Methodology

Devising the Policy Coherence for Sustainable Development Index 2019

1 Introduction

In this project, Smart & City Solutions provided methodological and statistical support to the Coordinadora de ONGD España (the Spanish Development NGO umbrella group) in the process of devising and interpreting the new 2019 version of the Policy Coherence for Sustainable Development Index (PCSDI).

This document gives a detailed description of the work done and the methodology followed for updating and adapting the PCSDI and presents the findings and final country rankings.

The final set of indicators from the previous version of the index published in 2016 was used as a reference in the review and methodological update process. We have attempted to improve the quality of measurements by expanding the number of indicators and countries analysed.

2 Findings of the 2019 PCSDI

The 2019 PCSDI has been calculated as a combination of the values of the different components analysed (economic, social, global, environmental, productive). The following table shows the final 2019 PCSDI score for each country, from highest to lowest, and the individual score for each component.

Country	PCSDI	Economic	Social	Global	Environmental	Productive
Denmark	**79.02**	91.94	86.79	84.51	44.63	87.24
Iceland	**77.18**	83.61	88.10	78.86	40.73	94.60
Sweden	**73.21**	87.29	85.18	81.73	42.35	69.50
Norway	**72.75**	90.73	84.53	81.06	29.89	77.56
Portugal	**71.71**	73.08	76.62	74.68	48.22	85.98
New Zealand	**71.25**	67.20	80.57	78.83	43.40	86.25
Australia	**70.61**	64.94	80.01	78.68	38.09	91.34
Finland	**70.40**	93.16	82.77	78.03	40.46	57.58
Spain	**69.37**	67.48	71.78	75.73	46.09	85.79
Croatia	**68.42**	81.63	70.50	66.95	46.92	76.08

Ireland	**66.92**	58.70	75.62	72.02	40.05	88.20
Argentina	**66.40**	55.21	68.44	64.27	59.32	84.78
Cyprus	**65.86**	68.81	73.59	55.48	43.88	87.55
Greece	**65.57**	82.16	66.17	42.56	48.43	88.54
Hungary	**65.23**	89.15	74.33	70.94	45.12	46.59
United Kingdom	**64.95**	57.75	77.31	63.48	37.82	88.38
Austria	**64.73**	81.70	82.77	73.37	32.35	53.45
Latvia	**64.67**	68.23	73.34	64.53	41.29	75.93
Malta	**64.53**	70.89	77.86	57.52	26.56	89.82
Slovakia	**64.30**	81.08	70.12	66.60	38.36	65.35
Germany	**64.16**	72.48	84.65	78.23	32.89	52.54
Italy	**64.06**	66.80	76.11	65.54	42.93	68.92
Serbia	**64.02**	79.53	64.98	66.22	39.84	69.51
Uruguay	**63.24**	51.05	63.99	63.43	50.30	87.41
Japan	**62.98**	55.03	68.87	69.31	33.46	88.21
Canada	**62.97**	68.17	73.68	77.63	37.62	57.77
Czequia	**62.15**	75.90	74.81	72.65	28.86	58.55
France	**61.62**	74.96	75.73	61.89	36.98	58.56
Switzerland	**61.56**	32.80	80.66	79.81	35.89	78.66
Estonia	**61.49**	76.53	79.79	66.64	32.41	52.06
Slovenia	**60.82**	81.66	81.21	75.08	20.90	45.24
Lithuania	**60.69**	69.32	75.96	64.61	41.23	52.33
Georgia	**59.12**	59.68	59.97	56.68	48.54	70.75
Belarus	**58.91**	73.85	78.27	34.91	38.91	68.62
Belgium	**58.81**	78.86	77.62	77.54	10.85	49.15
Kyrgyzstan	**58.08**	60.53	53.74	51.34	51.33	73.47

Bosnia and Herzegovina	**57.90**	56.57	58.54	72.10	37.93	64.37
Netherlands	**57.89**	66.51	77.32	81.99	13.22	50.39
Montenegro	**57.78**	70.04	61.10	51.57	41.45	64.74
Albania	**57.46**	45.05	54.20	61.76	50.01	76.25
Mauritius	**57.44**	32.70	65.31	57.30	48.25	83.62
Luxembourg	**57.32**	39.18	79.85	68.67	7.52	91.37
Paraguay	**57.26**	44.39	47.65	59.32	55.12	79.80
Brazil	**57.07**	48.68	55.55	48.40	57.44	75.26
Moldavia	**56.98**	64.12	64.80	67.77	53.64	34.57
Guyana	**56.74**	42.72	54.12	44.99	65.28	76.59
Chile	**56.28**	38.96	66.29	53.87	44.85	77.44
Bolivia	**56.27**	44.34	58.94	51.84	66.04	60.17
Cuba	**56.16**	40.32	74.93	37.20	56.20	72.14
Poland	**56.10**	66.31	73.40	57.27	36.52	47.00
Costa Rica	**55.99**	27.99	66.41	56.05	52.88	76.60
North Macedonia	**55.61**	48.33	66.49	61.01	44.44	57.79
Ecuador	**55.39**	37.72	56.95	56.62	50.95	74.70
Azerbaijan	**55.09**	61.32	58.38	40.78	49.47	65.48
Philippines	**54.88**	44.75	48.39	56.72	59.15	65.39
Fiji	**54.84**	45.45	48.00	48.46	52.18	80.12
Mexico	**54.73**	45.44	59.63	61.54	48.88	58.18
Panama	**54.33**	26.09	55.34	55.36	56.24	78.60
Kazakhstan	**54.17**	55.27	65.59	44.10	37.09	68.79
South Africa	**54.15**	52.89	52.14	61.35	45.44	58.93
Dominican Republic	**54.06**	41.30	52.67	51.20	53.71	71.40

