	28156.82
7	6.13	The Netherlands	19	48223.16
8	6.09	Austria	4	47290.91
9	5.96	Italy	18	31952.98
10	5.95	Slovenia	21	23597.29
11	5.95	Australia	7	53799.94
12	5.88	Norway	2	75504.57
13	5.87	The Czech Republic	23	20368.14
14	5.86	Greece	28	18613.42
15	5.84	Britain	15	39720.44
16	5.82	Germany	11	44469.91
17	5.79	Ireland	13	69330.69
18	5.79	Macau	24	80892.82
19	5.78	Indonesia	55	3846.86
20	5.77	France	14	38476.66
21	5.73	Sweden	3	53442.01
22	5.73	South Korea	9	29742.84
23	**5.70**	**Poland**	**29**	**13811.66**
24	5.66	Cyprus	25	25233.57
25	5.64	Croatia	33	13294.51
26	5.63	Belgium	8	43323.81
27	5.61	Finland	10	45703.33
28	5.58	Slovakia	27	17604.95
29	5.58	Israel	17	40270.25
30	5.53	The Dominican Republic	58	7052.26

Source: prepared by the authors.

↘ Table 11. Top 30 countries in terms of progress in pillar III

Rank	Country	Change 15-17 (%)	Change 15-17	Rank in Index	GDP per capita (USD)
1	Slovenia	3.30	0.19	21	23597.29
2	Portugal	2.93	0.11	35	21136.30
3	Switzerland	1.78	0.11	1	80189.70
4	The Czech Republic	1.57	0.09	23	20368.14
5	Indonesia	1.36	0.08	55	3846.86
6	Georgia	1.29	0.07	61	4078.25
7	Bulgaria	1.24	0.07	46	8031.60
8	Italy	0.83	0.05	18	31952.98
9	Bosnia and Herzegovina	0.81	0.04	64	5180.64
10	Cyprus	0.72	0.04	25	25233.57
11	**Poland**	**0.66**	**0.04**	**29**	**13811.66**
12	Bhutan	0.73	0.04	86	3110.23
13	France	0.55	0.03	14	38476.66
14	Oman	0.57	0.03	142	15668.37
15	The Netherlands	0.46	0.03	19	48223.16
16	Romania	0.46	0.03	40	10813.72
17	Greece	0.38	0.02	28	18613.42
18	Sweden	0.38	0.02	3	53442.01
19	Macau	0.36	0.02	24	80892.82
20	China	0.40	0.02	47	8826.99
21	Morocco	0.36	0.02	75	3007.24
22	Hungary	0.31	0.02	37	14224.85
23	Jordan	0.28	0.01	65	4129.75
24	Kyrgyzstan	0.27	0.01	74	1219.82
25	Botswana	0.27	0.01	66	7595.60
26	Australia	0.20	0.01	7	53799.94
27	Central African Republic	0.41	0.01	159	418.41
28	South Africa	0.23	0.01	120	6160.73
29	Finland	0.19	0.01	10	45703.33
30	Zimbabwe	0.22	0.01	100	1079.61

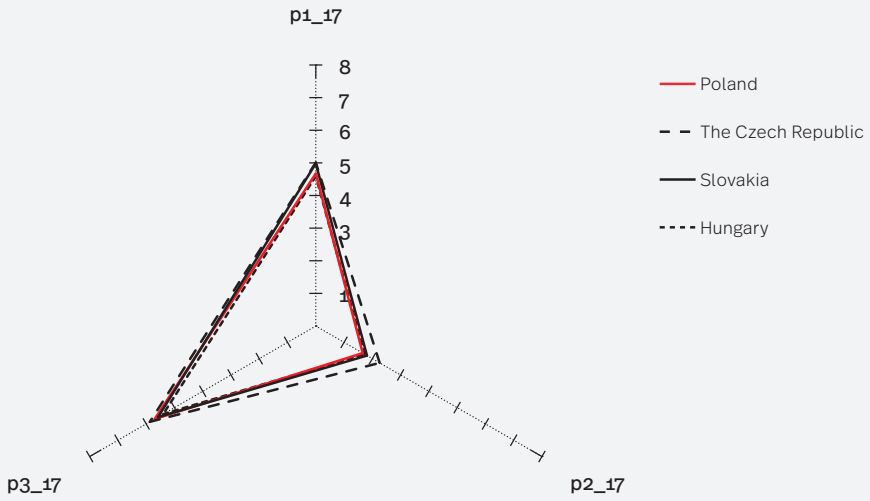
Source: prepared by the authors.

