Development Challenges Index: statistical measurement and validity

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Economic and Social Commission for Western Asia

Development Challenges Index: statistical measurement and validity

United Nations
Beirut

Authors: Khalid Abu-Ismail, Vladimir Hlasny, Abdulkarim Jaafar, Manuella Nehme.

E-mail: publications-escwa@un.org; website: www.escwa.un.org

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Introduction

Human development measures have traditionally focused only on quantitative aspects. For example, in the Human Development Index (HDI), life expectancy at birth, mean and expected years of schooling and per capita income represent quantitative dimensions of a long and healthy life, education and decent standard of living.

Previously, this focus on quantitative aspects was justified due to the presence of profound quantitative shortfalls in human development. However, countries have moved up the ladder of human development and made major progress in closing these gaps; today, the issue of quality is more important. In the case of education for example, it is not only the quantity of education that should be improved, but also the quality, especially in light of the fourth industrial revolution. The same applies to health and income.[1]

The quality of human development is also important from an equity perspective. In some cases, focusing on the quantitative dimensions of human development leads to better quality services being enjoyed by the rich and wealthy, with the rest of the people having access to poor services. This in turn leads to higher human development disparities between the rich and the poor.[2]

It is thus imperative that human development measures assess qualitative dimensions and not be limited to the quantitative. A measure is needed that is more comprehensive than the traditional HDI, which focuses on basic needs and does not capture the new realities and challenges facing the world and especially the Arab region. At the same time, the HDI should also be expanded by adjusting the traditional well-being dimensions to account for quality aspects, introducing the two additional dimensions of environmental sustainability and governance.[3]

Environmental sustainability is a crucial element of human development and well-being because of its centrality in intergenerational equity. Today's intensified environmental threats pose a serious challenge to the social and economic well-being of the current generations and generations to come. Likewise, recent history from many Arab countries shows that neither well-being freedom which has largely been the primary focus of the human development approach and of the Human Development Reports over the years, nor agency freedom which is fundamentally linked to freedom of expression, democratic space and participation can be ensured without good governance and effective institutions.[4]

1 ESCWA 2021.
2 Ibid.
3 Ibid.
4 Ibid.

Accordingly, this paper introduces a new index developed by the Economic and Social Commission for Western Asia (ESCWA) to capture development challenges from this broader perspective. In addition to the basic human capabilities captured by the Human Development Index (HDI), the series of background papers produced by ESCWA make the case for the need to supplement these capabilities with measures of quality and account for environmental sustainability and good governance.

After the present introduction, section 2 makes the conceptual case for this proposed measurement framework and defines the indicators adopted in the new index, section 3 discusses the aggregation methodology, data sources and indicator cut-offs, section 4 presents analyses of robustness and sensitivity and section 5 concludes the present paper.

1. Conceptual framework

The Development Challenges Index (DCI) asses three global challenges that must be taken into account when measuring development. These challenges are of equal importance and this is reflected in the equal weights allocated to each of them in the DCI. Table below summarizes the DCI, its dimensions, sub-dimensions, indicators and weights.

Development Challenges Ind)ex (DCI Framework

Challenge (weight)	Dimension (weight)	Sub-dimension (weight)	Indicator (weight)
Quality-adjusted human development challenge index (1/3)	Health (1/9)		Healthy life expectancy at birth, years (1/9)
	Education (1/9)		Quality-adjusted education (the HDI education index adjusted to account for the quality of education using the harmonized test scores as a proxy) (1/9)
	Income (1/9)		Inequality-adjusted income (the HDI income index adjusted to account for inequality using the HDI inequality in income) (1/9)
Environmental sustainability challenge index (1/3)	Climate change and energy efficiency (1/6)	Climate change (1/12)	Carbon Dioxide (C02) emissions per capita (production) (1/24)
			Material footprint per capita (1/24)
		Energy efficiency (1/12)	Energy intensity per unit of GDP (1/12)
	Environmental health (1/6)	Air quality (1/12)	PM2.5 exposure (11/240)
			Household solid fuels (1/30)
			Ozone exposure (1/240)
		Sanitation and drinking water (1/15)	Unsafe sanitation (2/75)
			Unsafe drinking water (1/25)
		Heavy metals (1/120)	Lead exposure (1/120)
		Waste management (1/120)	Controlled solid waste (1/120)

Challenge (weight)	Dimension (weight)	Sub-dimension (weight)	Indicator (weight)
Governance challenge index (1/3)	Democratic governance (1/6)	Rule of law and access to justice (1/18)	Transparent laws with predictable enforcement (1/36)
			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)	Civil society organization (CSO) consultation (1/36)
			Civil society organization (CSO) participatory environment (1/36)
	Government effectiveness (1/6)		Government effectiveness (Quality of infrastructure and public service delivery) (1/6)

A. Quality-adjusted human development

The quality-adjusted human development challenge index builds on the HDI and factors in quality by measuring healthy life, quality-adjusted education and inequality-adjusted income. The DCI hence assesses living a long and healthy life using one indicator that is healthy life expectancy at birth. The standard HDI measures longevity by looking at life expectancy at birth. Its inclusion as an important indicator for human development is based on three premises underlined in the first Human Development Report (1990): "the intrinsic value of longevity, its value in helping people pursue various goals and its association with other characteristics, such as good health and nutrition." However, the very concept of health not only entails living a long life per se; but rather on living a long *and healthy* life. Hence, as in table above, healthy life expectancy is used instead since it measures both the longevity and the quality of health over the course of one's life.[5]

We also closely follow the standard HDI core education index, which is obtained by taking the simple average of the normalized mean years of schooling and expected years of schooling. The DCI builds on this by using a quality-adjusted education sub-index. There are two ways to measure the quality of education. One is based on input indicators in the form of structural interventions aiming at increasing the capacity of the education system; and the other focuses on educational outputs based on learning achievements. Consistent with the HDI we use the output approach, which is inferred using countries' relative performance on international

5 See background paper by Khalid Abu-Ismail, Phoebe W. Ishak and Oussama Safa (2021) Healthy Life Expectancy Index Reveals A MENA Paradox, ESCWA.

student achievement tests. The advantage of these test scores is that they are standardized, comparing learning across countries using the same yardstick. These tests measure learning outcomes in one or more of the following three dimensions: (1) Reading and language proficiency; (2) Mathematics and numeracy proficiency; and (3) Scientific knowledge and understanding. Following the World Bank (2018) approach, we adjust the educational achievements index to account for the quality of education using harmonized test scores as a proxy.[6]

Finally, unlike the health and education components, quality adjustments for the income component are not available in the literature. However, it is well established that societies with higher income and wealth inequalities have less equitable social outcomes and are prone to polarization and conflict. Therefore, the DCI adjusts the HDI's income index for the quality of income distribution using the Atkinson inequality measure. This indicator is the easiest to justify since it is based on an already well-established inequality adjusted HDI (IHDI) which is regularly updated by human development reports.[7]

