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BRICS Sustainable Development Index: Methodological Aspects[1]

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Abstract

This article discusses the methodological aspects of comparative research on sustainable development in order to form the BRICS Sustainable Development Index. The index can be considered as a mechanism for assessing the progress of the five BRICS countries (Brazil, Russia, India, China and South Africa) in achieving the United Nations' sustainable development goals (SDGs) in 2015–20.

The authors systematize the accumulated experience of international studies, indices, and rankings that address social, economic, and environmental aspects of sustainability, highlighting the key research problems of these works and intrinsic issues of the SDG methodological framework in general. The methodology of the BRICS Sustainable Development Index is described in detail, taking into account the conclusions on the applicability of the available experience for the purposes of the current study. The final section presents the interim results of the Index.

Keywords: Sustainable Development Goals (SDGs), 2030 Agenda for Sustainable Development, BRICS, sustainable development

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Introduction

Six years after the adoption of the United Nations (UN) 2030 Agenda for Sustainable Development (Agenda 2030), crises in the global economy are challenging the prospects for transition to a new growth model and implementation of the sustainable development goals (SDGs). In many areas, such as the fight against poverty, inequality, and climate change, progress is slowing significantly, especially for the most vulnerable regions, countries, and population groups. Under the new conditions of significant economic constraints, Russia needs to strike a balance between short-term goals and the implementation of long-term social and environmental prior-

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ities outlined both in the SDGs and in national strategic planning documents. The importance of interaction among BRICS partners (Brazil, Russia, India, China, and South Africa) in the interest of ensuring external conditions for the country's sustainable socio-economic development is also increasing.

This article, prepared within the framework of the research work on the state assignment of RANEPA, highlights the methodological aspects of the BRICS Sustainable Development Index as a mechanism for studying the progress of the five countries in achieving the SDGs in 2015–20. The necessity for the index is determined by the need for an objective assessment of the progress and contributions of the BRICS members in achieving the SDGs and the absence of similar studies focusing on the BRICS countries, taking into account their national and collective priorities.

The article presents a methodology for the assessment and comparative analysis of the implementation of the SDGs in the BRICS countries. First, it systematizes the accumulated experience and approaches to similar research tasks used in similar studies. Next, the methodology of the BRICS Sustainable Development Index is described, taking into account the conclusions on the applicability of this experience and experience for the purposes of this study.

Overview of Methodological Approaches to Comparative Research on Sustainable Development

The adoption of Agenda 2030 and the SDGs by the UN General Assembly in 2015 necessitated a deeper analysis of state and non-state actors on the different dimensions of sustainable development. Research on this topic was also conducted before 2015. The new generation of research, largely driven by the adoption of the 2030 Agenda, focuses on the analysis of progress in implementing the SDGs and, guided by the universal nature of the agenda, covers a range of issues at the intersection of economic, environmental, and social aspects. However, there are also works aimed at assessing and ranking countries' performance in specific areas of sustainable development, such as the energy transition, the circular economy, and gender equality.

The SDG indicator framework approved by the Inter-Agency and Expert Group on SDG Indicators in March 2017 provided the analytical framework and, in fact, the structure for most comprehensive studies in this area [UN, 2016]. Despite the importance of this structuring in terms of comparability, it has entailed additional methodological and substantive problems, both inherent in the chosen set of indicators and in the SDG targets themselves. Among the substantive problems is the absence in the 2030 Agenda of new challenges and thematic areas that have emerged over the past six years, such as the rapid digitalization of society and industry, as well as vulnerability to pandemic phenomena (such as COVID-19). Indeed, the SDGs have virtually no targets for digitalization as a means of promoting sustainable development or strengthening pandemic preparedness for both developed and developing economies. Similarly, these problems are not taken into account in the approved system of indicators.

Consequently, integrated research, rankings and indices of sustainable development face the dilemma of assessing the activities of actors in the field of sustainable development as close as possible to the generally accepted assessment framework, while maintaining comparability and consistency, leaving the assessment of current problem areas outside the scope of the study, or focusing on specific new challenges and departing somewhat from the UN set of commitments. To achieve a result that reflects the real progress of states in sustainable development in the current context, a balanced approach is required, supplementing the generally accepted analytical framework with indicators from new directions.

Another inherent vulnerability of the SDG framework and, as a consequence, of the approved list of indicators, is the universal nature of the 2030 Agenda for both developed and developing countries. On the one hand, this approach emphasizes humanity's commonality in the face of global challenges, while, on the other hand, it creates a situation in which the priority of the adopted goals and targets varies according to the level of wealth of states. Thus, studies may face the challenge of creating an assessment methodology that takes into account differences in national priorities and circumstances while still allowing for cross-country comparisons. Existing studies have pursued the path of maximum comparability, both in terms of choosing the focus of analysis and in the context of selecting the data to be analyzed.

Within the framework of the study a review of more than 40 existing international ratings and methodological publications in the field of sustainable development was conducted. Twenty-two international sustainability ratings and studies were selected for detailed analysis. The selected ratings were analyzed in terms of thematic scope (scale), approaches to the selection of data and sources, analytical structure (including proximity to the UN system of indicators), methodology of working with data, and the system of scoring (ranking). The results are the basis of the methodology developed by the authors for the BRICS Sustainable Development Index.

In terms of thematic coverage, the 22 international sustainability rankings and studies can be divided into four groups. The first group is made up of seven universal rankings that analyze several (or all) aspects of sustainable development. The first of these is the Sustainable Development Report (SDSN). This report, authored by the Sustainable Development Solutions Network (SDSN) team [Sachs et al., 2021], is a study that assesses states' progress toward achieving the sustainable development goals. It uses publicly available data published by international institutions (the World Bank, the World Health Organization (WHO), and the International Labour Organization (ILO), among others) and other actors, including research centres and non-governmental organizations. The system of SDG indicators is used as an analytical framework, and a wide range of sources makes it possible to replace some of its indicators with similar ones in the absence of data.

The second is the Human Development Report. This report, prepared annually (since 1990) by the United Nations Development Programme (UNDP) [n.d.a], is based on an assessment of three components: the level and length of life and the level of education. In total four indicators are used: life expectancy, expected duration of schooling, average duration of schooling, and GNP per capita. The resulting index makes it possible to assess the contribution of these components in shaping the conditions for the development of individuals in different states.

