

Supplementary Information

1. DATA

We construct a harmonized panel dataset combining indicators from the Sustainable Development Goals (SDGs), Millennium Development Goals (MDGs), and the Human Development Index (HDI). To capture interactions with climate-related outcomes, we incorporate sectoral national greenhouse gas (GHG) emissions data from the International Monetary Fund (IMF), which serve as proxies for Paris Agreement-aligned performance. The dataset spans five benchmark years (2000, 2005, 2010, 2015, and 2019), enabling longitudinal analysis across the transition from the MDG to the SDG framework. A brief description of each data source is provided below. We exclude data from 2020 to 2023, since they were the years of the COVID-19 pandemic. Data on HDI and Paris Agreement indicators are not available for years post 2023, and the SDG data is sparser for these years. Therefore, 2019 is the latest data in our analyses.

A. Millennium Development Goals Indicators (MDG)

MDG Indicators are sourced from the World Bank database ([Millennium Development Goals | DataBank, accessed on 12th October, 2023](#)). This provides information for 132 indicators in 2015, 2010, and 2005, and for 92 indicators in 2000. Moreover, the data is not available for 2019, since the SDGs replaced the MDGs in 2015.

B. Paris Agreement Indicators (PA)

IMF's data on 'national greenhouse gas emissions inventories and implied national mitigation (nationally determined contributions) targets' are used as indicators representing the Paris Agreement ([National Greenhouse Gas Emissions Inventories, accessed on 11th August, 2024](#)). We collect data on GHG emissions for six sectors (Energy, Industrial Processes and Product Use, Agriculture, LULUCF, Waste, and Other) for all the years at the country level.

C. Sustainable Development Goals (SDG)

We use data from the United Nations Department of Economic and Social Affairs on the Sustainable Development Goals. The SDG Global Database ([UNSDG, accessed on 26th March, 2025](#)) provides data on the 17 goals and 169 targets at the country-level. We collect the data for five data points, 2000, 2005, 2010, 2015, and 2019. The year 2019 is used as the most recent observation, as data for 2020–2023 are substantially affected by disruptions associated with the COVID-19 pandemic, limiting comparability and availability. The criteria guiding the selection of indicators are described in the following section.

D. Human Development Index

We download data for the Human Development Index, the Gender Inequality Index, the Inequality-adjusted Human Development Index, and the Planetary pressures-adjusted Human Development Index from ([HDI, accessed on 12th October, 2023](#)). The data we use is available as "All composite indices and components time series (1990-2023)".

E. Indicator Categorization

. We categorize the indicators into four major groups, based on their differentiated focus on specific dimensions of sustainable development. These groupings have been created to present out results in a more concise manner. The four categories are Social, Economic, Environment, and Institutional. The authors independently code the indicators into the categories and the final allocation is based on consensus among the four authors.

F. Indicator Selection

Using the above datasets we prepare a master list of indicators, consisting of all the indicators from the SDGs, MDGs, HDI, and Paris Agreement indicators that clear our inclusion criteria described here.

Base Year Selection

The year 2015 marked a pivotal moment in international sustainable development governance. United Nations member states formally adopted the SDGs, which succeeded the MDGs and established a comprehensive framework to guide national and subnational development strategies through 2030. Under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC), countries adopted the Paris Agreement, committing to limit the increase in global average temperature to well below 2°C and to pursue efforts to constrain warming to 1.5°C above pre-industrial levels. The choice of 2015 as the base year is motivated both by its central role in the global development agenda and by relatively strong data coverage. We exclude all indicators for which more than 50 percent of observations are missing in that year.

Indicator List for SDG/MDG

We systematically reduce the set of repetitive indicators. First, when an indicator is reported at multiple levels of disaggregation, we retain only the most aggregated version. Second, if both ratio and absolute (count) measures are available for the indicator, we retain the ratio measure to enhance cross-country comparability. Third, when indicators are expressed in both current and constant currency terms, we use constant currency series to reflect real values. Finally, we also apply certain rules on a case-by-case basis depending on the SDG indicators under consideration.

