Global Development Index: Methodology

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Global Development Index: Methodology

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Key messages

- *The Global Development Index (GDI) is a comprehensive measure of development achievements. It builds on the Development Challenges Index (DCI) from the 2022 World Development Challenges Report.*

- *The GDI focuses on quality-adjusted human development, environmental sustainability and governance, reflecting progress in these areas of development.*

- *While the DCI focuses heavily on challenges, the GDI concentrates more on achievements. The DCI uses national income and inequality metrics; the GDI focuses on household income and poverty-adjusted measures, and incorporates innovation into the "knowledge" dimension of the index. The DCI also examines water and food security as a part of environmental sustainability. These enhancements cater to specific needs in the Arab region while maintaining global applicability.*

- *Rigorous robustness tests validate the GDI's reliability in capturing multidimensional development achievements, making it a vital resource for evidence-based policymaking in diverse socioeconomic contexts.*

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Introduction

The 2022 **World Development Challenges Report** (WDCR),[1] which informs this paper, sought to develop a useful tool for measuring development progress that captures the most pressing global and regional challenges. For such a tool to be effective, it must meet four essential criteria. First, it must reflect current realities and address challenges faced by countries globally, regardless of their economic status. Second, the measure should be simple to understand and explain. Third, it should have wide applicability across both geographical contexts and timeframes, enabling thorough analysis of development issues. Finally, it must be grounded in a strong conceptual framework.

The WDCR introduced the **Development Challenges Index** (DCI). This index builds on the Human Development Index (HDI) by refining traditional dimensions of well-being for quality and integrating additional dimensions that align with a broader human development narrative. Specifically, the DCI includes two critical dimensions: **environmental sustainability** and **governance**. These make it more aligned with the ambitions of the Sustainable Development Goals (SDGs) by addressing global challenges such as education, poverty, climate change and environmental degradation.

Like the Human Development Reports issued by the United Nations Development Programme (UNDP), the WDCR provides assessments and policy insights based on comparisons across many countries. However, the DCI offers a significant advantage over the HDI by evaluating performance in three key areas: quality-adjusted human development, environmental sustainability and governance.

This technical note builds on the DCI framework and proposes several refinements which were inspired by consultations with the Institute of National Planning in Egypt during the preparation of the **"State of Development in Egypt"** report. This report comprehensively analyses economic, social, and environmental achievements and challenges in Egypt, providing a vital resource for planners and policymakers.

Four major adjustments were introduced to the DCI, tailored to reflect the priorities of middle-income and low-income countries. First, a new global scoring system was introduced, aligned more closely with policymaking needs and facilitating comparisons with the HDI. Second, the income dimension was revised: GNI per capita was replaced with household income per capita, providing a more accurate measure of individual economic welfare, and the Atkinson inequality index was replaced with the ESCWA global poverty index, offering a clearer assessment of income's role in poverty reduction. Third, the "quality-adjusted education" dimension was replaced with a "knowledge" dimension, which now includes measures of both quality-adjusted education and innovation. This reflects the transition of developing countries toward knowledge-based

1. United Nations Economic and Social Commission for Western Asia (ESCWA), *World Development Challenges Report*, 2022.

economies driven by technology and innovation. Lastly, a water and food security component was added to the "environmental sustainability" dimension to address critical issues such as water scarcity and food-import dependency.

These modifications increase the DCI's relevance and provide a robust, policy-oriented framework for evaluating achievements in developing countries.

In short, while the DCI focused on identifying and quantifying development challenges, the GDI shifts the emphasis to achievements, aligning with global best practices and offering policymakers actionable insights into areas of progress, stagnation and decline.

The GDI is globally applicable, but it provides especially useful information on the development of the Arab region. For example, the Arab region is one of the most water-stressed regions in the world. Reflecting this, the GDI uses data on water and food security in its "environmental sustainability" dimension. The drive to foster knowledge-driven economies in the region makes a broader "knowledge" dimension necessary, with innovation as a core component. As well as addressing pressing regional concerns, these enhancements also align with universal development priorities such as climate resilience and the transition to knowledge-based economies. This balance ensures that the GDI is both regionally and globally significant, serving as a useful resource for developing countries that navigate persistent structural obstacles alongside development progress.