Third is GAPFRAME [n.d.]. This study focuses on the concept of "safe space" presented as four dimensions of sustainability: planet, society, economy, and governance, together including 24 areas and 68 indicators. The authors of the study, from the Swiss Center for Sustainable Development (SSH), draw on publicly available data sources and position their work as a tool to visualize data on progress toward sustainable development "for business, government and education."

The Commitment to Development Index is the fourth universal ranking. This index is produced by the Center for Global Development [2020], based in Washington DC. It analyzes the performance of 40 leading world economies in eight areas: development finance, investment, migration, trade, environment, health, security, and technology. Each area includes from two to six basic indicators not tied to the system of UN SDG indicators.

The fifth is the Global Sustainability Competitiveness Index [SOLABILITY, n.d.], which measures the competitiveness of countries based on an analysis of data on 131 indicators. The indicators are grouped into five sub-indices: Natural Capital, Resource Efficiency and Intensity of Use, Intellectual Capital, Governance Efficiency, and Social Cohesion. The main source

of data is the World Bank. Indicators from the International Monetary Fund (IMF) and specialized UN databases are also used.

Sixth is the Measuring Distance to the SDG Targets study conducted by the Organization for Economic Co-operation and Development (OECD) [2022], which focuses on persistent gaps in the achievement of the SDGs by OECD member countries. Using indicators from the UN SDG framework, the report compares the results achieved by OECD countries to a benchmark or target selected individually for each indicator. In some cases, the target values are reflected in the 2030 Agenda. The provisions of international agreements, expert assessments, and the best results achieved by OECD countries have also been used for this purpose.

Finally, there are the World Bank World Development Indicators [n.d.]. This is a collection of internationally comparable statistics on global development and poverty reduction. In fact, it is a database with information on 1,400 indicators for 217 economies over a period of more than 50 years. The indicators are divided into six groups: poverty and inequality, population, environment, economy, states and markets, and global linkages.

The second group among the 22 international sustainability rankings and studies is made up of those that focus on climate change and environmental sustainability. There are eight of these in this group, the first of which is the Environmental Performance Index (EPI) [2022], which is a ranking of 180 states in 11 categories (40 indicators) addressing aspects of climate change, environmental health, and ecosystem resilience. States' performance is compared to established environmental policy goals defined for each indicator. The EPI offers a scorecard that identifies leaders and laggards in environmental policy and offers practical recommendations.

Second is the Green Growth Index [GGGI, n.d.], measuring the effectiveness of countries' policies to transition to a sustainable growth model, including through the implementation of the sustainable development goals, the Paris Agreement on Climate and the Aichi Biodiversity Targets. In particular, four dimensions of green growth are analyzed: efficient and sustainable use of resources, protection of natural capital, green economic opportunities, and social inclusion. In 2020, 119 countries were assessed: 25 in Africa, 20 in the Americas, 35 in Asia, 36 in Europe, and 3 countries in Oceania.

The Global Green Economy Index (GGEI) is the third index in this group [Tamanini, 2014]. Sponsored by the Green Policy Platform, it assesses 60 countries and 70 cities on four key dimensions: leadership and climate change, sector efficiency, markets and investment, and environment and natural capital. The GGEI also includes an element of expert assessment of perceptions of green growth issues in the same four areas.

The fourth is the MIT Green Future Index [MIT Technology Review, 2021]. The MIT Green Future Index is a ranking of 76 countries and territories on the degree of "progress and commitment toward a low-carbon future." The study measures countries' performance in five areas: carbon emissions, energy transition, green society, clean innovation, and climate policy.

Fifth, the OECD Green Growth Indicators [OECD, n.d.a] are part of the organization's extensive database of indicators related to environmental sustainability. The OECD positions the database as a tool to support climate policy development and to inform the public. The database synthesizes data and indicators from a wide range of fields, including a number of OECD databases as well as external data sources, and covers OECD member countries and key partners (Brazil, China, India, Indonesia, and South Africa) and other selected non-OECD countries, including Russia.

The sixth index in this group is the Sustainable Development Index [Hickel, 2020], which was designed to complement the Human Development Index (HDI) by including an environmental component. Thus, to the four HDI indicators (life expectancy, school life expectancy, average duration of schooling, and GNP per capita) two more were added: CO2 emissions per capita and total resource inputs per capita. A total of 165 economies were evaluated.

Seventh is KAPSARC's Circular Carbon Economy Index project [Luomi et al., 2021]. Developed since 2021 by Saudi Arabia's King Abdullah Center for Petroleum Studies, this index measures the performance and potential of countries on a group of parameters important in terms of building a circular economy. The index includes three key elements: a group of green economy indicators (energy efficiency, renewable energy, electrification, nuclear power, and CO2 capture and storage), a group of "facilitator" indicators (technology, environmental policy measures, finance and investment, and socio-economic conditions), and an additional filter for oil-producing states (carbon intensity of energy balance, weighted carbon intensity of oil production, and methane emissions during hydrocarbon production). The first report provided results for 30 states, including all G20 members and a number of major energy producers.

The final index in this group is the World Risk Index [Bündnis Entwicklung Hilft-IFHV, 2021]. This index is designed to show the risk of disasters from extreme natural events for 181 countries around the world. It is calculated for each country based on two groups of indicators reflecting exposure and vulnerability to risks. A total of 27 indicators from publicly available databases are used. Since 2018, the index has been calculated by the Institute for International Peace and Armed Conflict Law (IFHV) at the Ruhr University in Bochum. The category "exposure to risks" covers threats to the population related to earthquakes, storms, floods, droughts, and rising sea levels. The category "vulnerability" is largely social and consists of three components: the probability of damage, the means of dealing with negative consequences, and the possibilities for long-term adaptation.

The third group among the 22 international sustainability rankings and studies is made up of energy ratings aimed at examining the effects of energy policies in terms of environmental sustainability. First is the International Energy Agency's (IEA) Sustainable Recovery Tracker [IEA, 2022]. This tracker monitors and evaluates the recovery plans and measures of selected countries around the world against the goals of a sustainable energy transition. Key items of the study include an analysis of public and private spending on clean energy measures during the COVID-19 pandemic and modelling the impact of public spending on attracting private investment in the clean energy sector. The reports produced as part of this work provide information on aggregate financial flows to rebuild the economy and advance sustainability goals by specific industry sectors.

