

Abstract

(last)

Introduction

The Ecological Footprint (EF) measures human demand and supply of renewable biological resources, but does not give information on the quality of services provided as a result of that demand.

Low demand can be due to high efficiency or low quality of life. . .

Combining national Ecological Footprint results with the UN's Human Development Index (HDI) combined with the Ecological Footprint gives an overview into the global pattern of the provision of human welfare mapped against this demand for renewable resources.

. . . (MRIO-FA) accounts use (EE-MRIO) to provide EF results related to activities. (Brief description of MRIO This breaks down the total results in a way that differentiates that areas of life which are associated with different biocapacity demands by residents of different nations). Comparing across countries shows the range of demand for biocapacity by activity, but . . .

(Hypothesise that while x and y country have similar EF per capita for Food, one is likely more efficient with a high quality of food, while the other may be demanding less resources because there is a lack of sufficient quantity or quality of food for the residents).

The Sustainable Development Goals (SDG) are. . . An initiative to track nations' progress toward these goals is the Sustainable Development Goals Indicators project (SDGI). The SDGI collect and organise available data which is relevant to the progress toward and achievement of these goals. Using these data, we identified. . .

Methods

Ecological Footprint

MRIO-FA

Input output tables.

GTAP data

EF allocation

CLUM matrix

Sustainable Development Goals Indicator Data

SDG

SDGIs

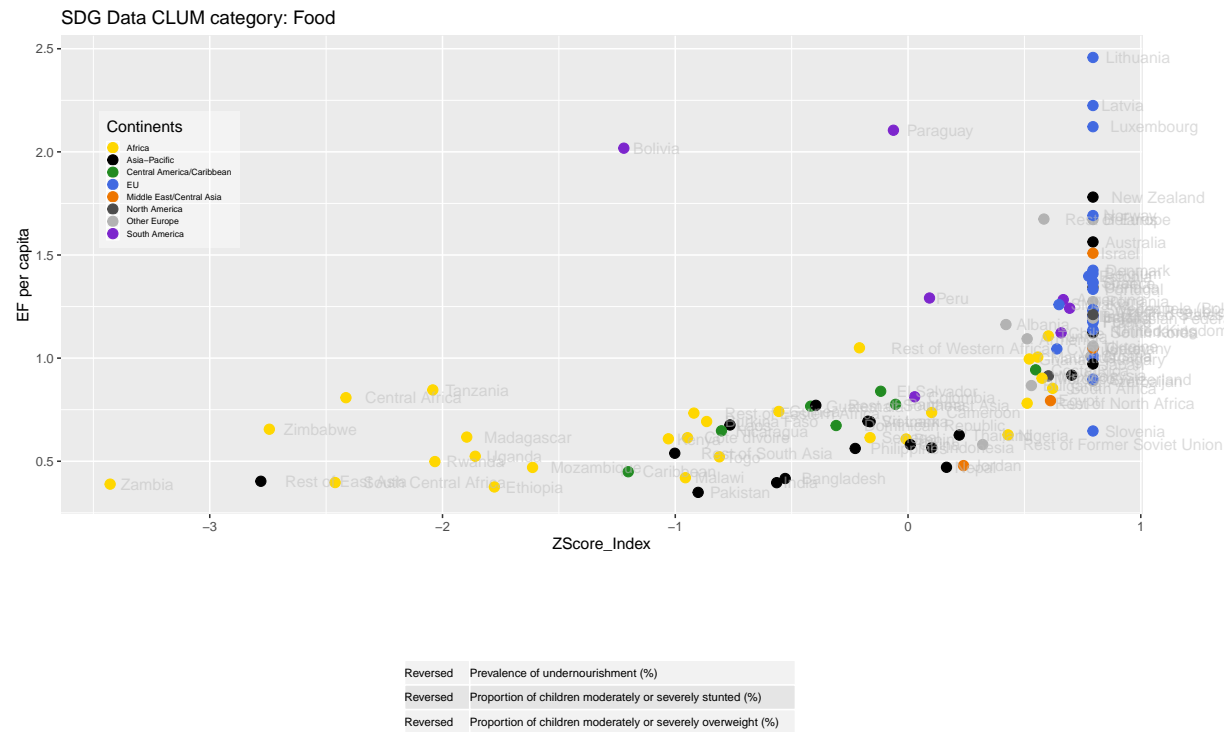
A full list of Indicators and data as of the time of publication appears as an appendix to this paper (see: APPENDIX A)

Our R script takes the most up-to-date data from the SDG API Using principles of reproducible and open source science, the underlying scripts are available at. . . We select from the list of Indicator data.