Addressing the SDG/MDG Overlap

We identify overlaps between SDG and MDG indicators. To avoid double-counting the same underlying construct, we consolidate indicators that exhibit high correlation, retaining a single representative variable in such cases. We compute pairwise correlations between all SDG and MDG indicators for the base year 2015. Where an SDG and an MDG indicator exhibit a correlation exceeding 0.95, we retain only the SDG indicator and exclude its MDG counterpart to avoid duplication.

Indicator Alignment

Most indicators in our dataset are defined such that higher values correspond to more favourable outcomes. However, a subset of indicators is constructed so that lower values reflect better performance. To ensure directional consistency across all variables, we transform these indicators by taking the reciprocal of their original values, so that higher values uniformly indicate better outcomes.

The final dataset comprises of 242 indicators from the four combined development paradigms. We extract the same indicators from the four combined development paradigms for the years 2000, 2005, 2010, and 2019. These indicators form the nodes for our final network analysis.

2. K-CORE DYNAMICS AND INDICATOR TRAJECTORIES

To examine temporal changes in network structure, we analyse the position of indicators across k-core layers for each benchmark year. Table S1 presents these results. The analysis identifies three distinct patterns: (i) indicators consistently located in the innermost k-cores across all years (persistently central), (ii) indicators consistently located in outer k-core layers (persistently peripheral), and (iii) indicators that shift across k-core layers over time (transitioning). These classifications capture differences in the stability of indicator positions within the network.

Persistently central indicators

Persistently central indicators are located in the innermost k-cores in all years. These include indicators related to health (for example, under-five mortality, maternal mortality, and universal health coverage), education (primary and secondary school completion), and basic services (access to drinking water and sanitation). Selected connectivity-related indicators, including electricity access, internet use, and the number of automated teller machines (ATMs), are also persistently central.

Persistently peripheral indicators

Persistently peripheral indicators remain in outer k-core layers throughout the study period. These include several environmental indicators (for example, forest cover, protected areas, Mountain Green Cover Index, Red List Index, and emissions-related measures), as well as selected

disease-specific and manufacturing-related indicators.

Transitioning indicators

Transitioning indicators shift across k-core layers over time, reflecting changes in their relative positions within the network. Indicators that decline in importance include commercial bank branches, selected health indicators (for example, HIV prevalence), gender parity measures, and selected economic indicators such as regulatory capital ratios, manufacturing value added per capita, and domestic material consumption. Indicators that increase in importance include measures of digital and institutional capacity, such as fixed broadband subscriptions, mobile network coverage (2G–4G), and international health regulation capacities. Gender-related indicators exhibit a consistent shift towards more peripheral k-core layers over time. These include measures such as the gender parity index for secondary and tertiary education and the gender inequality index. This pattern indicates a decline in their relative importance within the network across the study period.

Table S1. Classification of indicators according to their movement across k-core structures and corresponding Sustainable Development Goal (SDG) mapping. Indicators are grouped as transitioning, persistently central, or persistently peripheral across the study period.