Table 11 is much less dominated by rich countries. Very wealthy Macau is just slightly ahead of relatively poor Morocco. Big, populous China is almost beside rather small Jordan. The countries from the top of the Index are interwoven with those from the bottom. This shows, that progress in pillar III is not obvious at all. Even high GDP per capita does not guarantee that a country will improve its result. Naturally, this partly results from the construction of the pillar; for example, life expectancy changes slowly. Less developed countries can progress significantly by improving citizens' safety. If their air is clean, too, reducing crime may be enough to progress faster in pillar III than richer, more developed countries.

Poland and the other Visegrad countries

Compared to other countries in Central Europe, Poland does relatively well. This section compares Poland's results in all three pillars with those of the three other countries in the Visegrad Group. In many ways, these countries resemble Poland; not just due to economic factors, but geographical and cultural ones as well. Poland is 29th in the Index, the Czech Republic 23rd, Slovakia 27th and Hungary 37th.

↘ Chart 1. **Poland and the rest of the Visegrad Group**



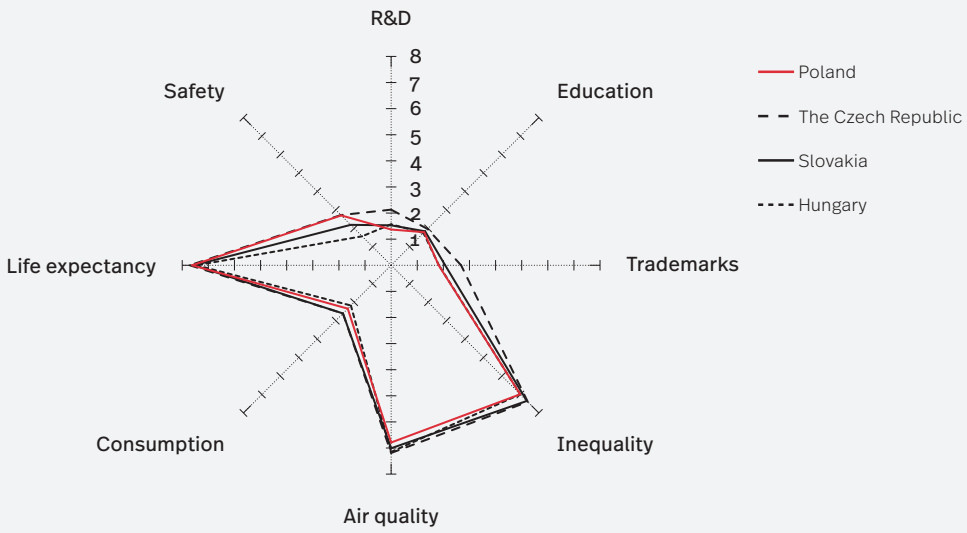
Source: prepared by the authors.

↘ **Table 12.** Poland and the rest of the Visegrad Group, data for Chart 1

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP *per capita* (w USD)
The Czech Republic	23	5.01	2.26	5.87	43.78	20368.14
Slovakia	27	4.98	1.81	5.58	41.26	17604.95
Poland	**29**	**4.67**	**1.66**	**5.70**	**40.10**	**13811.66**
Hungary	37	4.59	1.72	5.40	39.00	14224.85

Source: prepared by the authors.