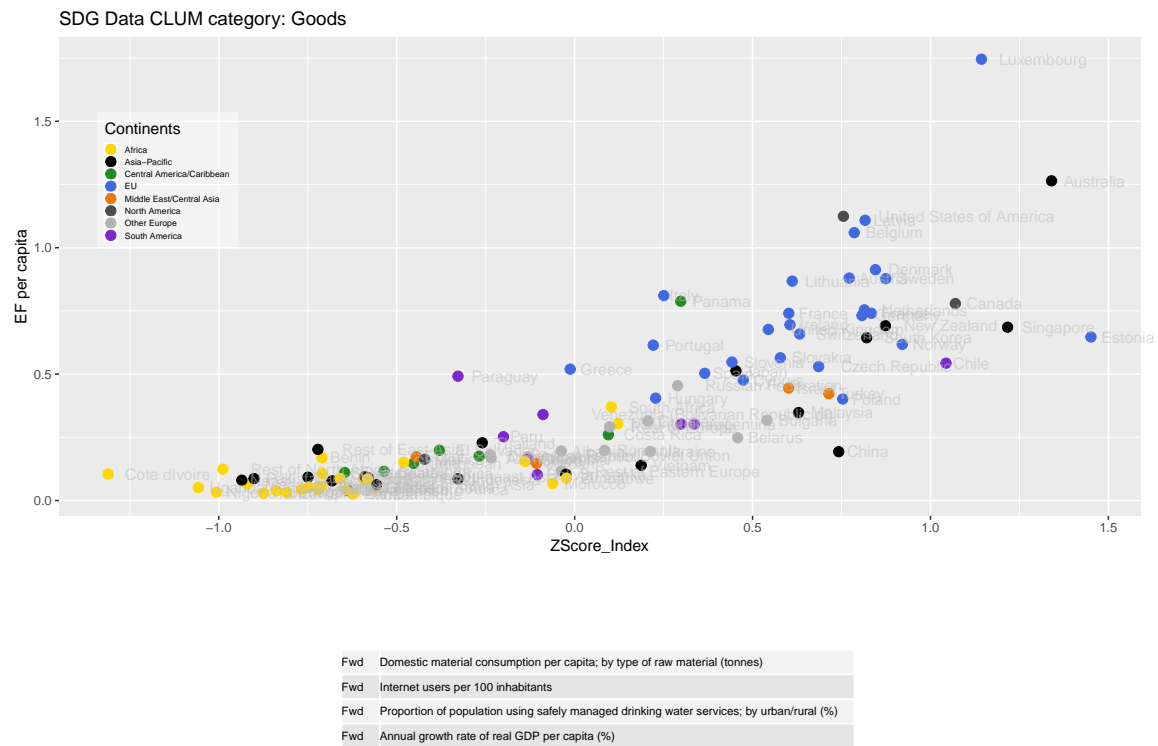
We normalize the data when there are multiple elements.

Results

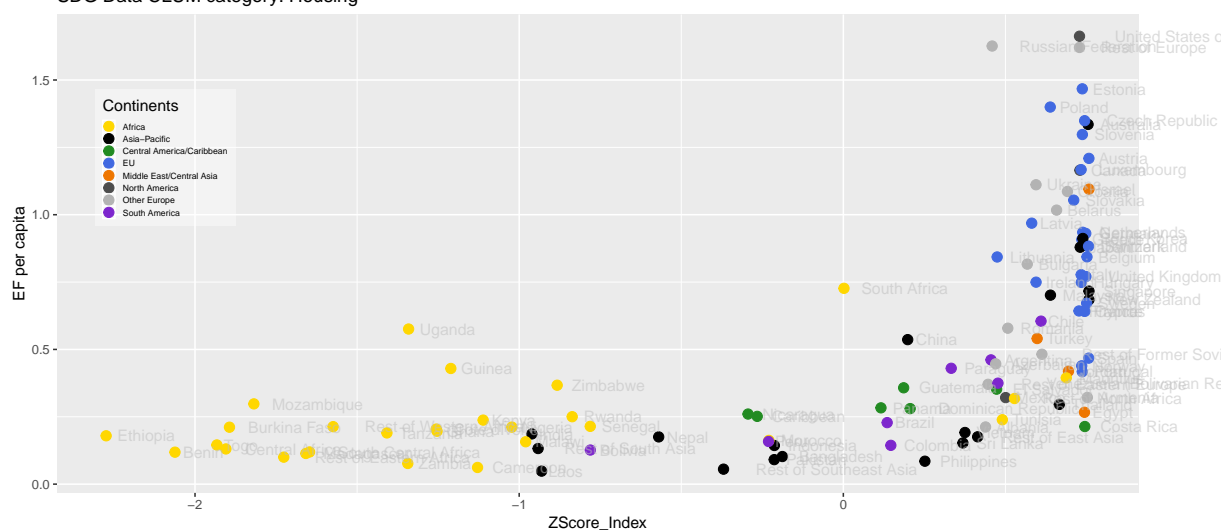
We found that combining EF by CLUM with appropriate SDGi data does differentiate countries according to variability in the quality of the consumption activities in each. . . .