B. Environmental sustainability

The environmental sustainability challenge index includes two dimensions. The first dimension includes indicators for climate change as well as energy efficiency. The former is measured using two indicators: Carbon dioxide emissions ($C0_2$) per capita and material footprint per capita. Climate change mitigation is most often related to reduction in greenhouse gases stemming from energy use. Greenhouse gas emissions are often used as a proxy to assess climate change instead of indicators such as change in temperature or change in precipitation since these latter indicators often present challenges stemming from projected data rather than observed measurements, wide sub-national variability and extensive data analysis.[8] However, energy plays a pivotal role in economic activity; hence, the goal is not to simply eliminate these emissions at any cost, but rather to create a balance between economic growth and environmental sustainability. Similar also to the Planetary pressures-adjusted HDI (PHDI), the DCI relies on carbon dioxide emissions ($C0_2$) per capita to address the challenge of shifting away from fossil fuels for energy and on the material footprint per capita representing the challenge of closing material cycles. Material footprint is defined as the allocation of extracted raw material relative to demand. It is distinguished from other ecological footprint indicators which consider land use, water use, threats to species, greenhouse emissions and other environmental pressures.[9] Thus, total material footprint encompasses the sum of biomass, fossil fuels, metal ores and non-metal ores. The unsustainable material footprint of many countries is illustrated by the recent PHDI; over 50 countries were eliminated from the high human development group due to material footprint and fossil fuel dependency.[10]

6 See background paper by Khalid Abu-Ismail, Phoebe W. Ishak, Abdulkarim Jaafar and Oussama Safa (2021). A Quality-Discounted Education Achievement Index. ESCWA.
7 See HDR 2020 (technical note 1) http://www.hdr.undp.org/en/content/inequality-adjusted-human-development-index-ihdi.
8 See Dahl, 2012 and ESCWA and others, 2017.
9 Wideman and others, 2015, P. 6271-6276.
10 UNDP, 2020.

The second dimension concerns environmental health by measuring freedom from environmental hazards that pose serious threats to human health. This dimension is based on the indicators of the global Environmental Performance Index (EPI) and measures health impacts from air quality and use of water and sanitation. The case for including these indicators is well established in the development literature. Long-term exposure to air pollution leads to amplified risk of illness and death from heart disease, lung cancer, lower-respiratory infections, type 2 diabetes, stroke and adverse birth outcomes.[11] Lead exposure in children and adults, even at low doses, can have effects on metabolism and intelligence, while at higher doses it can lead to convulsions, coma, renal failure and even death.[12] Likewise, unsafe drinking water and poor hygiene and sanitation may cause numerous infectious diseases including diarrhoea, cholera, gastritis and meningitis.[13] Finally, unsustainable disposal of solid waste contributes to air and water pollution, contaminates soils and exposes individuals to pathogens and dangerous materials.[14] Hence, the DCI justifiably measures shortfalls from achievements that measure progress in these indicators.

C. Governance

The governance challenge index also includes two dimensions: democratic governance and government effectiveness. The first dimension includes three sub-dimensions on rule of law, accountability and participation. The first sub- dimension on rule of law and access to justice ensures that there is equality under the law, transparency of the law and equal accessibility to the judicial system, all of which are linked to SDG 16. An equally accessible and independent judicial system is also more likely to deter corruption and foster transparency and accountability. This sub-dimension includes two indicators: transparent laws with predictable enforcement and access to justice. The first indicator examines whether or not laws are clear, well-publicized, coherent and consistent with one another, relatively stable from year to year and predictably enforced. Thus, this indicator relies on the strength and transparency of legal rules, which must not be aimed at particular individuals or groups.[15] The second indicator looks at whether the judicial system is equally accessible and available to any citizen regardless of their income, influence or geographic location.[16] Accessibility is often measured by examining the legal aid and public defender systems and examining hours of access. Access is also measured by the time it takes to get a case heard and adjudicated and the direct and indirect costs of litigation. In countries with uneven access to justice the poor are forced to await their trials languishing in jails. Judicial systems that are inefficient without sophisticated case management systems in place to ensure that standards are adhered to in the assignment of cases to judges and other officials.[17]

The second sub-dimension looks at institutional accountability, which is the idea that public

11 Health Effects Institute, 2020.
12 US Agency for Toxic Substances and Disease Registry, 1999.
13 Resnik and Portier, 2015.
14 Wendling and others, 2020.
15 Solum, 1994, p. 120-147.
16 Prillaman, 2000.; Staats and others, 2005, p. 77-106.
17 USAID, 2009.

officials are held responsible and sanctioned for abuse of power and improper conduct. This pillar includes three indicators: executive oversight, judicial accountability and rigorous and impartial administration. Executive oversight looks at how likely it is that a body other than the legislature such as a comptroller general, general prosecutor or ombudsman would question or investigate the executive and issue an unfavourable decision in their report if officials in the executive branch are engaged in unconstitutional, illegal or unethical activity. This indicator looks at whether or not the executive is above the law, and the degree of power that the executive has vis-à-vis other institutions. The second indicator looks at judicial accountability, or whether judges found responsible for serious misconduct are removed from posts or disciplined. Just as it is important to ensure that there are mechanisms of accountability for the executive, since the judiciary is often not elected (which is the best practice), there also need to be ways of ensuring that there are ethical standards of conduct for judicial officials which are meaningfully enforced. The third indicator looks at a rigorous and impartial administration, one of the key building blocks to good governance. This question looks at whether public officials are rigorous and impartial in the performance of their duties, whether public officials generally abide by the law and treat cases alike or if instead the public administration is characterized by arbitrariness, biases, nepotism, cronyism and other forms of discrimination.

The third sub-dimension looks at participation by people and civil society groups, which is an important aspect of good governance. This is because people are not mere recipients of development benefits but also active participants in influencing and shaping their own lives. Participation is critical to provide voice and autonomy to the people and also to create a democratic space. The importance of consultation with civil society has been well documented.[18] This pillar hence includes two indicators: civil society consultation and the civil society participatory environment. The first indicator looks at whether civil society organizations are routinely consulted by policymakers on policies, and whether they are recognized as important stakeholders in policy areas who should be given voice on different issues. The second indicator looks at whether civil society associations are state-sponsored and involuntary; voluntary but with few existing or few people are active in them; or diverse and with higher levels of activity.[19]

The second dimension addresses government effectiveness in terms of its institutional and particularly infrastructural effectiveness to ensure the effective delivery of public services and the quality of public and civil services. It also assesses effectiveness in terms of the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies in addition to the degree of its independence from political pressures.[20]

18 Graham, and others,.2003. Roy, 2008, p.677-705. Warren, 1999.

19 For more detailed information on the Varieties of Democracy indicators, please refer to https://www.v-dem.net/media/filer_public/e0/7f/e07f672b-b91e-4e98-b9a3-78f8cd4de696/v-dem_codebook_v8.pdf.