No.	Indicator	SDG mapping
Transitioning indicators		
Move from inner cores to outer cores		
1	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 11	SDG 3
2	Number of commercial bank branches per 100,000 adults	SDG 8
3	Prevalence of HIV, total (percent of population ages 15-49)	MDG
4	Proportion of medium and high-tech manufacturing value added in total value added (percent)	SDG 9
5	School enrollment, tertiary (gross), gender parity index (GPI)	MDG
6	Adjusted gender parity index for completion rate Lower Secondary	SDG 4
7	Domestic material consumption per capita (tonnes)	SDG 8
8	School enrollment, primary and secondary (gross), gender parity index (GPI)	MDG
9	Adjusted gender parity index for completion rate Upper Secondary	SDG 4
10	Manufacturing value added per capita (constant 2015 United States dollars)	SDG 9
11	Gender Inequality Index	HDI
12	Antiretroviral therapy coverage (percent of people living with HIV)	MDG
13	Non-performing loans net of provisions to capital (percent)	SDG 10
14	Regulatory capital to assets (percent)	SDG 10
15	Regulatory Tier 1 capital to risk-weighted assets (percent)	SDG 10
16	Liquid assets to short term liabilities (percent)	SDG 10
17	Bank capital to assets ratio (percent)	SDG 17
Move from outer cores to inner cores		
18	Labour share of GDP (percent)	SDG 10
19	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 1	SDG 3
20	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 2	SDG 3
21	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 3	SDG 3
22	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 4	SDG 3
23	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 5	SDG 3
24	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 8	SDG 3
25	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 9	SDG 3
26	Proportion of the target population with access to measles-containing-vaccine second-dose (MCV2) (percent)	SDG 3
27	Death rate due to road traffic injuries (per 100,000 population)	SDG 3
28	Fixed broadband subscriptions per 100 inhabitants	SDG 17
Persistently central indicators		
29	Prevalence of undernourishment (percent)	SDG 2
30	Prevalence of moderate or severe food insecurity (percent)	SDG 2
31	Inequality-adjusted Human Development Index	HDI
32	Countries with birth registration data that are at least 90 percent complete (1 = YES; 0 = NO)	SDG 17
33	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 12	SDG 3
34	Proportion of population with primary reliance on clean fuels and technology (percent)	SDG 7
35	Number of automated teller machines (ATMs) per 100,000 adults	SDG 8

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Table S1. Classification of indicators according to their movement across k-core structures and corresponding SDG mapping (continued).

No.	Indicator	SDG mapping
36	Proportion of population covered by at least a 3G mobile network (percent)	SDG 9
37	Proportion of population covered by at least a 4G mobile network (percent)	SDG 9
38	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (probability)	SDG 3
39	Proportion of children moderately or severely stunted (percent)	SDG 2
40	Health worker density, by type of occupation (per 10,000 population) Nurses and Midwives	SDG 3
41	GNI per capita, Atlas method (current US dollar)	MDG
42	Proportion of individuals using the Internet (percent)	SDG 17/ MDG
43	Prevalence of undernourishment (percent of population)	MDG
44	Maternal mortality ratio (modeled estimate, per 100,000 live births)	MDG
45	Proportion of women aged 15-49 years with anaemia (percent)	SDG 2
46	Under-five mortality rate (deaths per 1,000 live births)	SDG 3/ MDG
47	Neonatal mortality rate (deaths per 1,000 live births)	SDG 3
48	Maternal mortality ratio	SDG 3
49	Fixed telephone subscriptions (per 100 people)	MDG
50	GDP per person employed (constant 2017 PPP dollar)	MDG
51	Life expectancy at birth (years)	MDG
52	Planetary Human Development Index	HDI
53	Proportion of population using basic drinking water services (percent)	SDG 1/ MDG
54	Proportion of population using basic sanitation services (percent)	SDG 1/ MDG
55	Proportion of births attended by skilled health personnel (percent)	SDG 3
56	Universal health coverage (UHC) service coverage index	SDG 3
57	Completion rate (percent) Lower Secondary	SDG 4
58	Completion rate (percent) Primary	SDG 4
59	Completion rate (percent) Upper Secondary	SDG 4
60	Participation rate in organized learning (one year before the official primary entry age) (percent)	SDG 4
61	Proportion of population using safely managed sanitation services(percent)	SDG 6
62	Proportion of population using safely managed drinking water services(percent)	SDG 6
63	Proportion of population with basic handwashing facilities on premises(percent)	SDG 6
64	Proportion of population with access to electricity(percent)	SDG 7
Persistently peripheral indicators		
65	Number of directly affected persons attributed to disasters per 100,000 population (number)	SDG 1
66	Number of deaths and missing persons attributed to disasters per 100,000 population (number)	SDG 1
67	Annual mean levels of fine particulate matter (population-weighted) (micrograms per cubic meter)	SDG 11
68	Fossil-fuel subsidies (consumption and production) as a proportion of total GDP (percent)	SDG 12
69	Fossil-fuel subsidies (consumption and production) per capita (nominal United States dollars)	SDG 12
70	Chlorophyll-a deviations, remote sensing (percent)	SDG 14
71	Proportion of land that is degraded over total land area (percent)	SDG 15
72	Unsentenced detainees as a proportion of overall prison population (percent)	SDG 16
73	Worldwide weighted tariff-average, most-favoured-nation status (percent)	SDG 17
74	Worldwide weighted tariff-average, preferential status (percent)	SDG 17
75	Number of people requiring interventions against neglected tropical diseases (number)	SDG 3
76	Prevalence of hepatitis B surface antigen (HBsAg) (percent)	SDG 3