The GDI is also more comparable to well-established global indices such as the Human Development Index (HDI). The index is designed to complement these tools and offers additional insights to guide evidence-based policymaking. Its focus on progress also fosters a constructive narrative around development, equipping policymakers with a robust framework for benchmarking performance and setting actionable policy targets.

This technical note presents the conceptual framework and methodology of the GDI, describing ways in which it has been made different from the DCI in order to align it with contemporary development priorities. To ensure the index produces reliable scores and rankings, we have conducted rigorous robustness checks to validate its structure and confirm its value as a practical tool for assessing the evolving development landscape. These adjustments position the GDI as a relevant and adaptable measure for navigating the complex socioeconomic, environmental and governance dimensions of human development in diverse contexts.

1. Conceptual framework

The conceptual framework presented in this report builds on the ESCWA DCI, incorporating several adjustments to better capture a country's development status within the current global climate.[2] Since the proposed GDI strongly aligns with the conceptual foundations of the DCI, this section only highlights the differences between the two.

Table 1 summarizes the GDI, its dimensions, sub-dimensions, indicators, sources and weights, and the subsequent discussion outlines its four key differences with respect to the DCI.

Table 1. Global Development Index framework

Pillar	Dimension	Sub-dimension	Indicator	Source
 Quality-adjusted human development index (1/3)	Health (1/9)	Healthy life expectancy (1/9)	Healthy life expectancy at birth, years (1/9)	WHO
	Knowledge (1/9)	Quality-adjusted education (1/18)	Expected years of schooling (1/36)	HDI data centre
			Mean years of schooling (1/36)	HDI data centre
			Discount factor: harmonized test scores	World Bank Human Capital Index (HCI) dataset
		Innovation (1/18)	Patents by origin/constant $ GDP (1/90)	Global innovation database based on data from the World Intellectual Property Organization, Intellectual Property Statistics
			PCT-System patents by origin/constant $ GDP (1/90)	
			Utility models by origin/constant $ GDP (1/90)	

2. ESCWA, Development Challenges Index: Statistical measurement and validity, 2021.

Pillar	Dimension	Sub-dimension	Indicator	Source
			Scientific and technical articles/constant $ GDP (1/90)	Global innovation database based on data from Clarivate, Web of Science
			Citable documents H-index (1/90)	Global Innovation database based on data from SCImago (2021) SJR - SCImago Journal & Country Rank
	Income (1/9)	Poverty-adjusted household income (1/9)	Mean household income per capita (1/9)	ESCWA calculations based on survey data
			Discount factor: ESCWA poverty rates	ESCWA calculations
 Environmental sustainability index (1/3)	Climate change and energy (1/9)	Climate change (1/18)	Carbon Dioxide (CO2) emissions per capita (production) (1/54)	HDI data centre
			Material footprint per capita (1/54)	HDI data centre
		Energy efficiency (1/18)	Energy intensity per unit of GDP (1/54)	International Energy Agency (IEA)
	Environmental health (1/9)	Air quality (17/225)	PM2.5 exposure (221/7650)	Environmental performance index -Yale University
			Household solid fuels (221/7650)	
			Ozone exposure (187/28125)	
			NO2 exposure (119/26857)	
			SO2 exposure (119/53571)	
			CO exposure (119/53571)	
			VOC exposure (119/53571)	
			Unsafe sanitation (2/225)	