20 For a detailed explanation of what the government effectiveness indicator measures, please refer to https://info.worldbank.org/governance/wgi/pdf/ge.pdf.

2. Methodology, data sources and indicator cut-offs

The DCI is computed for 163 countries and for three points in time: 2000, 2010 and 2019, with country coverage subject to data availability. To build this list, we started with the countries in the HDI and added the new indicators. Missing values were replaced, when possible, with the values of the closest available years. However, in some cases where a country is excluded from a certain database, the country was removed from our database, unless the missing data is for the harmonized test scores and/or HDI inequality in income, which were imputed using simple regressions as described in this section.

To construct the indicators for the DCI, we follow two steps:

1. Indicators are standardized using the regular min-max formula, unless otherwise specified; and
2. The resulting indicator is subtracted from one to convert achievements into challenges.

In the case of the education and income indicators, which were discounted for HDI inequality in income and harmonized learning outcomes, the sub-indices were multiplied by the discount factors before converting them into challenge indices (before subtracting the values from one).

A. Quality-adjusted human development challenge index

The quality-adjusted human development challenge index is the simple average of the scores for three dimensions: **(a)** health, **(b)** education and **(c)** income. Note that all quality-adjusted human development indicators were standardized following the two steps described in section I above, using the following min-max formula: $\frac{value-min}{\max-min}$, except for quality of education and quality of income, which will be discussed later in this sub-section. Below are some notes regarding each of the dimensions and indicators.

The health dimension includes one indicator, healthy life expectancy at birth, defined by the World Health Organization (WHO) as the "average number of years that a person can expect to live in 'full health' by taking into account years lived in less than full health due to disease and/or injury." The minimum value for this indicator was set at 20 similar to the HDI life expectancy index, based on the same premise that no country in the 20th century had a life expectancy lower than 20 (see Maddison 2010; Oeppen and Vaupel 2002; Riley 2005).[21]

21 See HDR Technical Notes 2020 for more details on min-max values of HDI indicators, available at http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf.

The maximum value was set at 75, lower than the max of 85 used for the HDI life expectancy index since countries have much lower healthy life expectancy years. The maximum of 75 is reasonable given the continuous medical technologies and breakthroughs that advance people's health and living conditions. Many countries such as Japan (74.1) and Singapore (73.6) are already close to reaching 75 years of healthy life expectancy;

Indicator	Minimum value	Maximum value
Healthy life expectancy at birth, years	20	75

(a) **The education dimension** consists of one indicator: quality-adjusted education. This indicator is equal to the HDI education index multiplied by the quality of education adjustment ratio, both of which are described below;

1. HDI education index: This is the simple average of two standardized indicators: expected years of schooling and mean years of schooling. The data for both indicators were taken from the HDI data centre. The selected min and max values are those specified in the HDI.[22]

Indicator	Minimum value	Maximum value
Expected years of schooling	0	18
Mean years of schooling	0	15

2. To obtain the quality of education adjustment ratio, the harmonized test score for each country was divided by the maximum observed value (581). Data are taken from the World Bank Human Capital Index (HCI) for 2010 and 2019. Note that when data are not available for a given year, the data for the closest available year were used instead (2017 and 2020, respectively). Data for the year 2000 are taken from the Harmonized Learning Outcomes (HLO) database, which is also the source for the HCI. However, since only a few countries have values for 2000, the value of the closest available year was used for the other countries when available.

   For countries with no HLO data, this variable was imputed using a simple regression that controls for the expected years of schooling, mean years of schooling, regional classification and income group.

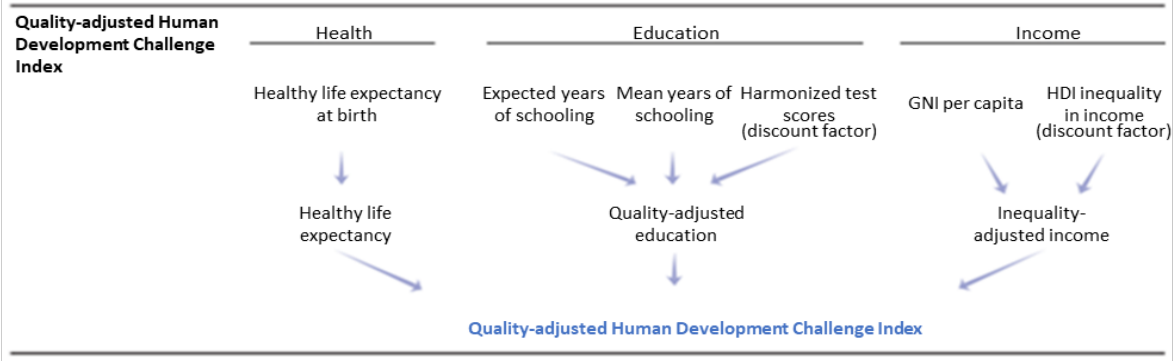
(b) **The income dimension** consists of one indicator: inequality-adjusted income. This indicator is obtained by multiplying the HDI income index by the income inequality adjustment factor (A), where

$$A = 1-\frac{HDI\ inequality\ in\ income}{100}$$

The HDI Income index is based on gross national income (GNI) per capita (constant 2017 PPP$) and data are taken from the HDI data centre. A log transformation is taken, and the min and max values are selected as specified in the HDI income index.[23] For countries with GNI per capita values that exceed the set maximum, the indicator is capped at 1;

22 See HDR Technical Notes 2020 for more details on min-max values of HDI indicators, available at http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf.

23 See HDR Technical Notes 2020 for more details on min-max values of HDI indicators, available at http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf.



Indicator	Minimum value	Maximum value
Gross National Income (GNI) per capita (constant 2017 PPP$)	100	75000

The HDI inequality in income uses the Atkinson measure to measure inequality. It is based on a well-established inequality-adjusted HDI (IHDI) and is regularly updated by human development reports. Countries with missing 2010 and/or 2019 HDI inequality in income values were handled as follows:

1. For countries with data available for either 2010 or 2019 but not both, we used the percentage changes of their World Bank Gini coefficients between 2010 and 2019. For example, assume a country has HDI inequality in income data for 2010 only, and its World Bank Gini has increased by 50 per cent between 2010 and 2019 (or the closest available years). Its imputed 2019 HDI inequality in income value would then be 50 per cent more than the 2010 value;
2. For countries with missing HDI inequality in income 2010 and 2019 data, 2019 values were imputed using a simple cross-country regression for the HDI inequality in income on the World Bank Gini coefficients, then the 2010 values were imputed using the World Bank Gini percentage change as described in (1).

Since no HDI inequality in income data is available for the year 2000, we used the percentage changes of their World Bank Gini coefficients over the period 2000–2010, as explained in point (a) above.

For countries with missing World Bank Gini values between 2000 and 2019, the values were replaced by the World Income Inequality Database (WIID) Gini values when needed.