For the category measuring the Ecological Footprint of Food against our indicator data representing the quality of food provision in each country,



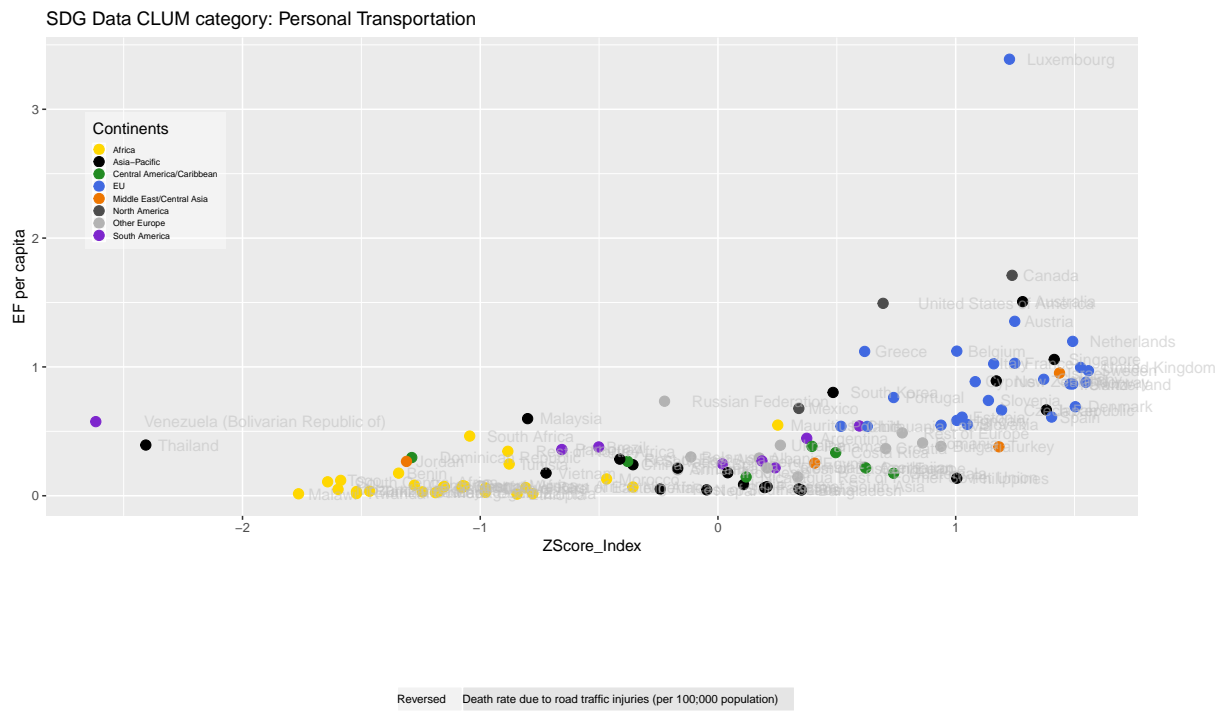
For the CLUM category of ‘Goods’, the results show highly clustered ...



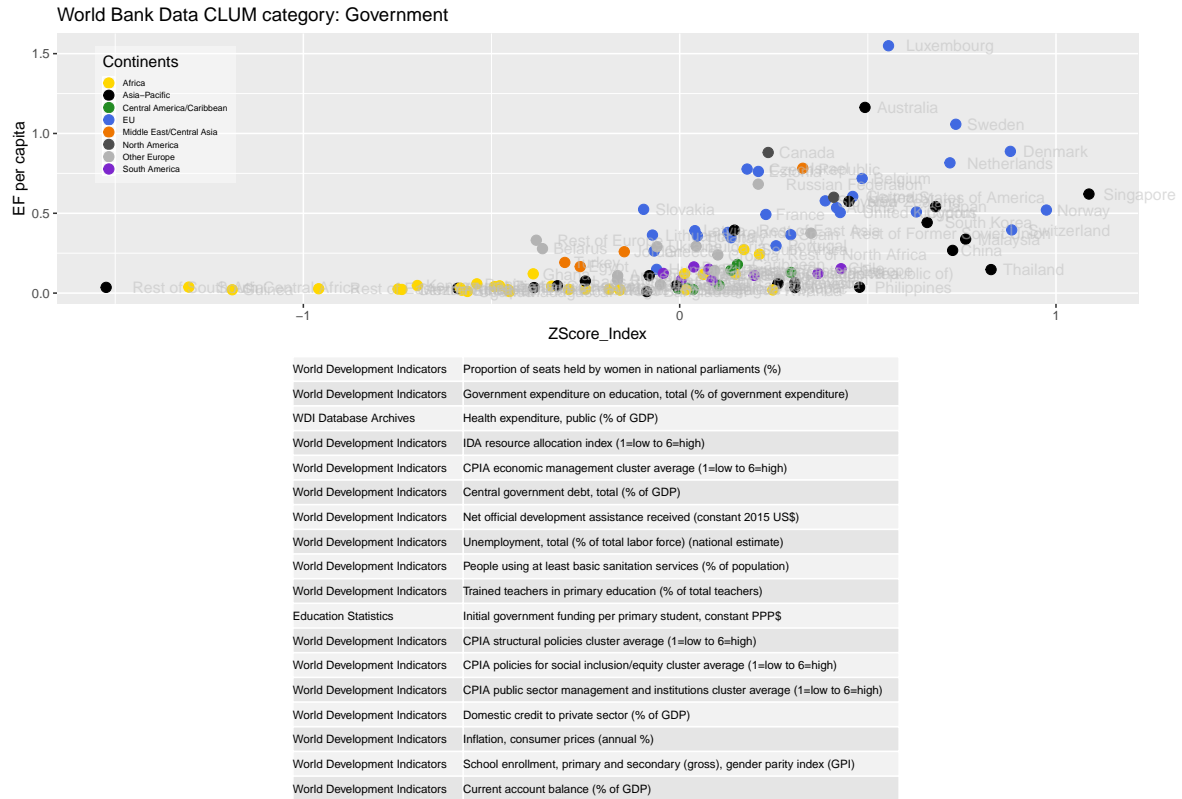
| | |
|----------|--|
| Fwd | Proportion of population using basic drinking water services; by location (%) |
| Fwd | Proportion of population using basic sanitation services; by location (%) |
| Fwd | Proportion of population with basic handwashing facilities on premises; by urban/rural (%) |
| Reversed | Proportion of population practicing open defecation; by urban/rural (%) |

For the consumption category of Housing, ...