Pillar	Dimension	Sub-dimension	Indicator	Source
		Sanitation & drinking water (1/45)	Unsafe drinking water (1/75)	
		Heavy metals (2/225)	Lead exposure (2/225)	
		Waste management (1/225)	Controlled solid waste (1/1125)	
			Waste generated per capita (2/1125)	
			Waste recovery rate (2/1125)	
	Water and food security (1/9)	Water stress (1/18)	SDG indicator 6.4.2 - Level of water stress (1/18)	FAO database
		Food security (1/18)	Food imports (% of merchandise imports) (1/18)	World Bank
Governance index (1/3)	Democratic governance (1/6)	Rule of law and access to justice (1/18)	Transparent laws with predictable enforcement (1/36)	Varieties of Democracy dataset
			Access to justice (1/36)	
		Institutional accountability (1/18)	Executive oversight (1/54)	
			Judicial accountability (1/54)	
			Rigorous and impartial public administration (1/54)	
		Participation (1/18)	CSO consultation (1/36)	
			CSO participatory environment (1/36)	
	Government effectiveness (1/6)	Government effectiveness (1/6)	Government effectiveness (Quality of infrastructure and public service delivery) (1/6)	World Bank World Governance Indicators (WGI)

Note: Green-highlighted cells show differences from the DCI.

A. Measuring development achievements as opposed to challenges

The first difference between the GDI and DCI is that the GDI measures development achievements rather than challenges, in line with conventional development metrics. Similarly to the HDI, higher scores indicate better performance. In this respect, the GDI is a near mirror image of the DCI.

This adjustment makes the index better aligned with policymaking efforts, highlighting areas of policy success and interest. It also facilitates comparisons with the HDI, which remains the core of the proposed GDI, and with other widely recognized development indices. By adopting a consistent scoring method, it becomes easier for stakeholders to draw meaningful comparisons across indices. This supports a more consistent and coherent narrative of development progress and aids in setting performance benchmarks, ensuring that the GDI remains a practical tool for guiding policy decisions.

B. Shifting from national to household income and prioritizing poverty reduction over income inequality

The second difference involves the income dimension of the Quality-adjusted Human Development Index (Q-HDI), where the inequality-adjusted income index has been replaced with the poverty-adjusted household income index.

This revision involves two key adjustments: first, the HDI income index, which is based on GNI per capita, has been substituted with mean household income (or expenditure) per capita. This change offers a more accurate representation of individual economic well-being, acknowledging that national income growth does not always translate into improved household welfare – a challenge particularly evident in the Arab region and in sub-Saharan Africa, where national income gains have often not led to increases in household income.[3]

The second key adjustment is that the index is now discounted using the ESCWA global poverty index rather than the Atkinson income inequality index.[4] This focuses more directly on the challenge of absolute deprivation, which may be a more pressing concern than income inequality in the context of enhancing human development. Although poverty and inequality are closely related, combating inequality may not effectively address poverty. For example, policies aimed at narrowing income disparities between people with medium and higher incomes may improve equality, but they have no bearing on individuals living in poverty.

By focusing on poverty reduction, the Q-HDI captures the true impact of household income on human development. This is because income growth that fails to lift individuals out of poverty is likely to do little to enhance the overall well-being of a population. Accordingly, the adjusted Q-HDI aligns more closely with the development priorities of many low- and middle-income countries where poverty reduction remains an urgent priority. Poverty-adjusted metrics also help policymakers set clearer, more actionable policy targets. This enables Governments to prioritize interventions aimed at improving the livelihoods

3. ESCWA, Obstructed poverty reduction: growth-passthrough analysis, 2022.
4. ESCWA, Counting the world's poor, 2021.

of the most marginalized socioeconomic groups and reducing the proportion of people living under the poverty line.

C. Emphasizing knowledge-driven development through innovation

The third change seeks to achieve a more comprehensive measure of knowledge enhancement. This allows the GDI to more accurately capture a country's capacity for sustainable development in a knowledge-driven global economy. In addition to measuring quality-adjusted education, this modification introduces a new subdimension – innovation.

Measuring innovation is essential, as it provides an accurate reflection of a country's development progress by assessing its ability to generate, protect and disseminate new knowledge and technologies. Innovation metrics – such as the number of patents and utility models, and the amount of scientific output – are key indicators of a country's capacity to foster technological advancement and drive economic growth. They provide a comprehensive measure of a country's ability to use intellectual capital, optimize productivity and build resilience in an increasingly digitized and interconnected world.