B. Environmental sustainability challenge index

The environmental sustainability challenge index is the simple average of two dimensions: (i) climate change and energy efficiency and (ii) environmental health. The dimensions of the environmental sustainability challenge index were standardized following the two steps described in section I above, using the following min-max formula:

$$\frac{\max - value}{\max - min}$$.[24]

24 Except for the controlled solid waste index of the environmental health dimension: for this index, higher values reflect better achievements, so it is standardized using the following min-max formula: $\frac{value - min}{\max - min}$.

Below are some notes regarding each of the dimensions and the indicators.

(a) The climate change and energy efficiency dimension is the simple average of two sub-dimensions: (1) climate change and (2) energy efficiency;

1. The climate change sub-dimension is calculated using the simple average of two indicators: CO_2 emissions per capita and Material footprint per capita.
2. The energy efficiency dimension consists of the energy intensity per unit of GDP indicator.

The data for $C0_2$ emissions per capita and Material footprint per capita are taken from the HDI data centre and data for energy efficiency are taken from IEA. For the material footprint, the HDI data centre only provides the 2017 data, so we used this data for the year 2019, and took the 2000 and 2010 data from UNEP (which is the source of the HDI data centre). For countries with missing data for 2000, 2010 or 2017, we took the closest available year if possible. The min and max values for these three indicators were selected based on the Kernel distribution and the observed values in the raw time series as listed below. For CO_2 emissions and material footprint, the selected maximum values are different than those used for the Planetary pressures-adjusted HDI since we are introducing the environment as a new dimension in the DCI, while they were discounting the HDI with the planetary adjustment factor (using their min-max values would give very high values, clustered around 0.9).

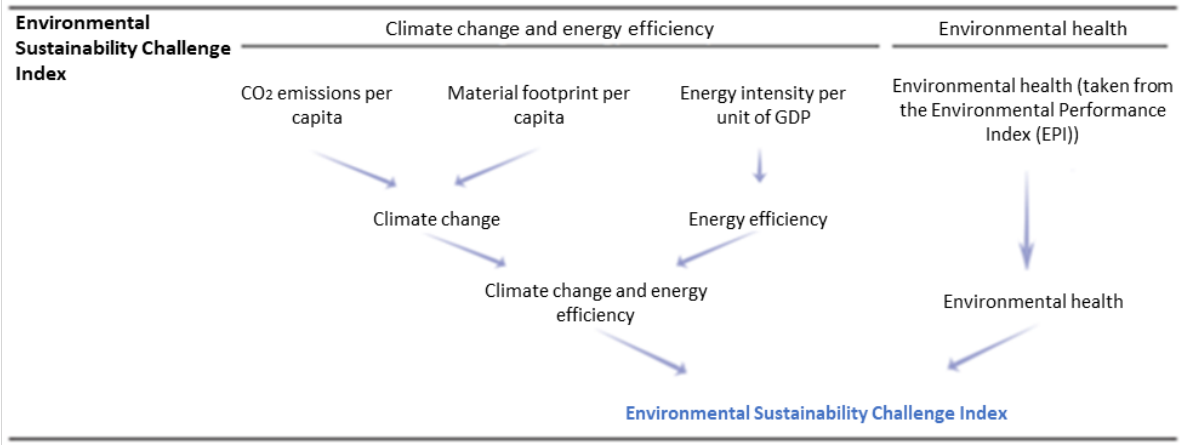
Indicator	Minimum value	Maximum value
$C0_2$ emissions per capita	0	25
Material footprint per capita	0	60
Energy intensity per unit of GDP	0.11	12

(b) The environmental health dimension consists of four sub-dimensions: (1) air quality, (2) sanitation and drinking water, (3) heavy metals and (4) waste management;

1. The air quality sub-dimension consists of three indicators: $PM_{2.5}$ exposure, household solid fuels and ozone exposure.
2. The sanitation and drinking water sub-dimension consists of two indicators: unsafe sanitation and unsafe drinking water.
3. The heavy metals sub-dimension consists of one indicator: lead exposure.
4. The waste management sub-dimension consists of one indicator: controlled solid waste.

Data for this index are taken from the global Environmental Performance Index (EPI). Note that since data for 2019 was not available, 2020 data was used instead. For the 2000 and 2010 years, since the EPI team changes the methodology and/or the indicators between versions of the EPI, we used their raw data to compute the environmental health index for 2000 and 2010 using the 2020 methodology. Since controlled solid waste values are only available for the year 2017, these values were used in the computation of the environmental health index for 2000, 2010 and 2020.[25]

25 The environmental health dimension includes indicators under four sub-dimensions: (a) air quality, (b) sanitation and drinking water, (c) heavy metals and (d) waste management. The EPI allocates to these categories the following weights: 50%, 40%, 5% and 5%, respectively. For a detailed explanation of the environmental health index, please refer to the EPI 2020 technical note available at https://epi.yale.edu/downloads/epi2020technicalappendix20200803.pdf.



Note also that while equal weights were used in the construction of all other challenges, dimensions and sub-dimensions of the DCI, different weights are assigned to the different indicators under environmental health. More specifically, weights within the environmental health index reflect two factors: (a) the novelty of the controlled solid waste indicator leaves some degree of uncertainty in the data and in the assumptions and decisions underlying it, so a modest weight of 5 per cent was assigned to it, and (b) for the other indicators/categories, weights generally correspond to the proportion of disability-adjusted life years (DALYs) lost. For example, since most DALYs lost are due to pollution generally and ambient particulate matter specifically, the air quality sub-dimension and PM2.5 exposure indicator were assigned the highest weights.[26] Since the environmental health dimension and its sub-dimensions are constructed on a 0–100 scale, the min and max values were set at 0 and 100, respectively.

C. Governance challenge index

The governance challenge index is the simple average of two dimensions: (a) democratic governance and (b) government effectiveness. Note that all dimensions under governance were standardized following the two steps described in section I above, using the following min-max formula:

$$\frac{value - min}{max - min}$$

Below are some notes regarding each of the dimensions and the indicators.

(a) The democratic governance dimension is measured using the simple average of three sub-dimensions: (1) Rule of law and access to justice, (2) Institutional accountability and (3) Participation.

1. The Rule of law and access to justice sub-dimension is the simple average of two indicators: Transparent laws with predictable enforcement and Access to justice.

26 Wendling, Z. A., and others, (2020). 2020 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law and Policy. https://epi.yale.edu/.

2. The institutional accountability sub-dimension is the simple average of three indicators: Executive oversight, Judicial accountability and Rigorous and impartial public administration.
3. The participation sub-dimension is the simple average of two indicators: Civil society organization (CSO) consultation and CSO participatory environment.