↘ **Chart 2.** Poland and the rest of the Visegrad Group, in terms of individual indicators



Source: prepared by the authors.

↘ **Table 13.** Poland and the rest of the Visegrad Group, data for Chart 2

Country	R&D	Education	Trademarks	Inequality	Air quality	Consumption	Life expectancy	Safety
Poland	**1.37**	**1.79**	**1.82**	**6.99**	**6.79**	**2.35**	**7.62**	**2.70**
The Czech Republic	2.13	1.97	2.68	7.40	7.19	2.61	7.71	2.72
Hungary	1.57	1.75	1.83	6.99	7.15	2.18	7.46	1.57
Slovakia	1.53	1.84	2.07	7.35	7.01	2.61	7.55	2.19

Source: prepared by the authors.

As Chart 1 shows, the four countries' results are very close; it would be difficult to say which one is well ahead of the others. The Czechs do slightly better than Poland in every pillar. In this respect, the Responsible Development Index is consistent with others, such as the Global Competitiveness Index, which place the Czech Republic slightly above Poland. In pillar I, Poland is only ahead of Hungary; in the Czech Republic and Slovakia, per capita consumption is higher and inequalities are lower. In pillar II, which describes the creation of future wellbeing, Poland did worst in the whole Visegrad Group. Even though only the Czechs spend significantly more per PhD student, Poland invests the least in R&D. It also lags behind Slovakia and the Czech Republic in terms of trademarks per capita. In contrast, Poland has a certain advantage in pillar III. Only the Czechs have a higher life expectancy than the Poles. Poland also has a low level of crime; together with the Czech Republic, it is ahead of both Hungary and Slovakia. Poland's air quality, which is the worst in the Visegrad Group, casts a shadow over pillar III. Nevertheless, Poland is second in the group in that pillar. Chart 2 presents the four countries' results in each pillar (after standardisation) in more detail.

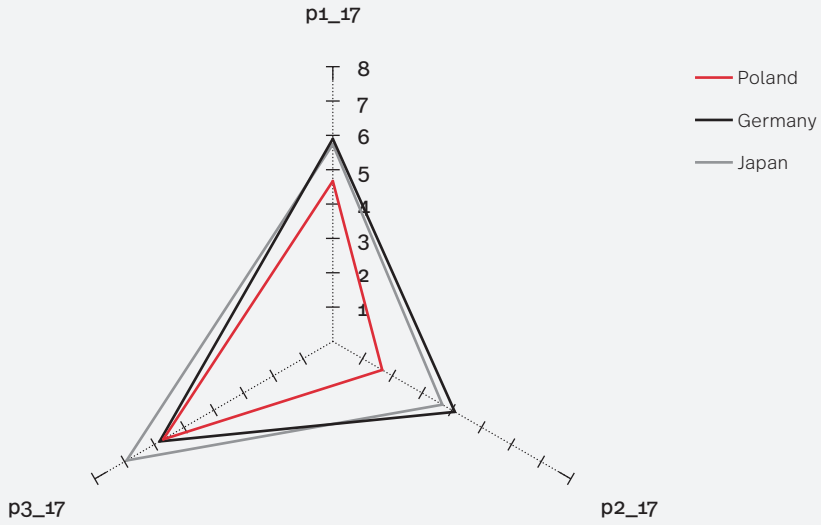
Comparing Poland with the rest of the Visegrad Group allows us to posit that Poland's fundamental problem is low spending on R&D. Without concrete investments, Poland – rather than aspire to lead it – will hamper the Group. Poland also needs to improve its air quality by lowering the concentration of PM2.5. Finally, the Czech Republic and Slovakia have much less inequality, so it would be sensible for Poland to continue efforts to reduce it.