Together, the subdimensions of quality-adjusted education and innovation constitute the knowledge index, which accounts for a third of the Q-HDI. The remaining two thirds are accounted for by healthy life expectancy and poverty-adjusted household income.

Integrating water and food security as prerequisites for sustainable development

The fourth and final adjustment involves the incorporation of a water and food security index into the "environmental sustainability" index.[5] Water stress and food insecurity affect billions of people worldwide, making it crucial to pay attention to them when evaluating development performance.

Water stress can be caused by many factors, including high population growth, inadequate storage and sanitation infrastructure, unfavourable climate conditions and conflict. Perhaps counterintuitively, it very seldom relates to physical water shortages per se.[6] Water stress is harmful to human development progress at all stages of development. In developing agriculture-heavy economies, water scarcity severely disrupts crop yields and rural subsistence, whereas in more developed, diversified economies, it disrupts water-reliant manufacturing, energy production and sanitation. In both country groups, water scarcity may perpetuate vulnerabilities – such as the risk of poverty, inequality, and economic downturns. In 2024, approximately 2.4 billion people were living in water-stressed countries; a large proportion of these people are predicted to be living in absolute water scarcity[7] by 2025.[8]

5. The detailed framework is provided in annex 1.
6. Council on Foreign Relations, Water Stress: A Global Problem That's Getting Worse, 2023.
7. A threshold of 500 m3 per person per year is used as a proxy to indicate absolute water scarcity, see https://www.unescwa.org/sd-glossary/absolute-water-scarcity.
8. United Nations Environmental Programme (UNEP), As shortages mount, countries hunt for novel sources of water, 2024.

Water stress also contributes to food shortages, since water is a primary input for agriculture. Irrigation accounts for approximately 70 per cent of global freshwater withdrawals.[9] Food security is thus inseparable from effective water management.[10] Food security also frequently falls victim to supply-chain disruptions, such as those that followed the COVID-19 crisis and the Ukraine-Russia war, which disproportionately affect import-dependent economies.[11] In 2023, the Food and Agriculture Organization (FAO) classified 44 countries with weak net food trade positions as low-income food-deficit countries.[12]

Meeting basic needs – such as safe drinking water and adequate nutrition – is necessary to effectively pursue other aspects of human development, as these resources form the basis for well-being and productivity. For example, malnutrition and waterborne diseases significantly hinder economic productivity, while contributing to social unrest and conflict. Their effects on vulnerable populations are also more pronounced, which usually results in increased healthcare costs and lower educational attainment.

Moreover, the rapidly intensifying consequences of climate change – including extreme weather events that trigger water shortages and disrupt agricultural production – make water and food security increasingly integral to climate resilience and adaptation. Integrating them into the development framework provides a holistic and forward-looking measure of sustainability.

Notably, these concerns tend to be much more pronounced in developing regions, such as the Arab region, which is among the most water-scarce regions in the world.[13] Water production is energy-intensive and costly in most Arab countries. This constrains efforts to improve food security. The highly interdependent nature of water, energy and food security makes it challenging to address these issues – both individually and collectively – which has a negative impact on sustainable development progress in the region.[14] However, water and food security remain highly relevant concerns across all regions. While some countries may be more directly vulnerable, all countries rely on security in these areas to power economic growth and development.

9. Food and Agriculture Organization (FAO), World Water Congress: Agriculture holds solution to global water crisis and food security, 2023.
10. FAO, Water for Sustainable Food and Agriculture, 2017.
11. Center for Strategic & International Studies, Russia, Ukraine, and Global Food Security: A Two-Year Assessment, 2024.
12. FAO, Low-Income Food-Deficit Countries (LIFDCs), 2023.
13. ESCWA, Climate finance for water in the Arab region, 2023.
14. ESCWA, The Water, Energy and Food Security Nexus in the Arab Region, 2016.