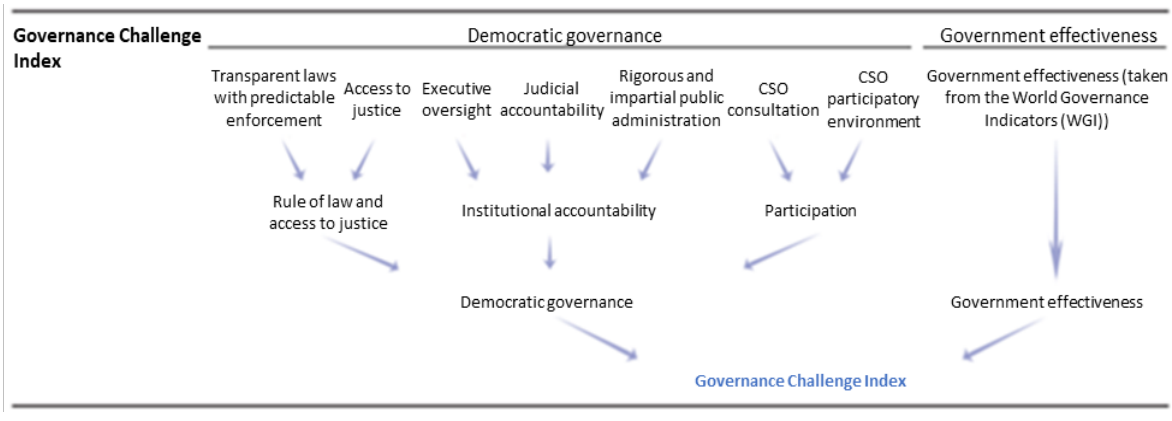
Data for this dimension are taken from the Varieties of Democracy dataset which utilizes expert surveys/perceptions to fully capture the subjects we are examining. The Varieties of Democracy dataset has addressed many of the methodological issues and offers the most consistent and reliable coverage in measuring the principles and processes of good governance that we are concerned with. It is consistent since it asks the same questions over time and across countries to similar groups of respondents to obtain reliable data sets in a large number of countries. This consistency across countries and over time is critical in comparative work. This dataset has also developed a measurement model that minimizes coder error as much as possible and addresses some of the issues of comparability over time and across different countries. It works with 170 Country Coordinators (CCs) and over 2,800 Country Experts (CEs) and is currently one of the largest social science data collection projects focusing on research with over 18 million data points. The dataset has been used in collaboration with many organizations including the World Bank, UNDP and the International Institute for Democracy and Electoral Assistance. The min and max values were selected based on the Kernel distribution and the observed values in the raw time series as listed below.

(b) The government effectiveness dimension consists of one indicator: **government** effectiveness.

Government Effectiveness along with Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Regulatory Quality, Rule of Law and Control of Corruption make up the six composite indicators of broad dimensions of the World Bank's World Governance Indicators (WGI) covering over 200 countries from 1996. These indicators are based on hundreds of variables acquired from 31 different data sources, capturing governance perceptions as reported by survey respondents, non-governmental organizations, commercial business information providers and public sector organizations worldwide. The World Bank datasets standardize the data for this dimension from the different sources into comparable units, generate an aggregate indicator of governance as a weighted average of the original source variables and construct margins of error that take into account the inevitable inaccuracy in measuring governance so that the government effectiveness index can provide meaningful cross-country and over-time comparisons. Min and max values were selected based on the Kernel distribution and the observed values in the raw time series as listed below.

Indicator	Minimum value	Maximum value
Government effectiveness	-2.483	2.44

Indicator	Minimum value	Maximum value
Transparent laws with predictable enforcement	-3.859	3.512
Access to justice	N/A already standardized	N/A already standardized
Executive oversight	-3.269	3.108
Judicial accountability	-3.109	3.67
Rigorous and impartial public administration	-3.73	3.607
Civil society organization (CSO) consultation	-2.463	3.47
CSO participatory environment	-3.438	2.92



D. Development Challenges Index (DCI)

$$\text{DCI} = \frac{\text{Quality adjusted human development challenge index} + \text{Environmental sustainability challenge index} + \text{Governance challenge index}}{3}$$

The DCI is computed as the arithmetic average of the three challenge indices:

While the geometric mean has its own advantages, especially in accounting for the relationships between dimensions, the arithmetic average has been used for two main reasons. First, we have a comprehensive index with many dimensions, sub-dimensions and indicators. This means that applying arithmetic averages is preferable for simplicity, especially when shifting from achievements to challenges (and vice versa). Second, arithmetic averages allow us to easily calculate the shares of the challenges in the overall index, and the shares of the dimensions in each of the three challenges. Note that we tried the calculations using both geometric mean and arithmetic mean; scores and ranks were fairly robust.

3. Robustness and sensitivity

This section aims to test the robustness of the DCI and the sensitivity of regions' or countries' ordering when methods change. We identify three sources of uncertainty and study their impact on countries' rankings: (a) the choice of dimensions and indicators; (b) the weights assigned to the challenges, dimensions, sub-dimensions and indicators; and (c) the structure of the framework. In order to measure the robustness of the ranks to changes in these sources of uncertainty, we use two types of tests. First, redundancy tests such as Pearson's correlation or Cramer's V statistics check whether different DCI components capture equivalent information and are hence redundant. The higher the correlation (in absolute value), the more similar a pair of indicators is. Second, robustness tests using distance-based metrics such as the Euclidean distance provide pairwise distances between the rank of each region (or country) under a scenario relative to other scenarios. The lower the distance between the ranks of two scenarios, the higher the similarity between the two sets (See Omar and Hage Sleiman 2021).[27]

The results of the redundancy tests show that most of the correlations are low to moderate, with the exception of a few high coefficients above 0.7, seven of them above 0.837 (R-squared above 0.7) in absolute value. However, these high correlations are in most cases expected. For example, while the highest correlation is between the health and environmental health dimensions, this is expected given that environmental health is included in the DCI to measure the impact of environmental pressures on human health. Similarly, the high correlation between government effectiveness and many other variables is also expected since government effectiveness is a means for improving many aspects of human development. Likewise, the Cramer's V correlation coefficients also show moderate correlations with only two pairs of variables showing correlation coefficients above 0.7.

Another important note to highlight is that the components of the DCI show higher correlations with some of the components included in other scenarios, such as the human development drivers and the human rights and freedoms components, which justifies the exclusion of these components from the DCI.

Moving now to the robustness test, we computed 219 scenarios of the DCI using different weights or compositions of the index. After computing the Euclidean Distances for the rankings of regions under a scenario relative to a comparison scenario, the distances are summed across all comparison scenarios. The scenario with the lowest sum of ED vis-à-vis all other scenarios is deemed the most robust, as it features a set of weights and a composition leading to the most robust set of region rankings. The results show that the base

27 For more detailed information on the results of these tests, please refer to the annex.

scenario has the lowest ED, and that its rankings are preserved in as many as 165 out of all 219 scenarios.