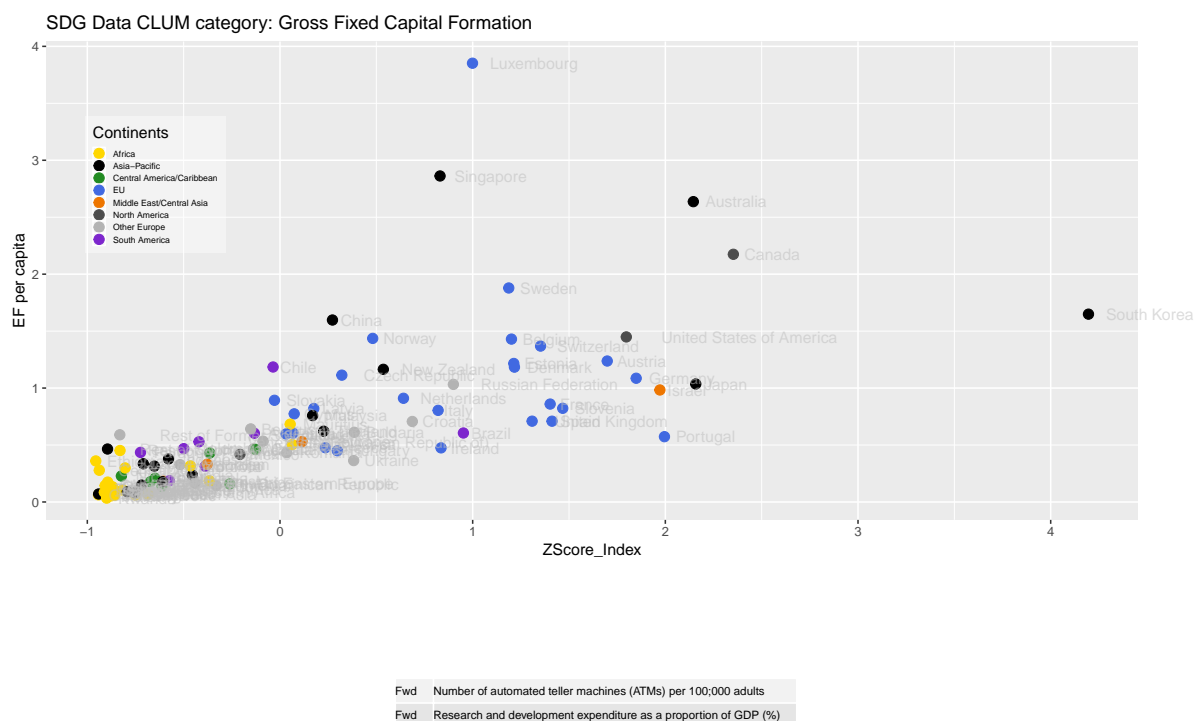
For the Services consumption category, ...



For the Personal Transportation category, we can see that a fairly straight-forward proxy indicator of a single set of data gives a picture of the state and variability of different nations' relative success in achieving safe and effective transport within ...



For the Government category, the SDG Indicator data did not provide appropriate data series with data for year in this study. Pulling directly from the World Bank data – which is the original data source for a few of the SDG Indicator data series – gives a robust picture of the provision of government services across countries. Interestingly, the pattern and distribution are similar at the continent level to that of the Ecological Footprint and the Human Development Indicator.



Gross Fixed Capital Formation is a measure of investment. For this category, we

Conclusion

While EF is useful for tracking... sometimes criticized for limitations in understanding drivers. Breaking down and linking with quality of services indicators enables Make these results publicly available for researchers, policy makers, or any interested parties to better understand both the areas of particular demand. Highlights countries where aspects are particularly successful in minimizing demand for biocapacity while at the same time providing high quality of life in that area. Can be a guidepost for other countries and individuals to learn from and potentially implement some best practices for sustainable development. Better MRIO data would be great. Better ability to allocate EF to IO tables would be great. Additional work could ...