Next is the Energy Policy Tracker [n.d.]. This study, led by Yvette Gerasimchuk (of the International Institute for Sustainable Development), is a weekly update of Group of 20 (G20) public policy responses to the COVID-19 pandemic from a climate and energy perspective. The work provides an overview of public financing, by country, energy type, and financing mechanism. The work tracks the share of funding for the world's largest economies allocated to sustainable energy during the economic recovery.

The Fossil Fuel Subsidy Tracker [OECD-IISD, n.d.] is also included in this group. This study, conducted jointly by the OECD and the International Institute for Sustainable Development, monitors government policies and estimates the resulting subsidies for fossil fuel production and consumption. Fossil fuel subsidies and other support measures include direct budget transfers and tax expenditures that provide benefits or preferences for fossil fuel production or consumption as well as other, including indirect, consumer support measures. The database contains information on 192 economies for 2010–20.

The fourth group among the 22 international sustainability rankings and studies selected for analysis is made up of four socio-economic rankings looking at different societal aspects of sustainability. The first is the Sustainable Society Index of the University of Applied Sciences Cologne [2018], which uses 21 indicators reflecting the degree of socio-economic sustainability, including in such areas as food security, access to drinking water and sanitation, education, gender equality, income equality, consumption, and energy. The selected indicators generally reflect the focus of the UN SDGs, but with a strong emphasis on the social dimension of the 2030 Agenda.

The OECD Framework for Measuring Well-Being and Progress [OECD, n.d.] is the second indicator in this group. It aims to create a research framework to measure the impact of public policies on human well-being along three dimensions: current well-being, inequality, and future well-being potential development. In fact, this framework is used both in research (including as part of Measuring Distance to the SDG Targets) and in the practical work of the OECD (making recommendations, standards, and initiatives). The indicators and data used in the research should reflect the three directions chosen by the organization.

Third, there is the Gender Inequality Index developed by the UNDP [n.d.b], which measures gender inequality in 162 countries on three dimensions of human development: reproductive health as measured by the maternal mortality ratio and adolescent birth rate; empowerment as measured by the proportion of parliamentary seats held by women and the proportion of adult women and men age 25 and older with at least a secondary education, and economic status as measured by labour market participation. The sub-indices are calculated for women and men, and their difference forms the resulting index.

Finally, the Social Progress Index [Social Progress Imperative, n.d.] assesses 168 states on the degree of progress in such areas as health, security, education, technological development, civil rights and freedoms, environmental quality, and inclusion. A total of 53 indicators from publicly available databases of international organizations are used.

Studies conducted over several years can evolve in terms of thematic coverage. For example, the Commitment to Development Index, compiled by the Center for Global Development since 2003 and focusing on the spillover effects of national policies to promote global development, added a health theme in 2021 to reflect new needs in pandemic preparedness.

Studies also vary in geographic scope. For example, the OECD work focuses primarily on member countries as well as partner countries, prioritizing data availability and comparability, which improves the quality of research over expanding geographic coverage. The Commitment to Development Index assesses only 40 countries, while the MIT Green Future Index assesses 76 countries, far fewer than the 193 sovereign members of the United Nations. The SDSN Sustainable Development Report comes closest to universal coverage, ranking 165 countries in 2021. Nevertheless, this result was achieved with some reservations. For example, 109 indicators were used for the OECD members, while for other countries only 86, which was explained by the difference in the availability of information.

The problem of data selection for analysis is one of the central problems in the context of comparative studies. As in many other areas of knowledge, the availability of reliable, comparable, and relevant data can be limited, especially when it comes to least developed countries or closed political systems. It also takes some time for national statistical offices to adapt their own data collection systems to the requirements of the SDG indicator system. For example, as of May 2022, Rosstat publishes data for 90 of the 248 SDG indicators [Federal State Statistics Service, n.d.]. The situation with data comparability is exacerbated as the number of indicators and the number of states selected for analysis grows.

Missing data can be replaced by values available for previous years. For example, the authors of the Green Growth Index had to replace missing values for 2020 with data for 2017–19. Were it not for the missing data, they estimate that the index could have been compiled for 243 countries, whereas in reality it only includes 117 states. In addition, the lack of data is particularly noticeable for regions such as Oceania, where information is missing for an average of 82% of the indicators.

The OECD study Measuring Distance to the SDG Targets attempted to follow the UN-approved SDG indicator framework "as closely as possible" and used the UN SDG database as its main data source. However, for 57 of the 132 indicators used in the study, the OECD database was used because, while it was largely consistent with the UN indicators, it met "more

rigorous international statistical standards." This approach, according to the authors, made it possible to approach the statistical standards approved by UN (and OECD) member countries and to provide reliable and comparable data on the countries being assessed. Even so, only 59 indicators of the selected 132 were available for all 36 OECD members; 47 indicators were available for 30–35 members and another 26 indicators were available for fewer than 30 countries.

Thus, the issue of data availability may be a key factor in determining the geographic and thematic scope of the study, as well as its analytical framework.

In the post-2015 period, a key factor in shaping the research framework and source selection for sustainability research is the extent to which it follows the formal framework of UN SDG targets and corresponding indicators. Universal sustainability rankings have largely attempted to approximate the established framework of indicators, but with some caveats and limitations. Most work, as noted above, faces considerable difficulties due to the lack of comparable and reliable data for many of the indicators. In these cases, researchers tend to limit the number of indicators and actors considered. For example, the Human Development Index (HDI), which, although first published in 1990, can be considered a universal study of sustainable development, uses only four generalized indicators: life expectancy, expected years of schooling, average years of schooling, and gross national income (GNI) per capita. To ensure comparability of country data, the UNDP, which forms the index, relies on data from international institutions, primarily the UN Population Division (data on life expectancy), the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (average years of schooling and expected years of education) and the World Bank (GNI per capita).