As for the country rankings, the results are nearly as satisfactory as those for the region rankings. The trials show that our base scenario is among the most robust five scenarios (the ones with the lowest EDs). It is also to note that the difference between the ED of the base scenario and that of the "best" scenario is relatively small, with only 4 pair of countries (out of 163) interchanging their rankings, and thus only 8 countries with rankings different by one position from those attained in the base scenario.

Additional robustness tests were conducted for the country and region scores. Evaluating the region scores, the selected model is in the top 25 per cent of the 219 models according to the sum of Euclidian distances and exhibits a sum of Euclidian distances that underperforms the model with the lowest sum by only 1.7 per cent (0.464 versus 0.456, whereas the sum of Euclidian distances of the worst performing model is significantly higher at 8.498). Furthermore, evaluating the country scores, the selected model is in the top 15 per cent of the models and exhibits a sum of Euclidian distances that underperforms the model with the lowest sum by only 1.0 per cent (10.925 versus 11.032, whereas the sum of Euclidian distances of the worst performing model is significantly higher at 164.423).[28]

28 In addition to these robustness tests, the base scenario showed near perfect score and rank correlations with other additional scenarios. One of these scenarios consisted of changing the weights allocated to the two dimensions of the environmental sustainability challenge index as follows: 2/3 for climate change and energy efficiency and 1/3 for environmental health. Additionally, the three climate change and energy efficiency indicators were given equal weights.

4. Conclusion

The present paper introduced the Development Challenges Index (DCI). This index is a comprehensive measure for development that takes into account the quantitative and qualitative aspects of the components of the Human Development Index (health, education and income), environmental sustainability and good governance. The DCI serves as a tool to track developmental challenges and helps policymakers assess their national policies.

The adjustment of the HDI components by quality factors and the inclusion of two additional dimensions to measure development are justified conceptually. For instance, while focusing on quantitative achievements in health, education and income was justifiable, it is no longer enough given that most countries have largely addressed deficits in terms of quantity. Additionally, the environmental threats that the world is facing pose a serious challenge to social and economic well-being, since environmental sustainability is an essential element of human development and well-being. Lastly, freedom of agency, which is important on its own and as an instrument to enhance well-being, is linked to freedom of expression, democratic space and participation which cannot be ensured without good governance and institutions.

While the DCI builds on the Human Development Index (HDI), there are three major differences between them. In addition to bringing in new indicators to capture the quality of human development, environmental sustainability and good governance, the DCI computes challenges rather than achievements to shift the focus to the most challenged countries and uses arithmetic averages rather than the geometric mean when computing sub-dimensions, dimensions, challenges and the overall index.

The index is computed for 163 countries across three points in time: 2000, 2010 and 2019. Robustness and sensitivity analyses were conducted, and the results show that the overall index is fairly robust. With the exception of a few cases, the correlations between the DCI components are moderate. Additionally, the rankings of the regions under the current DCI framework are the most robust and are preserved in 165 out of 219 scenarios (including the base scenario). These rankings also have the lowest Euclidian Distance. As for the country rankings, they have, under the base scenario, the fifth lowest ED. It should be noted however that this ED for the country rankings is not very different than in the other "better" scenarios.

Annex

This annex provides additional details on the missing values that were replaced and imputed as discussed in section 3 of the paper. Additionally, it shows the results of the robustness and sensitivity tests described in section 4. More specifically, the tables of this annex show the following:

Table 1, GNI per capita missing values, lists the countries for which the GNI per capita value was not available and the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 2, Expected years of schooling missing values, lists the countries for which the expected years of schooling value was not available and the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 3, Mean years of schooling missing values, lists the countries for which the mean years of schooling value was not available and the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 4, Harmonized test scores missing values, lists the countries for which the test score value for the baseline year (2017) was not available and the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 5, Harmonized test scores imputed values, lists the countries for which the test score values were imputed. The table also includes information on the years for which the values were imputed.

Table 6, HDI inequality in income imputed values, lists the countries for which the 2010 and/or 2019 test score values were imputed. The table also includes information on the years for which the values were imputed.

Table 7, Gini coefficient missing values, lists the countries for which the Gini coefficient data was taken from the World Income Inequality Database (WIID).

Table 8, CO2 emissions missing values, lists the countries for which data on C02 emissions per capita were not available from the HDI data centre and therefore were taken from the Sustainable Development Goals database. Please note that if 2010 and 2017 data were also not available, the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 9, Energy intensity missing values, lists the countries for which the energy intensity value was not available and the closest available year was used instead. The table also includes information on the missing year and the closest available year used.

Table 10, Countries excluded from the 2020 EPI list, lists the countries for which the 2020 environmental health index was not available. The raw data were available for these countries, so we used them to compute the recent year's values.

Table 11, Missing democratic governance indicators, lists countries for which the values of democratic governance indicators were missing, and values of the closest available year were used instead. The table also includes information on the missing indicator(s), the missing year and the closest available year used.

Table 12, Correlation matrix for DCI components, shows the correlations between the DCI components. The results show moderate correlations with only a few expected high (in absolute value) coefficients.

Table 13, Cramer's V correlation matrix for DCI components, shows the Cramer's V correlation between DCI components. The results also show moderate correlations with only two coefficients above 0.7.

Table 14, Region rankings under 219 alternative scenarios, presents all possible rankings for the regions using the 219 scenarios, the sum of Euclidean Distances of region rankings of each scenario relative to all comparison scenarios, and the count of models achieving each set of rankings. The base scenario has the lowest ED, and its region ranks are preserved in 165 out of all the 219 scenarios.

Table 15, Scenarios with the lowest sums of Euclidean Distances of country rankings, out of 219 scenarios, lists the scenarios with the five lowest sums of Euclidean Distances of country rankings. The table show that the base scenario is among the top five scenarios out of 219 scenarios, and that the differences between the EDs of these five scenarios are small.

Table 16, Country rank changes under the scenario with the smallest ED relative to the base scenario, lists the countries for which the ranks change under the scenario with the smallest ED relative to the base scenario and presents the countries' ranks in the two scenarios. Only eight countries witness changes in their rankings, and by only one position.