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Table S1. Classification of indicators according to their movement across k-core structures and corresponding SDG mapping (continued).

No.	Indicator	SDG mapping
77	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (percent)	SDG 6
78	Net open position in foreign exchange to capital (percent)	SDG 10
79	Parties meeting their commitments and obligations in transmitting information as required by Basel Convention on hazardous waste, and other chemicals (percent)	SDG 12
80	Parties meeting their commitments and obligations in transmitting information as required by Stockholm Convention on hazardous waste, and other chemicals (percent)	SDG 12
81	Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism (SEEA tables)	SDG 12
82	Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism (Tourism Satellite Account tables)	SDG 12
83	Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism (number of tables)	SDG 12
84	Sustainable fisheries as a proportion of GDP	SDG 14
85	Mountain Green Cover Index Tree-covered areas	SDG 15
86	Mountain Green Cover Index Sparsely natural vegetated areas	SDG 15
87	Mountain Green Cover Index Croplands	SDG 15
88	Mountain Green Cover Index Artificial surfaces	SDG 15
89	Mountain Green Cover Index Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	SDG 15
90	Total official development assistance for biodiversity, by recipient countries (millions of constant 2021 United States dollars)	SDG 15
91	Mountain Green Cover Index Inland water bodies	SDG 15
92	Primary government expenditures as a proportion of original approved budget (percent)	SDG 16
93	Annual growth of the general government final consumption expenditure (percent)	SDG 17
94	Annual growth of households and NPISHs final consumption expenditure (percent)	SDG 17
95	Annual growth of the gross capital formation (percent)	SDG 17
96	Annual growth of imports of goods and services (percent)	SDG 17
97	Dollar value of all resources made available to strengthen statistical capacity in developing countries (current United States dollars)	SDG 17
98	Agriculture orientation index for government expenditures	SDG 2
99	Total official development assistance to medical research and basic health sectors, net disbursement, by recipient countries (millions of constant 2021 United States dollars)	SDG 3
100	International Health Regulations (IHR) capacity, by type of IHR capacity (percent) 6	SDG 3
101	Proportion of the target population with access to pneumococcal conjugate 3rd dose (PCV3) (percent)	SDG 3
102	Lakes and rivers permanent water area change (percent)	SDG 6
103	Lakes and rivers seasonal water area change (percent)	SDG 6
104	Installed renewable electricity-generating capacity (watts per capita)	SDG 7
105	Total official flows (commitments) for Aid for Trade, by recipient countries (millions of constant 2021 United States dollars)	SDG 8
106	Total official flows (disbursement) for Aid for Trade, by recipient countries (millions of constant 2021 United States dollars)	SDG 8
107	Tuberculosis case detection rate (percent, all forms)	MDG
108	Red List Index	SDG 15
109	Proportion of children moderately or severely overweight (percent)	SDG 2
110	Number of new HIV infections per 1,000 uninfected population	SDG 3
111	Age-standardized prevalence of current tobacco use among persons aged 15 years and older (percent)	SDG 3
112	Unemployment rate 13th ICLS (percent)	SDG 8
113	Employment to population ratio, 15+, total (percent) (modeled ILO estimate)	MDG
114	Proportion of total government spending on essential services, education (percent)	SDG 1
115	Forest area certified under an independently verified certification scheme (thousands of hectares)	SDG 15
116	Proportion of domestic budget funded by domestic taxes (percent)	SDG 17
117	Portfolio investment, net (Balance of Payments, current United States dollars)	SDG 17
118	Adjusted gender parity index for participation rate in organized learning (one year before the official primary entry age), (ratio)	SDG 4

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Table S1. Classification of indicators according to their movement across k-core structures and corresponding SDG mapping (continued).