2. Methodology

As with the DCI, the indicators used for the GDI are selected on the basis of relevance and data availability. The GDI has been calculated for 160 countries for the years 2000, 2010 and 2023, with country coverage selected based on data availability. Missing values were replaced, where possible, with the values for the closest available years. Once the values are collected, they are rescaled, with minimum and maximum values determined conceptually as informed by the kernel distribution of each indicator. Certain indicators, such as those related to education and income, are discounted using appropriate discount factors. Unlike with the DCI, the rescaled values of indicators that reflect challenges are subtracted from 1 to transform them into achievement-based metrics.

The GDI uses an arithmetic average to compute and interpret scores, which are then classified into one of five achievement categories: "very low", "low", "medium", "high" and "very high". GDI scores (from 0 to 1) and ranks (from 1 to 160) that are closer to 1 correspond to higher levels of development achievement. Subdimension scores are similarly classified. This approach ensures simplicity and clarity in the interpretation of scores. Countries with scores less than or equal to 0.35 are classified in the "very low" achievements category. Scores from 0.35-0.5 are in the "low" achievements category, whereas those from 0.5-0.65 are in the "medium" achievements category. Scores from 0.65-0.75 are in the "high" achievements category, and countries with scores greater than 0.75 are classified in the "very high" achievements category.

The changes in the methodology of constructing the index are summarized below.

A. Quality-adjusted human development index

- Due to the non-normal distribution of the healthy life expectancy index with the presence of numerous outliers, two distinct distributions are established: one for the main dataset and another for the outliers. The standard index range is set between 0.3 and 1, while outliers fall within the 0.05 to 0.3 range. This adjustment ensures that the index reflects underlying patterns more accurately by mitigating the disproportionate influence of extreme values.
- To obtain poverty-adjusted household income, GNI per capita is replaced by survey household income per capita data, and the ESCWA global poverty index is used rather than the Atkinson income inequality index. For countries with missing poverty values, a regression is run between poverty rates and inequality-adjusted income using the ESCWA Gini index of inequality. The missing values of quality-adjusted income are then imputed using estimates from the fitted relationship. For Libya, which also had a missing ESCWA Gini index value, a regression is run between poverty rates and GDP per capita (constant 2021 international PPP $). The missing values are then imputed using the fitted poverty–inequality relationship.

- In addition to quality-adjusted education, the innovation subdimension is introduced. Together, these two dimensions constitute the knowledge index, which accounts for one quarter of the overall Q-HDI, alongside healthy life expectancy and quality-adjusted income. The innovation sub-dimension is made up of 5 indicators: **Patents by origin/GDP, PCT-System patents by origin/GDP, Utility models by origin/GDP, Scientific and technical articles/GDP and Citable documents H-index**, where GDP is measured in billions of constant United States dollars (USD). The methodological framework for this index is taken from the WIPO Global Innovation Index database.[15] Since this database covers only 132 of the 160 countries in the analysis, we rely on the original sources of these indicators to compute our indices. Additionally, contrary to the approach taken by WIPO, we divide our indicators by constant USD GDP instead of PPP USD GDP as a result of data availability constraints.

B. Environmental sustainability

- Similarly to the healthy life expectancy index, several environmental sustainability indicators do not follow a normal distribution and include a non-trivial number of outliers. Hence, the index range for these indicators was established between 0.1 and 1, with outliers' scores ranging from 0.05 to 0.1. Restricting the range for these outlier scores minimizes their impact, preventing extreme values from skewing the indices.
- The "environmental health" dimension, which is based on the Yale Environmental Performance Index (EPI) indicators, was updated to reflect the latest available data (i.e. EPI 2024) and now includes additional indicators in the air quality and waste management subdimensions.[16]
  - The "air quality" subdimension now comprises seven indicators instead of three: $PM_{2.5}$ exposure, household solid fuels and ozone exposure, NOx exposure, SO_2 exposure, CO exposure and volatile organic compound exposure.
  - The "sanitation and drinking" water subdimension consists of two indicators: unsafe sanitation and unsafe drinking water.
  - The "heavy metals" subdimension consists of a single indicator: lead exposure.
  - The "waste management" subdimension now consists of three indicators instead of one: waste generated per capita, controlled solid waste and waste recovery rate.
  - While equal weights were used in the construction of all other achievements, dimensions, and sub-dimensions of the GDI, different weights are assigned to the different indicators under environmental health, as per the EPI methodology. The weights assigned to the components of the index are as follows: air quality (68 per cent), sanitation and drinking water (20 per cent), heavy metals (8 per cent), and waste management (4 per cent).
- A third dimension is added to the environmental sustainability: "water and food security".