Poland and developed economies – Germany and Japan

Analysing Poland's position in the Index, it should not only be compared with similar countries, but also the leaders. To this end, Poland will be compared with culturally and geographically close Germany (11th in the Index) and more distant Japan (6th). Chart 3 presents their results in the three pillars. After that, Chart 4 compares all the indicators (after standardisation). Comparing Poland with two developed countries that are well ahead of it in the Index shows how much separates it from the leaders. In pillar I, despite a similar level of inequality, per capita consumption in Japan and Germany is almost three times higher than in Poland. In pillar II, Polish spending on R&D is ten times lower. Spending per PhD student is also just a fraction of that in Germany or Japan. German and Japanese are several times more active when it comes to registering trademarks. Pillar III, where Poland is almost equal with Germany offers some consolation. Poland is safer than its western neighbour, but not Japan, where people also live longer and breath much better air.

This comparison with Germany and Japan shows how much work Poland has ahead of it if it wants to catch up with developed countries. The two indicators in which Poland is close to rich countries are life expectancy and inequality. For the rest, the distance between Poland and Japan or Germany is sizeable. Spending on education and R&D is especially problematic. In these areas, it will be impossible to reach the level of rich countries quickly. Nevertheless, Poland needs to set out concrete intentions for improving its position.

↘ Chart 3. Poland compared with Germany and Japan



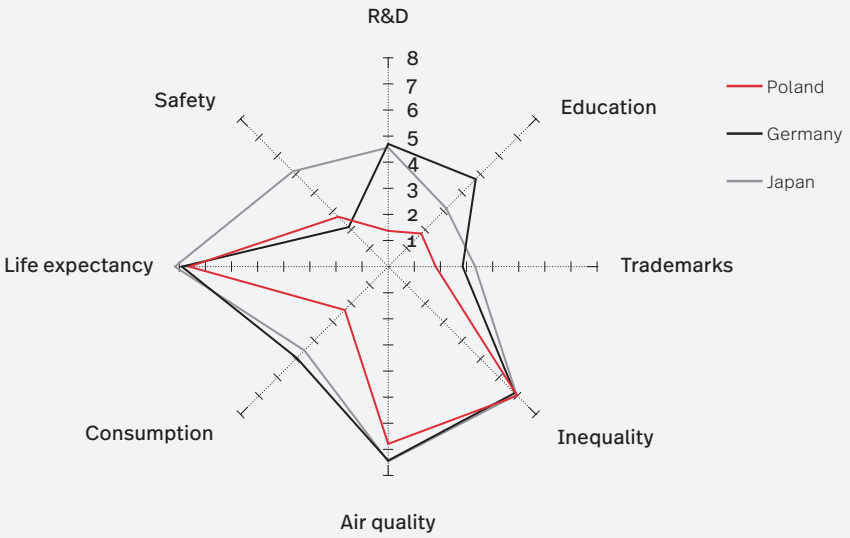
Source: prepared by the authors.

↘ Table 14. Poland compared with Germany and Japan, data for Chart 3

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Poland	**29**	**4.67**	**1.66**	**5.70**	**40.10**	**13811.66**
Germany	11	5.90	4.10	5.82	52.74	44469.91
Japan	6	5.74	3.68	6.93	54.51	38428.10

Source: prepared by the authors.

↘ Chart 4. Poland compared with Germany and Japan, individual indicators



Source: prepared by the authors.

↘ Table 15. Poland compared with Germany and Japan, data for Chart 4

Country	R&D	Education	Trademarks	Inequality	Air quality	Consumption	Life expectancy	Safety
Poland	**1.37**	**1.79**	**1.82**	**6.99**	**6.79**	**2.35**	**7.62**	**2.70**
Germany	4.70	4.74	2.85	6.85	7.43	4.95	7.90	2.14
Japan	4.56	3.15	3.33	6.95	7.46	4.54	8.17	5.16

Source: prepared by the authors.