Researchers have also resorted to replacing problematic indicators for which, for example, data cannot be made comparable, with similar ones. For example, the SDSN Sustainability Report on SDG 4, quality education, for which there is a lack of data, uses indicators for primary school enrolment, literacy rates, and secondary school completion rates, which are similar but not identical to those used in the UN indicator system. It should be noted that even for the selected indicators, data are given including for 2011, which once again emphasizes the lack of relevant and comparable country information on many of the goals.

A different approach is the complete rethinking and transformation of the SDG indicator system to meet the research challenge. The GAPFRAME index is an attempt to translate the SDGs into a set of 24 questions (composite indicators) in four areas—planet, society, economy, and governance—with two to four indicators for each question (68 indicators in total). These indicators differ significantly from those approved in the structure of the SDG indicators. For example, the authors acknowledge that they were limited by the lack of sufficient data in areas such as "equal opportunities," "quality of life," and "sustainable production," which mostly correspond to SDG 1. The authors of GAPFRAME had to use various publicly available sources, ranging from UN, OECD, and World Bank databases to information from KPMG, Deloitte, and even Wikipedia.

Thus, faced with various problems related to unreliability, obsolescence, and incompatibility of available data sources, researchers are forced to compromise the quality and coverage of their rankings. For example, the SDSN Sustainability Report introduced the following criteria for data selection: in order to be included in the rankings, indicator data must be available for 80% of the 149 UN members with a population of more than one million people, and a country must have available data for 80% of the selected indicators.

An important component of benchmarking is the approach to transforming raw data into a final score (index/rating). This process includes the normalization and aggregation of data, as well as the presentation of the final results (scores) of the study.

Normalization methods include, among others: simple ranking of actors by the value of initial indicators; categorization of indicator values into subjective evaluation groups; distribu-

tion of indicator values on a scale from minimum to maximum; comparison of an indicator value with an "ideal" or "optimal" value (used, in particular, in the OECD Measuring Distance to the SDG Targets); standardization (z-scoring), in which indicator values are transformed into a scale with an average value, pegged to 0. The most important challenge in the normalization process is to preserve the mathematical meaning and significance of the final estimates in the context of the original values of the indicators.

The procedure of weighting indicators in the final evaluation also plays an important role. Due to the subjective nature of the process of determining the importance of individual sustainable development goals and targets, most composite indicators in this area are based on the principle of equal indicator weighting, that is, all variables are assigned the same weight in the final assessment. In essence, this means that all variables contribute equally to the composite indicator. While this method is straightforward, it should be kept in mind that it serves only to reduce the subjectivity of the study by effectively masking the absence of consensus and reliable methods for assessing global/country priorities. Moreover, singling out individual goals as relatively more or less important may run counter to the political message and inclusiveness of the 2030 Agenda.

One of the most comprehensive works on the methodology of constructing composite indicators for comparative studies, including in relation to the topic of research and development (R&D) is the OECD Handbook on Constructing Composite Indicators. This publication covers the whole range of issues related to data selection and handling, methods of normalization, weighting, aggregation of data, and presentation of results. In addition, the authors provide recommendations on the application of particular methodological approaches to specific research problems. These recommendations were also used in the development of the methodology for the pilot BRICS Sustainable Development Index.

Methodology of the BRICS Sustainable Development Index

Based on the analysis of international experience and its applicability to BRICS, the methodology of the BRICS Pilot Sustainable Development Index was formed. The index describes the relative progress of the five countries in achieving the SDGs in the first five years after the adoption of the 2030 Agenda (2015–20).

The Pilot Sustainable Development Index shows the relative (relative to each other) positions of the BRICS countries on each of the selected SDG indicators at the beginning and end of the monitoring period. For each of the two sets of raw data (beginning and end of the monitoring period, conventionally denoted as "2015" and "2020"), a static index is formed (Fig. 1). On the vertical scale 0 denotes the average BRICS result. Thus, positive values reflect results above the BRICS average, and negative values reflect results below the average, but do not necessarily mean a negative absolute value of the indicator described by the index.

The index also shows the relative (relative to each other) progress of each of the BRICS countries over the monitoring period for each of the selected SDG indicators. Based on the difference in the values of the indicators for the late and early monitoring periods, a dynamic progress index is formed for each of the BRICS countries. On the vertical scale 0 denotes the average BRICS result. Positive index values reflect dynamics above the BRICS average, and negative index values reflect dynamics below the average, but not necessarily negative dynamics. Cases of negative dynamics (regression in absolute values of the index) are additionally marked in red in the illustration (Fig. 2).

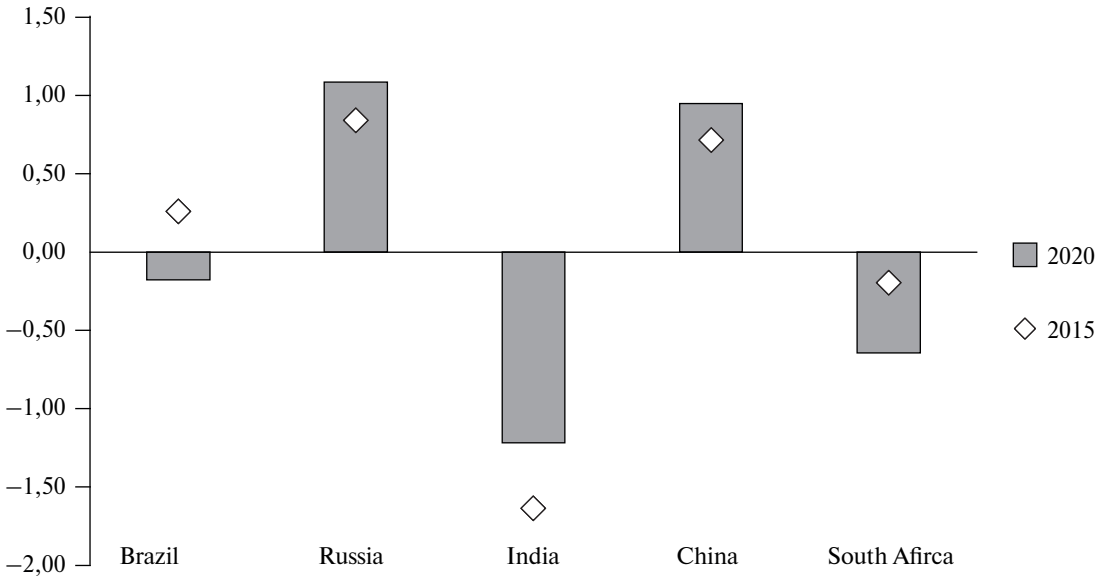

Fig. 1. Example Illustration of the BRICS Sustainable Development Index at the Beginning and End of the Monitoring Period: Indicator 1.1.1 Proportion of the population living below the international poverty line ($1.25 per day), by gender, age, employment status and place of residence

Source: Compiled by the authors.