APPENDIX A

Full list of SDG Indicators data available (at time of publication) for 2011

(some series may be sparsely populated)

| indicator | series | seriesDescription |
|-----------|-----------------|---|
| 1.1.1 | SI_POV_DAY1 | Proportion of population below international poverty line (%) |
| 1.1.1 | SI_POV_EMP1 | Employed population below international poverty line; by sex and age (%) |
| 1.2.1 | SI_POV_NAHC | Proportion of population living below the national poverty line (%) |
| 1.3.1 | SI_COV_SOCAST | [World Bank] Proportion of population covered by social assistance programs (%) |
| 1.3.1 | SI_COV_SOCASTPQ | [World Bank] Poorest quintile covered by social assistance programs (%) |
| 1.3.1 | SI_COV_SOCINS | [World Bank] Proportion of population covered by social insurance programs (%) |
| 1.3.1 | SI_COV_SOCINSPQ | [World Bank] Poorest quintile covered by social insurance programs (%) |
| 1.3.1 | SI_COV_UEMP | [ILO] Proportion of unemployed persons receiving unemployment cash benefits (%) |

| indicator | series | seriesDescription |
|---------------------|----------------|---|
| 1.3.1 | SI_COV_WKINJRY | [ILO] Proportion of employed population covered in the event of work injury |
| 1.3.1 | SI_COV_LMKT | [World Bank] Proportion of population covered by labour market programs |
| 1.3.1 | SI_COV_LMKTPQ | [World Bank] Poorest quintile covered by labour market programs (%) |
| 1.3.1 | SI_COV_PENSN | [ILO] Proportion of population above statutory pensionable age receiving a |
| 1.4.1 | SP_ACS_BSRVH2O | Proportion of population using basic drinking water services; by location (%) |
| 1.4.1 | SP_ACS_BSRVSAN | Proportion of population using basic sanitation services; by location (%) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_MISS | Number of missing persons due to disaster (number) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_AFFCT | Number of people affected by disaster (number) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_MORT | Number of deaths due to disaster (number) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_MTMP | Number of deaths and missing persons attributed to disasters per 100;000 p |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_MTMN | Number of deaths and missing persons attributed to disasters (number) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_DAFF | Number of directly affected persons attributed to disasters per 100;000 pop |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_IJILN | Number of injured or ill people attributed to disasters (number) |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_PDAN | Number of people whose damaged dwellings were attributed to disasters (n |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_PDYN | Number of people whose destroyed dwellings were attributed to disasters (n |
| 1.5.1 11.5.1 13.1.1 | VC_DSR_PDLN | Number of people whose livelihoods were disrupted or destroyed; attributed |
| 1.5.2 11.5.2 | VC_DSR_GDPLS | Direct economic loss attributed to disasters (current United States dollars) |
| 1.5.2 11.5.2 | VC_DSR_LSGP | Direct economic loss attributed to disasters relative to GDP (%) |
| 1.5.2 11.5.2 | VC_DSR_AGLN | Direct agriculture loss attributed to disasters (current United States dollar |
| 1.5.2 11.5.2 | VC_DSR_HOLN | Direct economic loss in the housing sector attributed to disasters (current U |
| 1.5.2 11.5.2 | VC_DSR_CILN | Direct economic loss resulting from damaged or destroyed critical infrastru |
| 1.5.2 11.5.2 | VC_DSR_CHLN | Direct economic loss to cultural heritage damaged or destroyed attributed |
| 1.5.2 11.5.2 | VC_DSR_DDPA | Direct economic loss to other damaged or destroyed productive assets attri |
| 1.a.2 | SD_XPD_ESED | Proportion of total government spending on essential services; education (%) |
| 10.4.1 | SL_EMP_GTOTL | Labour share of GDP; comprising wages and social protection transfers (%) |
| 10.5.1 | FI_FSI_FSANL | Non-performing loans to total gross loans (%) |
| 10.5.1 | FI_FSI_FSERA | Return on assets (%) |
| 10.5.1 | FI_FSI_FSKA | Regulatory capital to assets (%) |
| 10.5.1 | FI_FSI_FSKNL | Non-performing loans net of provisions to capital (%) |
| 10.5.1 | FI_FSI_FSKRTC | Regulatory Tier 1 capital to risk-weighted assets (%) |
| 10.5.1 | FI_FSI_FSLs | Liquid assets to short term liabilities (%) |
| 10.5.1 | FI_FSI_FSSNO | Net open position in foreign exchange to capital (%) |
| 10.b.1 | DC_TRF_TOTDL | Total assistance for development; by donor countries (millions of current U |
| 10.b.1 | DC_TRF_TOTL | Total assistance for development; by recipient countries (millions of current |
| 10.b.1 | DC_TRF_TFDV | Total resource flows for development; by recipient and donor countries (mil |
| 10.c.1 | SI_RMT_COST | Remittance costs as a proportion of the amount remitted (%) |
| 11.5.2 | VC_DSR_C DAN | Number of damaged critical infrastructure attributed to disasters (number) |
| 11.5.2 | VC_DSR_HFDN | Number of destroyed or damaged health facilities attributed to disasters (n |
| 11.5.2 | VC_DSR_EFDN | Number of destroyed or damaged educational facilities attributed to disaste |
| 11.5.2 | VC_DSR_CDYN | Number of other destroyed or damaged critical infrastructure units and fac |
| 11.5.2 | VC_DSR_BSDN | Number of disruptions to basic services attributed to disasters (number) |
| 11.5.2 | VC_DSR_ESDN | Number of disruptions to educational services attributed to disasters (numb |
| 11.5.2 | VC_DSR_HSDN | Number of disruptions to health services attributed to disasters (number) |
| 11.5.2 | VC_DSR_OBDN | Number of disruptions to other basic services attributed to disasters (numb |
| 11.6.1 | EN_REF_WASCOL | Municipal Solid Waste collection coverage; by cities (%) |
| 12.2.1 8.4.1 | EN_MAT_FTPRPG | Material footprint per unit of GDP; by type of raw material (kilograms per |
| 12.2.1 8.4.1 | EN_MAT_FTPRPC | Material footprint per capita; by type of raw material (tonnes) |
| 12.2.1 8.4.1 | EN_MAT_FTPRTN | Material footprint; by type of raw material (tonnes) |
| 12.2.2 8.4.2 | EN_MAT_DOMCMPT | Domestic material consumption; by type of raw material (tonnes) |
| 12.2.2 8.4.2 | EN_MAT_DOMCMPG | Domestic material consumption per unit of GDP; by type of raw material (|
| 12.2.2 8.4.2 | EN_MAT_DOMCMPC | Domestic material consumption per capita; by type of raw material (tonnes |
| 14.4.1 | ER_H2O_FWTL | Proportion of fish stocks within biologically sustainable levels (not overexp |