Appendix

↘ Detailed results for the Index and individual pillars for all 162 countries

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Switzerland	1	7.41	6.82	6.23	68.21	80189.70
Norway	2	6.97	5.33	5.88	60.59	75504.57
Sweden	3	6.02	5.03	5.73	55.91	53442.01
Austria	4	6.06	4.50	6.09	55.51	47290.91
Denmark	5	6.31	4.98	5.12	54.71	56307.51
Japan	6	5.74	3.68	6.93	54.51	38428.10
Australia	7	6.41	3.82	5.95	53.94	53799.94
Belgium	8	5.97	4.51	5.63	53.72	43323.81
South Korea	9	5.16	5.04	5.73	53.10	29742.84
Finland	10	6.24	3.98	5.61	52.77	45703.33
Germany	11	5.90	4.10	5.82	52.74	44469.91
United States	12	6.87	4.25	4.59	52.35	59531.66
Ireland	13	5.78	3.70	5.79	50.88	69330.69
France	14	5.65	3.81	5.77	50.80	38476.66
Britain	15	6.06	3.34	5.84	50.79	39720.44
Luxembourg	16	6.53	2.25	6.21	49.94	104103.04
Israel	17	5.47	3.40	5.58	48.18	40270.25
Italy	18	5.50	2.52	5.96	46.62	31952.98
The Netherlands	19	5.87	1.90	6.13	46.33	48223.16
Spain	20	5.06	2.65	6.16	46.24	28156.82
Slovenia	21	5.26	2.51	5.95	45.71	23597.29
Singapore	22	2.72	3.98	6.69	44.65	57714.30
The Czech Republic	23	5.01	2.26	5.87	43.78	20368.14
Macau	24	2.64	4.62	5.79	43.48	80892.82
Cyprus	25	4.88	2.33	5.66	42.88	25233.57
Canada	26	6.03	2.19	4.63	42.82	45032.12
Slovakia	27	4.98	1.81	5.58	41.26	17604.95
Greece	28	4.85	1.44	5.86	40.46	18613.42
Poland	**29**	**4.67**	**1.66**	**5.70**	**40.10**	**13811.66**

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Lithuania	30	4.60	2.05	5.34	39.98	16680.68
Latvia	31	4.63	1.88	5.36	39.59	15594.29
Estonia	32	4.72	2.31	4.84	39.58	19704.66
Croatia	33	4.60	1.61	5.64	39.51	13294.51
Uruguay	34	4.58	1.92	5.33	39.42	16245.60
Portugal	35	4.95	2.93	3.87	39.16	21136.30
Hong Kong	36	3.59	3.65	4.51	39.14	46193.61
Hungary	37	4.59	1.72	5.40	39.00	14224.85
Chile	38	4.08	2.32	5.30	39.00	15346.45
Costa Rica	39	3.84	2.40	5.35	38.64	11630.67
Romania	40	4.33	1.56	5.52	38.02	10813.72
Argentina	41	4.43	2.23	4.67	37.76	14401.97
New Zealand	42	3.17	3.85	4.29	37.70	42940.58
Mauritius	43	4.43	1.76	5.02	37.34	10547.22
Malaysia	44	4.05	1.76	5.37	37.28	9944.90
Azerbaijan	45	4.80	1.14	5.22	37.17	4131.62
Bulgaria	46	4.13	1.63	5.39	37.14	8031.60
China	47	3.81	2.26	5.02	37.00	8826.99
Ukraine	48	4.45	1.50	5.08	36.78	2639.82
Albania	49	4.43	1.20	5.37	36.67	4537.86
Mexico	50	3.89	1.90	5.16	36.47	8902.83
Moldova	51	4.37	1.35	5.19	36.38	2289.88
Turkey	52	4.02	2.22	4.66	36.31	10540.62
Belarus	53	4.45	1.24	5.20	36.30	5726.03
Montenegro	54	4.42	1.18	5.24	36.13	7669.57
Indonesia	55	3.85	1.20	5.78	36.11	3846.86
Brazil	56	3.68	1.83	5.31	36.07	9821.41
Ecuador	57	3.76	1.75	5.30	36.04	6198.95
Dominican Republic	58	3.78	1.46	5.53	35.91	7052.26
Macedonia	59	4.26	1.32	5.17	35.82	5442.61
Russia	60	4.13	1.44	5.17	35.79	10743.10
Georgia	61	4.09	1.32	5.28	35.61	4078.25
Jamaica	62	3.87	1.46	5.28	35.37	5109.55
Thailand	63	4.06	1.49	5.05	35.35	6593.82
Bosnia and Herzegovina	64	4.24	1.08	5.24	35.18	5180.64
Jordan	65	4.22	1.32	5.01	35.15	4129.75