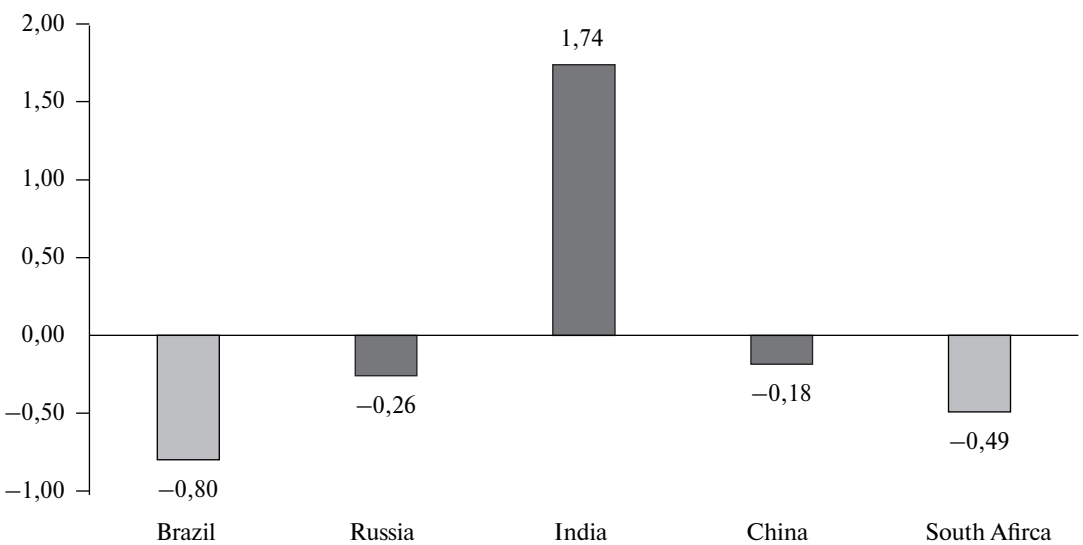

Fig. 2. Example Illustration of the BRICS Sustainable Development Index (Relative Progress): Indicator 1.1.1 Proportion of the population living below the international poverty line ($1.25 per day), by gender, age, employment status and place of residence

Source: Compiled by the authors.

The index further indicates the average relative (relative to each other) progress of each of the BRICS countries over the monitoring period, for each of the goals and for all of the SDGs. Based on the indices of progress on the SDG indicators, the average value of the indices for individual goals and for all SDGs is calculated.

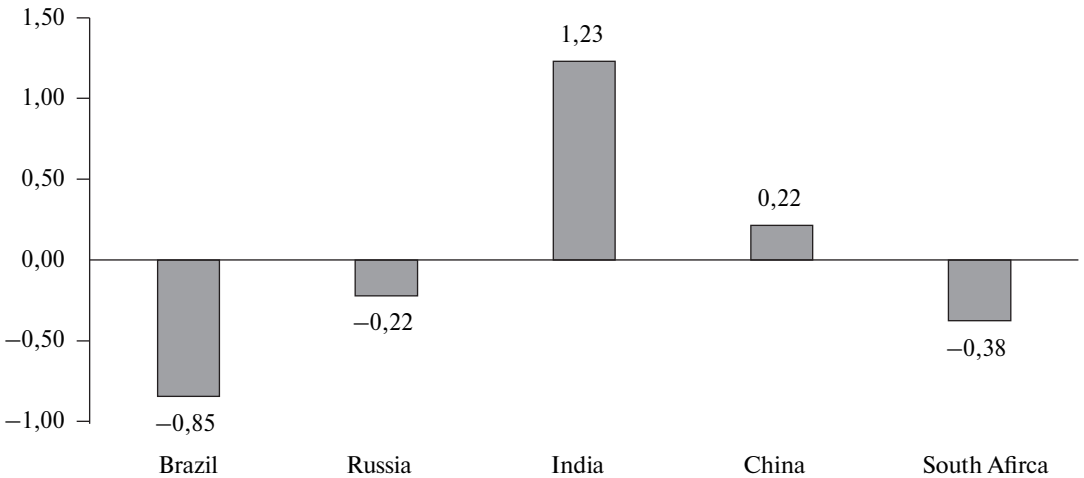

Fig. 3. Example Illustration of the BRICS Sustainable Development Index (Average Relative Progress Across the SDGs): SDG 1 Eradicate Poverty

Source: Compiled by the authors.

In the interest of ensuring close alignment with the UN Sustainable Development Goals and targets, the SDG Indicator Framework approved by the Inter-Agency and Expert Group on SDG Indicators in March 2017, including 248 indicators, was taken as the methodological basis for the pilot index. Further selection of indicators for inclusion in the analysis was based on the availability of comparable and relevant country data. International databases on SDG indicators and similar (related) indicators were used to ensure comparability, specifically: the UN SDG database [n.d.], the OECD database [n.d.c]; BRICS statistical publications [Federal State Statistics Service, 2021], and databases of specialized international institutions such as the IEA [n.d.], the Food and Agriculture Organization (FAO) [n.d.], and the UN Educational, Scientific and Cultural Organization (UNESCO) [n.d.]).

The following criteria were formulated for selection of indicators for analysis: data should be available for all five BRICS countries for 2015–16 for the "early" year; data should be available for all five BRICS countries for 2017–21 for the "last available" year; and the indicator should not be an estimate or imply a binary result (yes/no) (for example, SDG 8.b.1 "Existence of a developed and implemented national youth employment strategy as a separate strategy or within a national employment strategy," or SDG 16.a.1 "Existence of independent national human rights institutions working in line with the Paris Principles").