| indicator | series | seriesDescription |
|-----------|-----------------|---|
| 2.1.1 | SN_ITK_DEFCN | Number of undernourish people (millions) |
| 2.2.1 | SH_STA_STUNT | Proportion of children moderately or severely stunted (%) |
| 2.2.1 | SH_STA_STUNTN | Children moderately or severely stunted (millions) |
| 2.2.2 | SH_STA_WASTE | Proportion of children moderately or severely wasted (%) |
| 2.2.2 | SH_STA_WASTEN | Children moderately or severely wasted (millions) |
| 2.2.2 | SH_STA_OVRWGT | Proportion of children moderately or severely overweight (%) |
| 2.3.1 | PD_AGR_SSPF | Productivity of small-scale food producers (agricultural output per labour |
| 2.3.2 | SI_AGR_SSPF | Average income of small-scale food producers; PPP (constant 2011 internat |
| 2.5.2 | ER_RSK_LBREDS | Proportion of local breeds classified as being at risk as a share of local bree |
| 2.a.1 | AG_PRD_ORITND | Agriculture orientation index for government expenditures |
| 2.a.1 | AG_PRD_AGVAS | Agriculture value added share of GDP (%) |
| 2.a.1 | AG_XPD_AGSGB | Agriculture share of Government Expenditure (%) |
| 2.a.2 | DC_TOF_AGRL | Total official flows (disbursements) for agriculture; by recipient countries (r |
| 2.b.1 | AG_PRD_XSUBDY | Agricultural export subsidies (millions of current United States dollars) |
| 3.1.1 | SH_STA_MMR | Maternal mortality ratio |
| 3.1.2 | SH_STA_BRTC | Proportion of births attended by skilled health personnel (%) |
| 3.2.1 | SH_DYN_IMRTN | Infant deaths (number) |
| 3.2.1 | SH_DYN_MORT | Under-five mortality rate; by sex (deaths per 1;000 live births) |
| 3.2.1 | SH_DYN_IMRT | Infant mortality rate (deaths per 1;000 live births) |
| 3.2.1 | SH_DYN_MORTN | Under-five deaths (number) |
| 3.2.2 | SH_DYN_NMRTN | Neonatal deaths (number) |
| 3.2.2 | SH_DYN_NMRT | Neonatal mortality rate (deaths per 1;000 live births) |
| 3.3.1 | SH_HIV_INCD | Number of new HIV infections per 1;000 uninfected population; by sex and |
| 3.3.2 | SH_TBS_INCID | Tuberculosis incidence (per 100;000 population) |
| 3.3.3 | SH_STA_MALR | Malaria incidence per 1;000 population at risk (per 1;000 population) |
| 3.3.5 | SH_TRP_INTVN | Number of people requiring interventions against neglected tropical disease |
| 3.6.1 | SH_STA_TRAF | Death rate due to road traffic injuries (per 100;000 population) |
| 3.7.1 | SH_FPL_MTMM | Proportion of women of reproductive age (aged 15-49 years) who have their |
| 3.7.2 | SP_DYN_ADKL | Adolescent birth rate (per 1;000 women aged 15-19 years) |
| 3.8.2 | SH_XPD_EARN25 | Proportion of population with large household expenditures on health (gre |
| 3.8.2 | SH_XPD_EARN10 | Proportion of population with large household expenditures on health (gre |
| 3.b.1 | SH_ACS_DTP3 | Proportion of the target population with access to 3 doses of diphtheria-tet |
| 3.b.1 | SH_ACS_MCV2 | Proportion of the target population with access to measles-containing-vacci |
| 3.b.1 | SH_ACS_PCV3 | Proportion of the target population with access to pneumococcal conjugate |
| 3.b.2 | DC_TOF_HLTHNT | Total official development assistance to medical research and basic heath se |
| 3.b.2 | DC_TOF_HLTHL | Total official development assistance to medical research and basic heath se |
| 3.c.1 | SH_MED_HEAWOR | Health worker density; by type of occupation (per 10;000 population) |
| 3.d.1 | SH_IHR_CAPS | International Health Regulations (IHR) capacity; by type of IHR capacity |
| 4.1.1 | SE_MAT_PROF | Minimum proficiency in mathematics; by education level and sex (%) |
| 4.1.1 | SE_REA_PROF | Minimum proficiency in reading; by education level and sex (%) |
| 4.2.1 | SE_DEV_ONTRK | Proportion of children aged 36-59 months who are developmentally on trac |
| 4.2.2 | SE_PRE_PARTN | Participation rate in organized learning (one year before the official primar |
| 4.3.1 | SE_ADT_EDUCTRN | Participation rate in formal and non-formal education and training; by sex |
| 4.4.1 | SE_ADT_ACTS | Proportion of youth and adults with information and communications tech |
| 4.5.1 | SE_PRE_GPIPARTN | Gender parity index for participation rate in organized learning (one year b |
| 4.5.1 | SE_GPI_MATACH | Gender parity index for achievement in mathematics; by education level (ra |
| 4.5.1 | SE_GPI_REAACH | Gender parity index for achievement in reading; by education level (ratio) |
| 4.5.1 | SE_GPI_TRATEA | Gender parity index of trained teachers; by education level (ratio) |
| 4.5.1 | SE_SEP_MATACH | Low to high socio-economic parity status index for achievement in mathem |
| 4.5.1 | SE_SEP_REAACH | Low to high socio-economic parity status index for achievement in reading; |
| 4.5.1 | SE_URP_MATACH | Rural to urban parity index for achievement in mathematics; by education |
| 4.5.1 | SE_URP_REAACH | Rural to urban parity index for achievement in reading; by education level |