No.	Indicator	SDG mapping
119	Domestic material consumption per unit of GDP (kilograms per constant 2015 United States dollars)	SDG 8
120	Manufacturing value added (constant 2015 United States dollars) as a proportion of GDP (percent)	SDG 9
121	Total debt service (percent of exports of goods, services and primary income)	MDG
122	External debt stocks as a proportion of GNI (percent)	SDG 17
123	Alcohol consumption per capita (aged 15 years and older) within a calendar year (litres of pure alcohol)	SDG 3
124	Mortality rate attributed to unintentional poisonings (deaths per 100,000 population)	SDG 3
125	PPP conversion factor, GDP (LCU per international dollar)	MDG
126	Current account balance as a proportion of GDP (percent)	SDG 17
127	Total reserves in months of imports (ratio)	SDG 17
128	Cash surplus/deficit as a proportion of GDP (percent)	SDG 17
129	Annual growth of exports of goods and services (percent)	SDG 17
130	DEC alternative conversion factor (in local currency unit per United States dollar)	SDG 17
131	Proportion of seats held by women in national parliaments (percent of total number of seats)	SDG 5/ MDG
132	Malaria cases reported	MDG
133	Annual Net Emissions Rate Green House Gases Agriculture	PA
134	Debt service as a proportion of exports of goods and services (percent)	SDG 17
135	Proportion of population practicing open defecation(percent)	SDG 6
136	Carbon dioxide emissions per unit of GDP PPP (kilogrammes of CO2 per constant 2017 United States dollars)	SDG 9
137	Carbon dioxide emissions from fuel combustion (millions of tonnes)	SDG 9
138	Carbon dioxide emissions per unit of manufacturing value added (kilogrammes of CO2 per constant 2015 United States dollars)	SDG 9
139	Fertility rate, total (births per woman)	MDG
140	Average proportion of Marine Key Biodiversity Areas (KBAs) covered by protected areas (percent)	SDG 14
141	Above-ground biomass in forest (tonnes per hectare)	SDG 15
142	Average proportion of Mountain Key Biodiversity Areas (KBAs) covered by protected areas (percent)	SDG 15
143	Forest area as a proportion of total land area (percent)	SDG 15/ MDG
144	Annual inflation, consumer prices (percent)	SDG 17
145	Renewable energy share in the total final energy consumption (percent)	SDG 7
146	Trade (percent of GDP)	MDG
147	Merchandise trade as a proportion of GDP (percent)	SDG 17
148	Average tariff applied by developed countries, most-favored nation status (percent)	SDG 17
149	Average tariff applied by developed countries, preferential status (percent)	SDG 17
150	Suicide mortality rate (deaths per 100,000 population)	SDG 3
151	Gross capital formation (percent of GDP)	MDG
152	Annual broad money growth (percent)	SDG 17
153	Lakes and rivers permanent water area (percent of total land area)	SDG 6
154	Lakes and rivers seasonal water area (percent of total land area)	SDG 6
155	Energy intensity level of primary energy (megajoules per constant 2017 purchasing power parity GDP)	SDG 7
156	Net ODA received (percent of GNI)	MDG
157	Tuberculosis treatment success rate (percent of new cases)	MDG
158	Official development assistance grants for poverty reduction, by recipient countries (percentage of GNI)	SDG 1
159	Average proportion of Freshwater Key Biodiversity Areas (KBAs) covered by protected areas (percent)	SDG 15

Note: SDG stands for Sustainable Development Goals, MDG stands for Millennium Development Goals, PA stands for Paris Agreement, and HDI stands for Human Development Index