At the stage of the pilot study, the goal was to ensure maximum compliance of the set of selected indicators with the SDG Indicator System and to minimize cases of indicator substitution. In this regard, the distribution of indicators according to the SDGs was also carried out in accordance with the parameters of the approved UN System. Thus, the indicator "number of dead, missing and affected directly as a result of disasters per 100,000 people" is used under three SDGs as 1.5.1, 11.5.1, and 13.1.1 (see list below). The second phase of the study will con-

sider whether this indicator should be retained to assess the performance of the BRICS countries under all three SDGs, and whether additional indicators should be included to deepen the analysis and fill data gaps.

As a result, 48 indicators were selected directly from the SDG Indicator Framework for all goals except for SDG 4, related to quality education, and SDG 16, related to peace and justice. In order to close the data gap on SDG 4, three indicators reflecting the percentage of completion of primary and secondary education, as well as the share of education expenditure in gross domestic product (GDP), were also included in the analysis. In total, the pilot index is based on 51 indicators, detailed as follows:

For SDG 1, poverty eradication, there are four indicators:

1.1.1 Proportion of population living below the international poverty line ($1.25 per day) by gender, age, employment status, and place of residence (urban/rural)

1.3.1 Proportion of population covered by social protection floor/systems, disaggregated by sex, with a breakdown of children, unemployed, elderly, disabled, pregnant, newborn, labour-injured, and poor and vulnerable

1.4.1 Proportion of population living in households with access to basic services

1.5.1 Number of people killed, missing, and affected as a direct result of disasters per 100,000 people

For SDG 2, eradicate hunger, there are two indicators:

2.1.1 Prevalence of malnutrition

2.2.3 Prevalence of anaemia among women aged 15–49 years by pregnancy status (percentage)

For SDG 3, good health and well-being, there are eleven indicators:

3.1.1 Maternal mortality rate

3.2.1 Under-five mortality rate

3.2.2 Neonatal mortality rate

3.3.2 Tuberculosis incidence rate per 100,000 people

3.3.5 Number of people in need of treatment for "neglected" tropical diseases

3.4.1 Mortality from cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases

3.4.2 Mortality from suicide

3.5.2 Alcohol consumption per capita (ages 15 and older) in liters of pure alcohol per calendar year

3.6.1 Mortality rate as a result of road accidents

3.7.2 Adolescent birth rate (ages 10 to 14; ages 15 to 19) per 1,000 adolescent girls in the same age group

3.8.1 Coverage of basic health services

3.9.3 Deaths from unintentional poisoning

For SDG 4, Quality education, there are three indicators:

Primary education completion rate

Completion rate of complete secondary education

Share of public spending on education as a share of GDP

For SDG 5, gender equality, there is one indicator:

5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments

For SDG 6, clean water and sanitation, there are five indicators:

6.1.1 Proportion of population using water services organized in a safe manner

6.2.1 Proportion of the population using (a) safe sanitation services and (b) handwashing devices with soap and water

6.4.1 Trends in water use efficiency

6.4.2 Level of water stress: freshwater withdrawal as a percentage of available freshwater

6.6.1 Dynamics of change in the area of water-related ecosystems

For SDG 7, related to low-cost and clean energy, there are three indicators:

7.1.1 Proportion of population with access to electricity

7.2.1 Share of renewable energy sources in total final energy consumption

7.3.1 Energy intensity, calculated as the ratio of primary energy consumption to GDP

For SDG 8, related to decent work and economic growth, there are two indicators:

8.1.1 Annual growth rate of real GDP per capita

8.2.1 Annual real GDP growth rate per person employed

For SDG 9, related to industrialization, innovations and infrastructure, there are four indicators:

9.4.1 CO2 emissions per unit of value added

9.5.1 Share of research and development expenditure in GDP

9.b.1 Share of value added by medium-tech and high-tech industries in total value added

9.c.1 Proportion of population covered by mobile networks, by technology

For SDG 10, related to reduction of inequality, there are five indicators:

10.4.1 Share of GDP attributable to wages and salaries

10.7.3 Number of people who died or disappeared during migration to international destinations

10.7.4 Proportion of refugees as a share of total population by country of origin

10.a.1 Proportion of least developed country and developing country commodity items subject to zero tariffs

10.b.1 Total development resource flows by recipient and donor country and type of flow (such as official development assistance, foreign direct investment, and other financial flows)

For SDG 11, related to sustainable cities and human settlements, there are two indicators:

11.5.1 Number of deaths, missing persons, and people directly affected by disasters per 100,000 people

11.6.2 Average annual level of fine particulate matter (for example, PM2.5 and PM10 class) in the atmosphere of cities (per population)

For SDG 12, related to responsible consumption and production, there are two indicators:

12.2.2 Total domestic material consumption and domestic material consumption per capita and as a percentage of GDP

12.c.1 Amount of fossil fuel subsidies per unit of GDP (production and consumption)

For SDG 13, related to combating climate change, there is one indicator:

13.1.1 Number of deaths, missing persons, and those directly affected by disasters per 100,000 people

Under SDG 14, related to conserving marine ecosystems, there is one indicator:

14.1.1 Plastic scrap density

Under SDG 15, related to conservation of terrestrial ecosystems, there are three indicators:

15.1.1 Forest area as a percentage of total land area

15.4.1 Proportion of mountainous areas important in terms of biodiversity under protection

15.5.1 Red List Index

For SDG 17, related to the Partnership for Sustainable Development, there is one indicator:

17.1.1 Total government revenue as a percentage of GDP by source

For the above indicators, it was possible to meet the data availability criteria for all five BRICS countries for 2015–16 for the "early" year and for 2017–21 for the "last available year." A key limitation of this study, as of many other similar studies, is the low degree of data availability for the SDG indicators. Only 49 out of 248 indicators were comparable and relevant data for all BRICS countries. The lack of data is particularly evident for SDG 4, related to quality education, SDG 16, related to peace, justice, and effective institutions, and for the goals of the climate block (SDGs 12–15). As a result, the indicators selected for analysis do not fully reflect the balanced nature of the 2030 Agenda and shift the focus of the study to goals with more data available. Thus, one of the goals of the second phase of this study will be to replace the missing data by including more alternative indicators reflecting selected areas of implementation of the 2030 Agenda.