| indicator | series | seriesDescription |
|-----------|----------------|--|
| 4.5.1 | SE_GPI_PART | Gender parity index for participation rate in formal and non-formal education |
| 4.5.1 | SE_LGP_ACHIRE | Language test parity index for achievement in reading; by education level (%) |
| 4.5.1 | SE_LGP_ACHIMA | Language test parity index for achievement in mathematics; by education level (%) |
| 4.6.1 | SE_ADT_FUNS | Proportion of population achieving at least a fixed level of proficiency in functional skills |
| 4.a.1 | SE_ACC_COMP | Schools with access to computers for pedagogical purposes; by education level (%) |
| 4.a.1 | SE_ACC_DWAT | Schools with access to basic drinking water; by education level (%) |
| 4.a.1 | SE_ACC_ELEC | Schools with access to electricity; by education level (%) |
| 4.a.1 | SE_ACC_HNWA | Schools with basic handwashing facilities; by education level (%) |
| 4.a.1 | SE_ACC_INTN | Schools with access to the internet for pedagogical purposes; by education level (%) |
| 4.a.1 | SE_ACC_SANI | Schools with access to access to single-sex basic sanitation; by education level (%) |
| 4.a.1 | SE_INF_DSBL | Proportion of schools with access to adapted infrastructure and materials for children with disabilities |
| 4.b.1 | DC_TOF_SCHIPSL | Total official flows for scholarships; by recipient countries (millions of constant 2011 US\$) |
| 4.c.1 | SE_TRA_GRDL | Proportion of teachers who have received at least the minimum organized training |
| 5.2.1 | VC_VAW_MARR | Proportion of ever-partnered women and girls subjected to physical and/or sexual violence |
| 5.3.1 | SP_DYN_MRBF18 | Proportion of women aged 20-24 years who were married or in a union before age 18 |
| 5.3.1 | SP_DYN_MRBF15 | Proportion of women aged 20-24 years who were married or in a union before age 15 |
| 5.3.2 | SH_STA_FGMS | Proportion of girls and women aged 15-49 years who have undergone female genital mutilation |
| 5.4.1 | SL_DOM_TSPDCW | Proportion of time spent on unpaid care work; by sex; age and location (%) |
| 5.4.1 | SL_DOM_TSPDDC | Proportion of time spent on unpaid domestic chores; by sex; age and location (%) |
| 5.4.1 | SL_DOM_TSPD | Proportion of time spent on unpaid domestic chores and care work; by sex; age and location (%) |
| 5.5.1 | SG_GEN_PARLN | Number of seats held by women in national parliaments (number) |
| 5.5.1 | SG_GEN_PARLNT | Number of seats in national parliaments (number) |
| 5.5.1 | SG_GEN_PARL | Proportion of seats held by women in national parliaments (% of total number of seats) |
| 5.5.2 | IC_GEN_MGTL | Proportion of women in managerial positions (%) |
| 5.5.2 | IC_GEN_MGTN | Proportion of women in senior and middle management positions (%) |
| 5.6.1 | SH_FPL_INFM | Proportion of women who make their own informed decisions regarding sexual and reproductive health |
| 5.6.1 | SH_FPL_INFMSR | Proportion of women who make their own informed decisions regarding sexual and reproductive health |
| 5.6.1 | SH_FPL_INFMCU | Proportion of women who make their own informed decisions regarding contraceptive use |
| 5.6.1 | SH_FPL_INFMRH | Proportion of women who make their own informed decisions regarding reproductive health |
| 6.1.1 | SH_H2O_SAFE | Proportion of population using safely managed drinking water services; by urban/rural (%) |
| 6.2.1 | SH_SAN_HNDWSH | Proportion of population with basic handwashing facilities on premises; by urban/rural (%) |
| 6.2.1 | SH_SAN_SAFE | Proportion of population using safely managed sanitation services; by urban/rural (%) |
| 6.2.1 | SH_SAN_DEFECT | Proportion of population practicing open defecation; by urban/rural (%) |
| 6.6.1 | EN_WBE_PMPR | Water body extent (permanent) (% of total land area) |
| 6.6.1 | EN_WBE_PMNR | Water body extent (permanent) (square kilometres) |
| 6.6.1 | EN_WBE_PMP | Water body extent (permanent and maybe permanent) (% of total land area) |
| 6.6.1 | EN_WBE_PMPN | Water body extent (permanent and maybe permanent) (square kilometres) |
| 6.a.1 | DC_TOF_WASHL | Total official development assistance (gross disbursement) for water supply |
| 7.1.1 | EG_ELC_ACCS | Proportion of population with access to electricity; by urban/rural (%) |
| 7.2.1 | EG_FEC_RNEW | Renewable energy share in the total final energy consumption (%) |
| 7.3.1 | EG_EGY_PRIM | Energy intensity level of primary energy (megajoules per constant 2011 purchasing power parity US\$) |
| 7.a.1 | EG_IFF_RANDN | International financial flows to developing countries in support of clean energy |
| 8.1.1 | NY_GDP_PCAP | Annual growth rate of real GDP per capita (%) |
| 8.10.1 | FB_ATM_TOTL | Number of automated teller machines (ATMs) per 100;000 adults |
| 8.10.1 | FB_CBK_BRCH | Number of commercial bank branches per 100;000 adults |
| 8.10.2 | FB_BNK_ACCSS | Proportion of adults (15 years and older) with an account at a financial institution |
| 8.2.1 | SL_EMP_PCAP | Annual growth rate of real GDP per employed person (%) |
| 8.3.1 | SL_ISV_IFRM | Proportion of informal employment in non-agriculture employment; by sex (%) |
| 8.5.1 | SL_EMP_AEARN | Average hourly earnings of managers (ISCO-08) (local currency) |
| 8.5.2 | SL_TLF_UEM | Unemployment rate; by sex and age (%) |
| 8.5.2 | SL_TLF_UEMDIS | Unemployment rate; by sex and disability (%) |
| 8.6.1 | SL_TLF_NEET | Proportion of youth not in education; employment or training; by sex and age (%) |