Appendix

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Botswana	66	3.09	2.60	4.83	35.07	7595.60
Qatar	67	2.22	1.63	6.62	34.92	63505.81
Armenia	68	4.14	1.38	4.95	34.91	3936.80
Vietnam	69	3.96	1.33	5.14	34.77	2343.12
Iran	70	4.01	1.52	4.90	34.75	5415.21
Algeria	71	4.30	1.08	5.03	34.67	4123.39
El Salvador	72	3.91	1.52	4.96	34.61	3889.31
Peru	73	3.86	1.48	5.03	34.57	6571.93
Kyrgyzstan	74	4.22	1.03	5.09	34.46	1219.82
Morocco	75	3.77	1.35	5.17	34.30	3007.24
Tunisia	76	4.02	1.33	4.85	34.02	3490.83
Niger	77	4.02	1.16	5.03	34.02	378.06
Panama	78	3.77	1.93	4.45	33.81	15087.68
Columbia	79	3.47	1.39	5.19	33.52	6301.59
Djibouti	80	3.57	1.29	5.17	33.46	1927.59
Tanzania	81	3.79	1.48	4.72	33.31	936.33
Guatemala	82	3.74	1.23	4.96	33.12	4470.99
Nicaragua	83	3.54	1.14	5.21	32.98	2221.81
Liberia	84	3.96	1.03	4.90	32.98	456.05
Mongolia	85	4.08	1.32	4.49	32.97	3735.16
Bhutan	86	3.85	1.17	4.86	32.94	3110.23
Guinea	87	4.10	1.06	4.63	32.63	825.34
Angola	88	3.86	1.32	4.58	32.56	4170.31
Nepal	89	4.10	1.09	4.57	32.53	835.08
Fiji	90	4.09	1.27	4.37	32.40	5589.39
Paraguay	91	3.54	2.59	3.58	32.38	4365.53
Namibia	92	3.10	1.85	4.73	32.27	5227.18
Tajikistan	93	3.93	1.01	4.70	32.16	800.97
Honduras	94	3.33	1.26	5.04	32.08	2480.13
Mali	95	4.17	1.10	4.35	32.07	824.52
Laos	96	3.79	1.04	4.79	32.03	2457.38
Sierra Leone	97	3.96	1.02	4.63	32.03	499.43
Uzbekistan	98	3.57	1.05	4.98	32.01	1504.23
Kenya	99	3.68	1.05	4.79	31.72	1507.81
Zimbabwe	100	3.52	1.19	4.75	31.51	1079.61
Bolivia	101	3.27	1.20	4.96	31.47	3393.96