For the 51 selected indicators, two data sets were formed—for each of the two chronological groups—"2015" and "2020" (beginning and end of the monitoring period).

The objective difference in the units of measurement and digit capacity of the various SDG indicators, as well as the presence of "negative" indicators, the reduction of values for which actually means progress toward sustainable development, necessitated the normalization of data to ensure comparability of results. Examples of negative indicators include: 1.1.1 Proportion of population living below the international poverty line, 3.3.2 Incidence of tuberculosis per 100,000 people, and 14.1.1 Plastic scrap density. Normalization was conducted using the z-score method. This method of normalization and scoring was chosen due to the following considerations: first, the absence of a consensus target ("optimum") value for most of the indicators makes it impossible to tie the evaluation scale to a reference value; second, the method of z-estimation makes it possible to link the results of many indicators with different measurement units to a single scale in order to ensure comparability and aggregation of these indicators on the targets; third, the chosen method also allows for additional correction of "negative" indicators and ensures the visibility of the final results based on the comparison of static values over chronological periods and the dynamics of the achievement of the SDGs among the BRICS countries.

Data normalization for each of the two arrays, for the "early" year (2015–16) and the "last available" year (2017–21), was conducted using the formula:

$$z = \frac{x - \bar{X}}{S_x},$$

where x is the indicator value of each BRICS country; $\bar{X}$ is the average value of the indicator of all BRICS countries; S_x is the standard deviation calculated for the set of indicator values of all BRICS countries. The Z-score allowed the countries' results for each of the chronological groups to be reduced to a single scale, with a mean value equal to 0. In the interest of increasing the visibility of the final results, as well as making the results comparable, the normalization procedure for the "negative" indicators was supplemented by changing the sign (z*–1). This procedure made it possible to avoid distortions in the average scores for a group of indicators within one SDG for each of the BRICS countries. The resulting values formed static indices of the BRICS countries' sustainable development for the beginning and end of the monitoring period.

The sustainability progress index, reflecting the dynamics of the values for the SDG indicators in the BRICS countries over the period 2015–20 relative to each other's results, was calculated using a similar formula:

$$z_{\Delta x} = \frac{\Delta x - \overline{\Delta x}}{S_{\Delta x}},$$

where Δx is the difference between the values of each BRICS country's indicator in the "late" and "early" chronological group; $\overline{\Delta x}$ is the average value for Δx of all BRICS countries; $S_{\Delta x}$ is the standard deviation calculated for the set of $\overline{\Delta x}$ values of all BRICS countries. The resulting z-score brought the countries' progress results to a single scale, with a mean value equal to 0. The formation of the final dynamic progress index was also supplemented by adjusting the values of the "negative" indicators ($Z_{\Delta x}* - 1$), by analogy with the static indices described above.

Thus, the static indices of the BRICS countries for the "early" and "late" stages and the dynamic progress index were formed. The country indices (both the static and the progress indices) were further grouped according to their belonging to specific targets, and an index of individual SDGs was formed based on the calculation of the arithmetic average for the group. The overall average index for individual BRICS countries was calculated in a similar way. The index values were grouped around 0, with no restrictions on minimum and maximum values. However, they are closely related to each other and reflect the relative position (or dynamics for the progress index) of countries in the context of the implementation of a particular SDG target. Thus, negative values of both the static indices and the progress index mean a result below the BRICS average, without necessarily indicating a regression in the absolute values for a particular indicator. The accumulated data set also makes it possible to trace the progress of the entire institution on the basis of the percentage difference between the average values of all countries in the "late" and "early" periods.

Results of the BRICS Pilot Sustainable Development Index

This pilot index should be considered as an intermediate result of ongoing research. Further work is planned to improve the quality of the BRICS Sustainability Index. In particular, it is planned to fill data gaps by including additional indicators, not included in the SDG Indicator System, across the range of goals. The feasibility of including additional indicators to deepen analysis in areas not directly addressed by the 2030 Agenda—digitalization and combating pandemics—will also be considered. Ways to improve the methodology to enhance the visibility and transparency of the index results are also being considered. The issue of refining the methodology for aggregating results within the individual goals and for the SDGs as a whole will be considered.

Nevertheless, the pilot index allows us to trace a number of regularities. In terms of the static sustainable development index at the end of the monitoring period, the five countries are ranked as follows (Fig. 4):

1. Brazil: 0.4
2. China: 0.38
3. Russia: 0.1
4. South Africa/India: –0.44

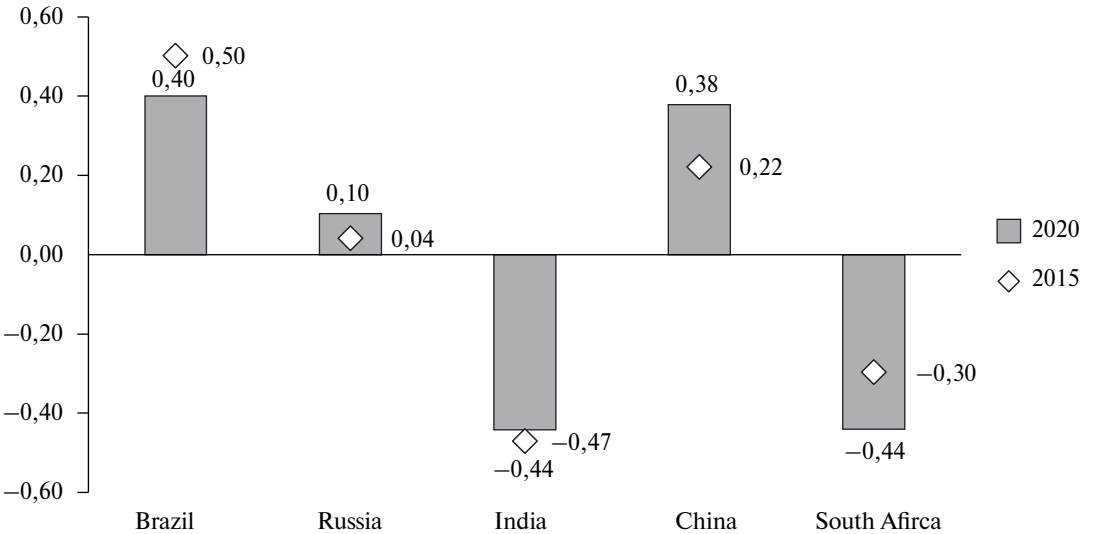

Fig. 4. Composite BRICS Sustainable Development Index at the Beginning and End of the Monitoring Period (2015 and 2020)

Source: Compiled by the authors.