Table 1. GNI per capita missing values

Country	Closest available year
Montenegro	2006

Table 2. Expected years of schooling missing values

Country	Closest available year
Montenegro	2003

Table 3. Mean years of schooling missing values

Country	Closest available year
Bhutan	2005
Lebanon	2005
Montenegro	2003
Nigeria	2003
Suriname	2004
Turkmenistan	2010
Vanuatu	2005

Table 4. Harmonized test scores missing values

Country	Closest available year
Belarus	2020
Bhutan	2020
Central African Republic	2020
Fiji	2020
Uzbekistan	2020

Table 5. Harmonized test scores imputed values

Country	Imputed year
Andorra	2017 and 2020
Antigua and Barbuda	2017
Bahamas	2017 and 2020
Barbados	2000, 2017 and 2020
Belarus	2000
Belize	2017 and 2020

Country	Imputed year
Bhutan	2000
Bolivia (Plurinational State of)	2000, 2017 and 2020
Brunei Darussalam	2017
Cabo Verde	2000, 2017 and 2020
Central African Republic	2000
Congo	2000
Congo (Democratic Republic of the)	2000
Cuba	2017 and 2020
Djibouti	2000, 2017 and 2020
Dominica	2017
Equatorial Guinea	2017 and 2020
Eritrea	2017 and 2020
Fiji	2000
Grenada	2017
Guinea-Bissau	2017 and 2020
Libya	2000, 2017 and 2020
Liechtenstein	2017 and 2020
Lithuania	2000
Maldives	2000, 2017 and 2020
Micronesia (Federated States of)	2017
Palau	2017
Saint Kitts and Nevis	2017
Saint Lucia	2017
Saint Vincent and the Grenadines	2017
Samoa	2017
Sao Tome and Principe	2000, 2017 and 2020
Suriname	2000, 2017 and 2020
Syrian Arab Republic	2017 and 2020
Turkmenistan	2000, 2017 and 2020
Uzbekistan	2000
Venezuela (Bolivarian Republic of)	2017 and 2020

Table 6. HDI inequality in income imputed values

Country	Imputed year
Afghanistan	2010 and 2019
Algeria	2010
Bahrain	2010 and 2019
Bhutan	2010
Botswana	2010 and 2019
Cabo Verde	2010 and 2019
Cuba	2010 and 2019
Fiji	2010 and 2019
Iran (Islamic Republic of)	2010
Iraq	2010
Japan	2010
Kiribati	2010
Kosovo	2010 and 2019
Kuwait	2010 and 2019
Lebanon	2010 and 2019
Libya	2010 and 2019
Malaysia	2019
Malta	2010
Mauritius	2010
Morocco	2019
Myanmar	2010 and 2019
New Zealand	2010
Oman	2010
Palestine, State of	2010
Papua New Guinea	2010
Qatar	2010 and 2019
Saint Lucia	2010
Sao Tome and Principe	2010
Saudi Arabia	2010 and 2019

Country	Imputed year
Seychelles	2010
Singapore	2010
Solomon Islands	2010
Somalia	2010 and 2019
Sudan	2010
Syrian Arab Republic	2019
Trinidad and Tobago	2019
Tuvalu	2010 and 2019
United Arab Emirates	2010 and 2019
Uzbekistan	2019
Vanuatu	2010

Table 7. Gini coefficient missing values

Country
Afghanistan
Bahrain
Barbados
Cambodia
Cuba
Guyana
Kuwait
Libya
New Zealand
Oman
Qatar
Saudi Arabia
Singapore
Suriname
Trinidad and Tobago
Turkmenistan

Table 8. CO2 emissions missing values

Country	Missing year	Closest available year
Aruba	2010 and 2017	2010 and 2016
Bermuda	2010 and 2017	2010 and 2016
British Virgin Islands	2010 and 2017	2010 and 2016
Cayman Islands	2010 and 2017	2010 and 2016
Curacao	2010 and 2017	2012 and 2016
Faroe Islands	2010 and 2017	2010 and 2016
French Polynesia	2010 and 2017	2010 and 2016
Gibraltar	2010 and 2017	2010 and 2016
Greenland	2010 and 2017	2010 and 2016
Kosovo	2010 and 2017	2010 and 2016
Macao SAR, China	2010 and 2017	2010 and 2016
New Caledonia	2010 and 2017	2010 and 2016
Sint Maarten (Dutch part)	2010	2010
Turks and Caicos Islands	2010 and 2017	2010 and 2016

Table 9 Energy intensity missing values

Country	Year	Closest available year
Montenegro	2000	2005

Table 10. Countries excluded from the 2020 EPI list

Country
Libya
Syrian Arab Republic
Yemen

Table 11. Missing democratic governance indicators

Country	Missing indicator	Missing year	Closest available year
Afghanistan	Executive oversight	2000	2005
Congo (Democratic Republic of the)	Executive oversight	2000	2003
Côte d'Ivoire	Executive oversight	2000	2001
Fiji	Executive oversight	2000 and 2010	2001 and 2014
Guinea	Executive oversight	2010	2007
Myanmar	Executive oversight	2000 and 2010	2011 and 2011
Niger	Executive oversight	2010	2011
Pakistan	Executive oversight	2000	2002
Palestine/West Bank	Executive oversight	2010	2006
Sierra Leone	Executive oversight	2000	2002

Table 12. Correlation matrix for DCI components[29]

	Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9	Var10	Var11	Var12	Var13	Var14	Var15	Var16	Var17
Var2	-0.790 (.000)																
Var3	-0.754 (.000)	0.830 (.000)															
Var4	-0.729 (.000)	0.783 (.000)	0.771 (.000)														
Var5	-0.839 (.000)	0.844 (.000)	0.848 (.000)	0.772 (.000)													
Var6	0.410 (.000)	-0.280 (.000)	-0.312 (.000)	-0.398 (.000)	-0.295 (.000)												
Var7	-0.497 (.000)	0.512 (.000)	0.570 (.000)	0.502 (.000)	0.695 (.000)	-0.209 (.007)											
Var8	-0.594 (.000)	0.639 (.000)	0.640 (.000)	0.653 (.000)	0.744 (.000)	-0.262 (.001)	0.577 (.000)										
Var9	0.351 (.000)	-0.224 (.004)	-0.153 (.052)	-0.139 (.076)	-0.332 (.000)	0.063 (.427)	0.122 (.123)	-0.190 (.015)									
Var10	0.868 (.000)	-0.830 (.000)	-0.790 (.000)	-0.830 (.000)	-0.858 (.000)	0.393 (.000)	-0.556 (.000)	-0.740 (.000)	0.255 (.001)								
Var11	0.420 (.000)	-0.475 (.000)	-0.417 (.000)	-0.516 (.000)	-0.489 (.000)	0.226 (.004)	-0.238 (.002)	-0.553 (.000)	0.233 (.003)	0.582 (.000)							
Var12	0.479 (.000)	-0.546 (.000)	-0.499 (.000)	-0.485 (.000)	-0.534 (.000)	0.266 (.001)	-0.263 (.001)	-0.523 (.000)	0.216 (.006)	0.580 (.000)	0.818 (.000)						

29 Var1: healthy life expectancy; Var2: expected years of schooling; Var3: mean years of schooling ; Var4: harmonized learning outcomes; Var5: GNI per capita; Var6: HDI inequality in income; Var7: CO2 emissions per capita; Var8: material footprint per capita; Var9: energy efficiency; Var10: environmental health; Var11: transparent laws with predictable enforcement; Var12: access to justice; Var13: executive oversight; Var14: judicial accountability; Var15: rigorous and impartial public administration; Var16: CSO consultation; Var17: CSO participatory environment; Var18: government effectiveness.

	Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9	Var10	Var11	Var12	Var13	Var14	Var15	Var16	Var17
Var13	0.363 (.000)	-0.434 (.000)	-0.336 (.000)	-0.436 (.000)	-0.340 (.000)	0.159 (.043)	-0.083 (.295)	-0.388 (.000)	0.168 (.032)	0.495 (.000)	0.713 (.000)	0.662 (.000)					
Var14	0.425 (.000)	-0.452 (.000)	-0.430 (.000)	-0.437 (.000)	-0.485 (.000)	0.189 (.016)	-0.296 (.000)	-0.489 (.000)	0.229 (.003)	0.544 (.000)	0.661 (.000)	0.649 (.000)	0.533 (.000)				
Var15	0.516 (.000)	-0.582 (.000)	-0.506 (.000)	-0.597 (.000)	-0.572 (.000)	0.212 (.007)	-0.277 (.000)	-0.579 (.000)	0.226 (.004)	0.647 (.000)	0.852 (.000)	0.812 (.000)	0.639 (.000)	0.690 (.000)			
Var16	0.228 (.004)	-0.326 (.000)	-0.239 (.002)	-0.325 (.000)	-0.281 (.000)	0.193 (.013)	-0.053 (.502)	-0.337 (.000)	0.096 (.223)	0.414 (.000)	0.724 (.000)	0.678 (.000)	0.622 (.000)	0.459 (.000)	0.666 (.000)		
Var17	0.102 (.195)	-0.167 (.033)	-0.108 (.169)	-0.155 (.048)	-0.120 (.128)	0.062 (.434)	0.100 (.206)	-0.166 (.034)	0.110 (.161)	0.260 (.001)	0.547 (.000)	0.491 (.000)	0.587 (.000)	0.328 (.000)	0.448 (.000)	0.686 (.000)	
Var18	0.739 (.000)	-0.799 (.000)	-0.746 (.000)	-0.800 (.000)	-0.835 (.000)	0.292 (.000)	-0.527 (.000)	-0.751 (.000)	0.283 (.000)	0.842 (.000)	0.720 (.000)	0.713 (.000)	0.532 (.000)	0.645 (.000)	0.784 (.000)	0.506 (.000)	0.282 (.000)

Source: Authors' calculations.
Note: the expected years of schooling, mean years of schooling and GNI per capita indicators reflect (positive) achievements, while all other indicators reflect (negative) challenges.

Table 13. Cramer's V correlation matrix for DCI components26

	Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9	Var10	Var11	Var12	Var13	Var14	Var15	Var16	Var17
Var2	0.602																
Var3	0.626	0.645															
Var4	0.517	0.587	0.624														
Var5	0.666	0.633	0.623	0.608													
Var6	0.498	0.571	0.614	0.486	0.598												
Var7	0.531	0.511	0.588	0.571	0.573	0.566											
Var8	0.553	0.545	0.588	0.584	0.589	0.586	0.679										
Var9	0.609	0.589	0.601	0.589	0.587	0.640	0.618	0.618									
Var10	0.650	0.648	0.617	0.665	0.633	0.619	0.674	0.667	0.614								
Var11	0.612	0.603	0.619	0.623	0.628	0.587	0.639	0.617	0.607	0.627							
Var12	0.674	0.677	0.653	0.671	0.649	0.677	0.612	0.645	0.655	0.642	0.656						
Var13	0.658	0.654	0.650	0.642	0.650	0.626	0.675	0.661	0.655	0.656	0.683	0.662					
Var14	0.653	0.632	0.646	0.661	0.645	0.643	0.669	0.658	0.646	0.659	0.654	0.654	0.681				
Var15	0.649	0.655	0.671	0.665	0.655	0.648	0.690	0.671	0.640	0.675	0.678	0.652	0.666	0.673			
Var16	0.664	0.647	0.662	0.667	0.671	0.642	0.706	0.652	0.662	0.662	0.693	0.670	0.672	0.666	0.674		
Var17	0.591	0.596	0.603	0.619	0.602	0.575	0.626	0.604	0.624	0.619	0.643	0.684	0.667	0.645	0.643	0.700	
Var18	0.663	0.656	0.642	0.667	0.659	0.638	0.665	0.677	0.623	0.679	0.663	0.662	0.645	0.656	0.675	0.659	0.627

Source: Authors' calculations.

Table 14. Region rankings under 219 alternative scenarios

East Asia and Pacific	Europe and Central Asia	Latin America and The Caribbean	North America	South Asia	Sub-Saharan Africa	Arab Region	ED	Model count (number of scenarios giving the same region rankings)
5	6	4	7	2	1	3	136	165
5	6	4	7	3	1	2	448	22
4	6	5	7	2	1	3	446	23
4	6	5	7	3	1	2	758	7
4	6	5	7	3	2	1	1,562	1
4	6	5	7	2	3	1	2,054	1

Source: Authors' calculations.

Table 15. Scenarios with the lowest sums of Euclidean Distances of country rankings, out of 219 scenarios

Scenario	Sum of ED
First	528,076
Second	528,330
Third	528,444
Fourth	528,490
Fifth (base)	528,550

Source: Authors' calculations.

Table 16. Country rank changes under the scenario with the smallest ED relative to the base scenario

Country	Rank under base scenario	Rank under scenario with smallest ED
Bolivia (Plurinational State of)	66	67
Gabon	58	59
India	59	58
Kuwait	87	88
Kyrgyzstan	67	66
Nicaragua	44	43
Oman	88	87
Tanzania (United Republic of)	43	44

Source: Authors' calculations.
Note: The difference between the base scenario and the scenario with the smallest ED is that the latter allocates 55 per cent of the weight of the rule of law and access to justice sub-dimension to the transparent laws with predictable enforcement indicator, while the latter allocates 50 per cent of the weight to this indicator. The scenario with the smallest sum of EDs still results in the same region rankings as the base scenario.

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This paper introduces the Development Challenges Index (DCI). This index is a comprehensive measure of development that takes into account the quantitative and qualitative aspects of the components of the Human Development Index (health, education and income), environmental sustainability and good governance. The DCI serves as a tool to track developmental challenges and help policymakers assess their national policies.

The adjustment of the components of the HDI by quality and the inclusion of two additional dimensions to measure development are justified conceptually. Previously, the focus on quantitative aspects was justified due to the presence of profound quantitative shortfalls in human development. However, countries have moved up the ladder of human development and made major progress in closing these gaps; today, the issue of quality is more important. Additionally, the environmental threats that the world is facing pose a serious challenge to social and economic well- being, since environmental sustainability is an essential element of human development. Lastly, freedom of agency, which is important on its own and as an instrument to enhance well-being, is linked to freedom of expression, democratic space and participation, which cannot be ensured without good governance and institutions.

The index is computed for 163 countries at three points in time: 2000, 2010 and 2019. After making the conceptual case for the index, this paper describes in detail the indicators that comprise the index, the aggregation methodology and the results of robustness and sensitivity analyses.

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