15. World Intellectual Property Organization (WIPO), Global Innovation Index, 2024.
16. For more information on the EPI see https://epi.yale.edu/about-epi.

- For "water security", **SDG indicator 6.4.2 - Level of water stress** from the FAO database is used. It measures freshwater withdrawal as a proportion of available freshwater resources. It is the ratio between total freshwater withdrawn by major economic sectors and total renewable freshwater resources, after considering environmental water requirements.
- For "food security"**, Food imports (percentage of merchandise imports)** from the World Wank WID database is used. This index measures the proportion of a country's total merchandise imports that consists of food products. It reflects the dependency on imported food relative to overall import activity.

C. Governance

No major changes were made to the "governance" pillar. The data for democratic governance was updated to reflect the latest available year, having also revised the data for 2000 and 2010, as the Varieties of Democracy database updates its entire dataset with each annual release. Similarly, the Government effectiveness indicator was updated to the most recent year available.

Table 2 summarizes the updated minimum and maximum values for the indicators and specifies whether or not they have undergone a logarithmic transformation. The minimum and maximum values were determined based on the kernel distribution and the observed values in the raw time series.

Table 2. Minimum and maximum of all GDI indicators

Indicator	Transformation	Min	Max
Healthy life expectancy	None	58.1	74.5
Expected years of schooling	None	0	22.316
Mean years of schooling	None	0	14.256
Harmonized test scores	None	300	581
Patents by origin/bn constant $ GDP	Logarithmic ln(X)	0.009	104.216
PCT patents by origin/bn constant $ GDP	Logarithmic ln(X)	0.0015	65.624
Utility models by origin/bn constant $ GDP	Logarithmic ln(X)	0.0026	171.43
Scientific and technical articles/bn constant $ GDP	Logarithmic ln(X)	0.39	167.803
H index	Logarithmic ln(X)	19.5	3055
Mean household income per capita	Logarithmic ln(X)	10	3051.057

Indicator	Transformation	Min	Max
Carbon dioxide emissions	Logarithmic ln(X)	0.025	38.7
Material footprint	Logarithmic ln(X)	1	118.07
Energy efficiency	Logarithmic ln(X)	0.9	22
PM2.5 exposure	None	0.062408	35
Household solid fuels	Logarithmic ln(X)	0.01	2000
Ozone exposure	None	0	110
NO2 exposure	None	0	8
SO2 exposure	None	0.000001	0.03
CO exposure	None	0	0.5
VOC exposure	None	0	0.1
Unsafe sanitation	Logarithmic ln(X)	0.3	1500
Unsafe drinking water	Logarithmic ln(X)	1	1000
Lead exposure	None	22.353	1400
Waste generated per capita	None	0	1
Controlled solid waste	None	0	1
Waste recovery rate	None	0	0.4
Food imports (% merchandise imports)	None	0.669	24.968
Water stress	Logarithmic ln(X)	0.05	3850.5
Transparent laws with predictable enforcement	None	-3.905	4.021
Access to justice	None	N/A (already standardized)	N/A (already standardized)
Executive oversight	None	-3.089	3.393
Judicial accountability	None	-2.866	3.893
Rigorous and impartial public administration	None	-3.57	4.017
CSO consultation	None	-2.8	3.64
CSO participatory environment	None	-3.403	3.174
Government effectiveness	None	-2.44	2.4697