The picture is different for the progress index, which reflects the relative changes in indicators over the monitoring period (Fig. 5):

1. Russia: 0.21
2. China: 0.17
3. India: 0.15
4. South Africa: –0.23
5. Brazil: –0.29

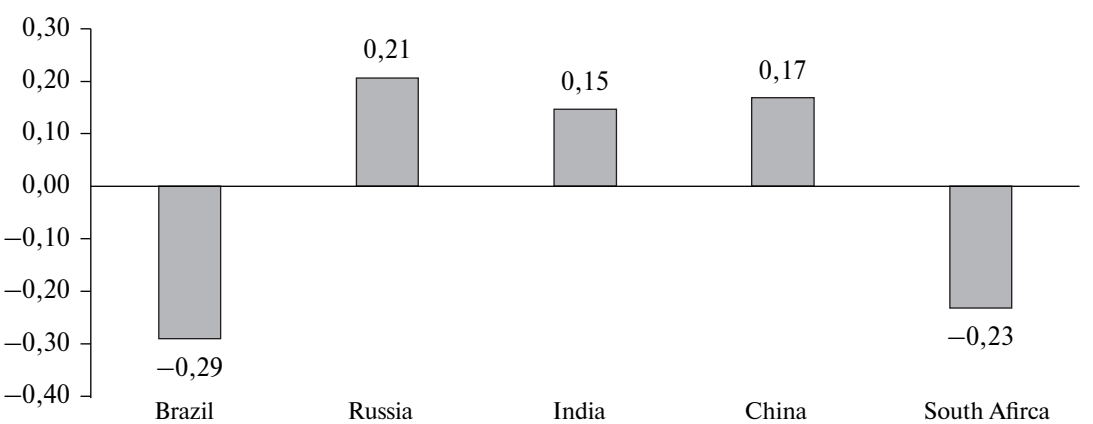

Fig. 5. Cumulative BRICS Progress Index Toward the SDGs, 2015–20

Source: Compiled by the authors.

Figure 6 shows the distribution of the BRICS Progress Index across the individual goals. It should be noted that 44 of the 51 indicators selected for analysis recorded positive dynamics on average across BRICS, indicating the overall progress of the five in achieving the goals in question. Nevertheless, the index revealed a number of problem areas for individual states and for the institution as a whole. These include an increase in the average prevalence of malnutrition, an increase in the number of people in need of treatment for tropical diseases, increasing pressure on water ecosystems in the BRICS countries amid a decrease in their area, a decrease in the share of R&D expenditures as a share of GDP, and a decline in biodiversity indicators.

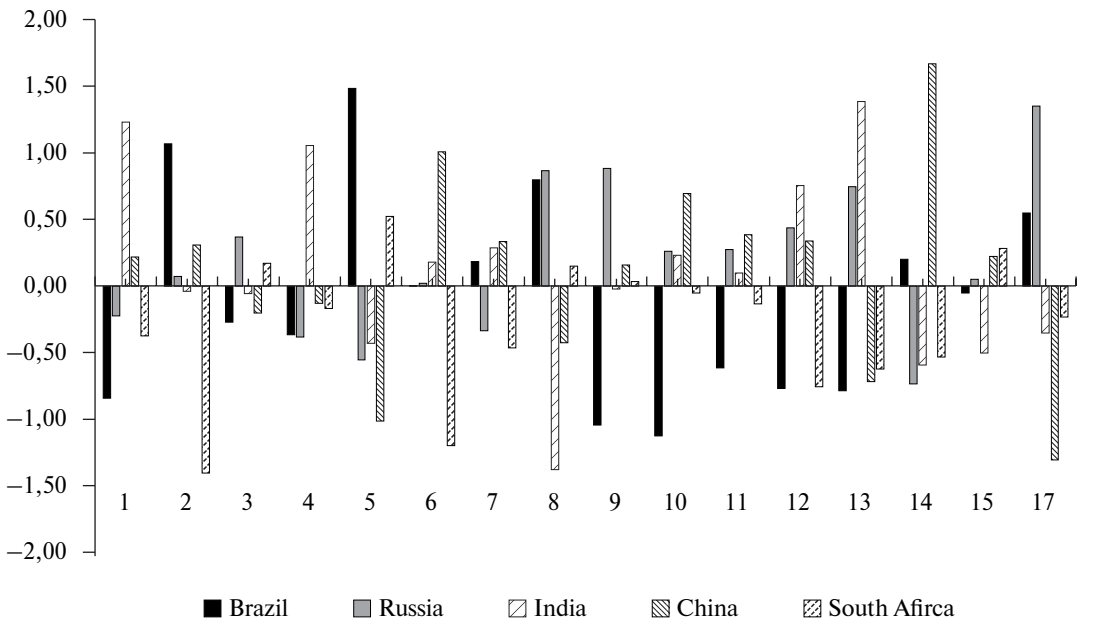

Fig. 6. SDG Progress Index, 2015–20

Source: Compiled by the authors.

Progress leaders are highlighted for the various goals. For example, Brazil progressed faster than the other BRICS countries on goals such as SDG 2, ending hunger and SDG 5, gender equality. Russia led in SDG 8, decent work and economic growth, SDG 9, industrialization, innovation, and infrastructure, and SDG 17, Partnership for Sustainable Development. India led on SDG 1, eradicating poverty, SDG 4, quality education, and SDG 13, combating climate change. Chinalet for SDG 6, clean water and sanitation, SDG 10, reducing inequality, and SDG 14, preserving marine ecosystems. South Africa led on SDG 15, conservation of terrestrial ecosystems.

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