| indicator | series | seriesDescription |
|-----------|-----------------|--|
| 8.7.1 | SL_TLF_CHLDEC | Proportion of children engaged in economic activity and household chores; |
| 8.7.1 | SL_TLF_CHLDEA | Proportion of children engaged in economic activity; by sex and age (%) |
| 8.8.1 | SL_EMP_FTLINJUR | Fatal occupational injuries among employees; by sex and migrant status (p |
| 8.8.1 | SL_EMP_INJUR | Non-fatal occupational injuries among employees; by sex and migrant statu |
| 8.a.1 | DC_TOF_TRDCMDL | Total official flows (commitments) for Aid for Trade; by donor countries (m |
| 8.a.1 | DC_TOF_TRDDBMDL | Total official flows (disbursement) for Aid for Trade; by donor countries (m |
| 8.a.1 | DC_TOF_TRDDBML | Total official flows (disbursement) for Aid for Trade; by recipient countries |
| 8.a.1 | DC_TOF_TRDCML | Total official flows (commitments) for Aid for Trade; by recipient countries |
| 9.2.1 | NV_IND_MANFPC | Manufacturing value added per capita (constant 2010 United States dollars) |
| 9.2.1 | NV_IND_MANF | Manufacturing value added as a proportion of GDP (%) |
| 9.2.2 | SL_TLF_MANF | Manufacturing employment as a proportion of total employment (%) |
| 9.3.1 | NV_IND_SIS | Proportion of small-scale industries in total industry value added (%) |
| 9.3.2 | FC_ACC_SSID | Proportion of small-scale industries with a loan or line of credit (%) |
| 9.4.1 | EN_ATM_CO2 | Carbon dioxide emissions from fuel combustion (millions of tonnes) |
| 9.4.1 | EN_ATM_CO2MVA | Carbon dioxide emissions per unit of manufacturing value added (kilogram |
| 9.4.1 | EN_ATM_CO2GDP | Carbon dioxide emissions per unit of GDP (kilogrammes of CO2 per consta |
| 9.5.1 | GB_XPD_RSDV | Research and development expenditure as a proportion of GDP (%) |
| 9.5.2 | GB_POP_SCIERD | Researchers (in full-time equivalent) per million inhabitants (per 1;000;000 |
| 9.a.1 | DC_TOF_INFRAL | Total official flows for infrastructure; by recipient countries (millions of con |
| 9.b.1 | NV_IND_TECH | Proportion of medium and high-tech industry value added in total value ad |
| 9.c.1 | IT_MOB_NTWK | Proportion of population covered by a mobile network; by technology (%) |