3. Robustness and sensitivity

This section assesses the robustness of the GDI and the sensitivity of region- and country-level results to methodological changes. We identify three sources of uncertainty and study their impact on country- and region-level scores and rankings: (a) the choice of dimensions and indicators; (b) the weights assigned to the achievements, dimensions, subdimensions, and indicators; and (c) the structure of the framework. In order to measure the robustness of both ranks and scores to changes in these sources of uncertainty, we use two types of test. First, redundancy tests, such as pairwise correlations, are used to check whether different GDI components capture equivalent information and are therefore redundant. Higher correlations – in absolute value – indicate a higher degree of similarity between a pair of indicators. Second, a robustness test using distance-based metrics, such as the Euclidean distance (ED), provides pairwise distances between the rank of each region (or country) under one scenario relative to another. Lower distances indicate a higher degree of similarity between a pair of scenarios.[17]

The results of the redundancy tests show that most of the correlations are low to moderate, with a few notable exceptions (table A.1). Six of the correlations are above 0.837 – which corresponds to an R-squared value of 0.7 – in absolute value. However, it is worth noting that the higher correlations are, in most cases, expected and justifiable. For example, very high correlations are observed between components of the quality-adjusted human development index and sanitation and drinking water, a component of the "environmental health" dimension. This is perfectly reasonable since the latter is included in the analysis to measure the impact of environmental pressures on human health and development. Similarly, a high correlation exists between quality-adjusted income and each of the "health and education" variables, since income is a necessary means for improving human development outcomes such as life expectancy and educational attainment. It is also highly correlated with government effectiveness, since higher income levels often enable better access to quality public services, infrastructure and resources, which in turn enhance a Government's ability to implement policies efficiently.

Moving to the robustness checks, we calculated 241 scenarios of the GDI using different weights or compositions of the index. After calculating the EDs for the regional rankings under each scenario relative to comparison scenarios, the distances are summed across all comparison scenarios. The scenario with the lowest sum of EDs compared with all other scenarios is deemed the most robust, as it features a set of weights and a composition that produces the most robust and least changeable set of regional rankings. The results show that the base scenario has the lowest ED among the 241 calculated scenarios and is therefore the most robust (table A.2). The base scenario's rankings are also

17. For more detailed information on the results of these tests, see the annex.

preserved in as many as 100 alternative scenarios. The results for country rankings are just as satisfactory. The trials show that the base scenario has the lowest ED among a similar set of scenarios (table A.3).

Additional robustness tests were conducted for region and country scores. At the region level, the selected specification is in the top 10 per cent of the 241 specifications according to the sum of EDs. It underperforms the most robust specification by only 1.88 per cent (0.1565 vs. 0.1536), whereas the sum of EDs of the least robust specification, in other words the worst-performing model, is significantly higher (at 1.9639). Furthermore, at the country level, the selected specification is in the best 5 per cent of all specifications. It underperforms the most robust specification by only 0.12 per cent (5.5787 vs. 5.5685), whereas the sum of the EDs of the worst-performing model is significantly higher (at 83.8274).

Finally, as part of this exercise, robustness tests were conducted on a specification that expands the knowledge dimension of the GDI to include one additional subdimension – digital infrastructure. The results showed a Euclidean distance for this scenario that was significantly further away from the "best scenario" relative to the current GDI specification, justifying the exclusion of this subdimension from the index.