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Cape Verde	102	3.57	1.10	4.76	31.43	3209.69
Ghana	103	3.61	1.12	4.67	31.35	1641.49
Kazakhstan	104	4.60	1.20	3.59	31.30	8837.46
Gabon	105	3.92	1.04	4.42	31.27	7220.69
Mauritania	106	4.01	1.08	4.28	31.22	1136.76
Madagascar	107	3.47	1.05	4.83	31.20	449.72
Iraq	108	4.30	1.00	4.06	31.19	5165.71
Swaziland	109	3.29	1.37	4.69	31.16	3224.39
Gambia	110	3.84	1.08	4.43	31.16	483.02
Ethiopia	111	3.63	1.18	4.51	31.06	767.56
Bangladesh	112	4.00	1.06	4.23	30.97	1516.51
Burkina Faso	113	3.91	1.07	4.27	30.82	670.71
East Timor	114	4.22	1.00	3.99	30.71	2279.25
Côte d'Ivoire	115	3.64	1.16	4.41	30.67	1662.44
Pakistan	116	3.99	1.14	4.06	30.67	1547.85
Malawi	117	3.27	1.01	4.89	30.55	338.48
United Arab Emirates	118	2.19	1.81	5.17	30.55	40698.85
Rwanda	119	3.58	1.06	4.48	30.40	748.39
South Africa	120	2.92	1.52	4.64	30.30	6160.73
India	121	3.93	1.23	3.91	30.25	1939.61
Senegal	122	3.38	1.19	4.48	30.16	1033.07
Burundi	123	3.63	1.07	4.27	29.89	320.09
Togo	124	3.52	1.04	4.39	29.86	617.18
Sri Lanka	125	3.79	1.33	3.75	29.56	4065.22
Mozambique	126	3.01	1.07	4.73	29.35	415.72
Chad	127	3.46	1.10	4.25	29.34	669.89
Democratic Republic of the Congo	128	3.53	1.03	4.24	29.32	457.85
Republic of the Congo	129	3.24	1.11	4.37	29.07	1658.04
Haiti	130	3.62	1.03	4.02	28.92	765.68
Benin	131	3.19	1.06	4.42	28.88	829.80
Kosovo	132	4.39	1.00	3.27	28.87	3893.97
Egypt	133	4.10	1.11	3.35	28.52	2412.73
Uganda	134	3.44	1.06	3.99	28.30	604.04
Guinea-Bissau	135	3.01	1.00	4.44	28.17	723.66
Zambia	136	2.76	1.02	4.66	28.14	1509.80

Country	Rank	p1_17	p2_17	p3_17	index_17	GDP_per_cap
Sudan	137	3.97	1.02	3.42	28.03	2898.55
Lesotho	138	3.02	1.00	4.30	27.73	1181.81
Cameroon	139	3.36	1.02	3.88	27.56	1446.70
Bahrain	140	1.87	1.60	4.78	27.51	23655.04
Solomon Islands	141	3.83	1.00	3.32	27.17	2132.12
Oman	142	1.47	1.54	5.03	26.80	15668.37
Serbia	143	1.35	1.36	5.28	26.65	5900.04
Lebanon	144	1.62	1.21	5.05	26.28	8523.75
Comoros	145	3.51	1.03	3.31	26.14	797.29
Kuwait	146	2.07	1.06	4.38	25.05	29040.36
Nigeria	147	3.57	1.07	2.87	25.05	1968.56
Surinam	148	1.19	1.22	4.93	24.48	5900.56
The Philippines	149	1.18	1.14	4.99	24.35	2988.95
Trinidad and Tobago	150	1.00	1.23	4.92	23.84	16145.18
Cambodia	151	1.08	1.05	5.00	23.81	1384.42
Guyana	152	1.26	1.06	4.81	23.76	4725.32
Turkmenistan	153	1.06	1.01	4.99	23.55	7355.83
Papua-New Guinea	154	1.02	1.00	4.84	22.86	2555.85
Saudi Arabia	155	1.72	1.32	3.78	22.72	20760.91
Libya	156	1.24	1.00	4.56	22.68	7998.03
Myanmar	157	1.05	1.07	4.66	22.58	1298.88
Somalia	158	1.06	1.00	4.40	21.53	499.82
Central African Republic	159	2.65	1.03	2.62	20.99	418.41
Equatorial Guinea	160	1.38	1.00	3.81	20.62	9850.01
Afghanistan	161	1.05	1.02	4.02	20.28	585.85

Source: prepared by the authors.

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