Annex

Table A.1 Correlation matrix for GDI components

Variable name	Healthy life expectancy	Quality-adjusted education	Innovation	Quality-adjusted income	Energy efficiency	Climate change	Air quality	Sanitation and drinking water	Heavy metals	Waste management	Food imports	Water stress	Rule of law	Institutional accountability	Participation	Government effectiveness
Healthy life expectancy	1.000															
Quality-adjusted education	0.830	1.000														
Innovation	0.616	0.733	1.000													
Quality-adjusted income	0.874	0.872	0.618	1.000												
Energy efficiency	0.402	0.285	0.193	0.319	1.000											
Climate change	-0.757	-0.800	-0.525	-0.886	-0.216	1.000										
Air quality	0.658	0.670	0.408	0.676	0.302	-0.571	1.000									
Sanitation and drinking water	0.895	0.903	0.695	0.898	0.327	-0.809	0.690	1.000								

Variable name	Healthy life expectancy	Quality-adjusted education	Innovation	Quality-adjusted income	Energy efficiency	Climate change	Air quality	Sanitation and drinking water	Heavy metals	Waste management	Food imports	Water stress	Rule of law	Institutional accountability	Participation	Government effectiveness
Heavy metals	0.727	0.777	0.522	0.733	0.304	-0.643	0.598	0.704	1.000							
Waste management	0.147	0.118	0.010	0.109	0.107	-0.013	0.151	0.107	0.060	1.000						
Food imports	0.441	0.611	0.523	0.519	0.127	-0.522	0.218	0.507	0.516	-0.001	1.000					
Water stress	-0.274	-0.122	-0.156	-0.226	-0.068	0.275	-0.057	-0.232	0.019	-0.002	-0.057	1.000				
Rule of law	0.491	0.543	0.478	0.545	0.313	-0.436	0.570	0.500	0.588	0.051	0.279	0.132	1.000			
Institutional accountability	0.575	0.620	0.529	0.575	0.305	-0.465	0.566	0.557	0.621	0.089	0.335	0.069	0.890	1.000		
Participation	0.250	0.308	0.340	0.293	0.280	-0.155	0.418	0.249	0.391	0.030	0.172	0.258	0.774	0.729	1.000	
Government effectiveness	0.765	0.800	0.648	0.811	0.392	-0.709	0.616	0.721	0.724	0.070	0.517	-0.108	0.711	0.751	0.476	1.000

Table A.2 Regional rankings under 241 alternative scenarios

East Asia and Pacific	Europe and Central Asia	Latin America and The Caribbean	North America	South Asia	Sub-Saharan Africa	Arab region	Sum of Euclidean distances	Model Count (number of scenarios with same regional rankings)
3	2	4	1	5	7	6	100	212
3	2	4	1	6	7	5	532	14
4	2	3	1	5	7	6	546	1
3	2	4	1	5	6	7	550	6
4	2	3	1	5	6	7	996	3
4	2	3	1	6	5	7	1878	2
4	2	3	1	7	5	6	2310	3

Table A.3 Sum of Euclidean distances for country-level rankings, out of 241 scenarios

Scenario	Sum of Euclidean distances
First (base scenario)	682,398
Second	683,298
Third	683,314
Fourth	684,582
Fifth	684,988
Sixth	686,502
Seventh	686,738
Eighth	686,754
Ninth	687,392
Tenth	688,396

This paper introduces the Global Development Index (GDI), a comprehensive measure of development achievements. Building on the Development Challenges Index (DCI) from the 2022 World Development Challenges Report, the GDI incorporates various modifications to better align with global and regional priorities, focusing on quality-adjusted human development, environmental sustainability and governance. The index reflects progress in addressing critical challenges such as education, poverty, climate change and governance inefficiencies.

While the DCI focuses heavily on challenges, the GDI concentrates more on achievements. The DCI uses national income and inequality metrics, but the GDI focuses on household income and poverty-adjusted measures and incorporates innovation into the "knowledge" dimension of the index. The GDI also examines water and food security as a part of the "environmental sustainability" dimension. These enhancements cater to specific needs in the Arab region while maintaining global applicability. Further methodological refinements ensure robust and meaningful comparisons across countries and regions.

This paper outlines the GDI's conceptual framework, methodology, and components, emphasizing its usefulness as a policy tool for benchmarking progress and identifying areas requiring intervention. Rigorous robustness tests validate its reliability in capturing multidimensional development achievements, making it a vital resource for evidence-based policymaking in diverse socioeconomic contexts.

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