Armenia	**54.05**	48.32	54.92	34.18	53.44	79.39
Uzbekistan	**54.01**	64.50	60.67	42.99	32.96	68.93
Bulgaria	**53.88**	57.62	72.72	57.44	40.01	41.62
Romania	**53.82**	45.11	64.52	55.63	53.60	50.23
Barbados	**53.09**	37.69	59.39	35.69	46.34	86.32
Cape Verde	**52.92**	39.89	48.58	58.67	55.94	61.54
Nicaragua	**52.64**	41.90	46.03	51.34	69.42	54.51
Belize	**52.48**	57.17	48.02	47.15	44.82	65.24
Jamaica	**51.65**	46.72	49.75	40.11	50.19	71.48
Venezuela	**51.60**	39.68	56.73	42.72	43.57	75.30
Ukraine	**50.74**	38.23	65.71	39.19	51.18	59.41
Maldives	**50.66**	45.36	56.82	29.49	45.45	76.17
Honduras	**50.51**	35.77	48.29	54.80	57.94	55.76
Israel	**50.02**	66.68	75.86	0.00	21.91	85.64
Peru	**49.71**	26.82	54.02	51.67	53.10	62.92
Tajikistan	**49.60**	35.49	50.74	60.91	51.17	49.67
South Korea	**49.45**	42.03	70.49	49.62	24.15	60.94
Russia	**48.96**	62.26	64.21	15.80	49.91	52.61
Senegal	**48.57**	37.46	36.35	67.54	58.32	43.20
Tunisia	**47.98**	27.22	47.66	47.47	52.20	65.34
El Salvador	**47.27**	36.51	45.15	46.19	51.60	56.86
Indonesia	**47.20**	24.09	46.34	48.09	52.14	65.36
Namibia	**47.19**	47.95	36.89	39.67	60.49	50.93
Mongolia	**46.78**	44.68	50.64	54.80	50.39	33.42
Colombia	**46.49**	37.01	45.14	45.03	39.87	65.39
Botswana	**46.03**	43.34	47.19	37.54	45.63	56.46

Turkey	**45.52**	21.39	56.51	41.47	38.14	70.10
Malaysia	**45.04**	31.24	57.49	35.33	35.09	66.06
Vietnam	**45.03**	43.66	55.72	32.36	34.90	58.49
United States	**44.72**	44.85	75.82	36.98	14.57	51.39
Trinidad and Tobago	**44.58**	33.96	64.19	42.11	12.13	70.50
Cambodia	**44.08**	36.40	32.16	45.96	53.38	52.52
Thailand	**43.83**	29.81	58.90	32.25	42.20	55.99
Ghana	**43.71**	39.60	21.93	56.49	53.97	46.57
Jordan	**43.65**	22.60	57.93	23.90	43.89	69.94
Morocco	**43.26**	17.74	36.04	39.77	55.29	67.46
Sri Lanka	**43.14**	22.77	50.33	22.59	52.84	67.18
Guatemala	**42.99**	19.31	47.16	48.58	48.77	51.10
Nepal	**41.97**	38.80	39.99	44.75	53.30	32.99
Lesotho	**41.88**	61.71	29.31	45.75	55.12	17.49
Kenya	**41.72**	28.12	22.40	45.65	69.92	42.51
Algeria	**41.26**	22.84	45.18	27.12	47.64	63.54
Ivory Coast	**41.08**	31.86	17.68	62.00	58.94	34.90
Kuwait	**41.05**	51.05	65.62	19.29	6.39	62.90
Mozambique	**40.63**	41.36	21.20	51.99	59.38	29.21
Burkina Faso	**40.56**	37.85	13.91	61.08	59.31	30.63
Iraq	**40.09**	51.45	43.23	20.05	43.87	41.83
Madagascar	**39.78**	37.18	16.75	56.73	64.05	24.17
Zambia	**39.37**	35.77	24.22	50.01	54.13	32.70
Zimbabwe	**38.84**	42.53	24.40	30.26	58.00	39.01
Singapore	**38.63**	27.27	67.58	20.56	15.95	61.78
China	**38.32**	39.43	58.88	38.16	25.45	29.66

Qatar	**38.22**	56.40	66.86	30.40	0.00	37.42
Rwanda	**37.94**	28.29	20.25	58.71	57.56	24.88
Malawi	**37.91**	36.98	10.25	46.37	56.58	39.36
Bhutan	**37.52**	38.05	32.18	34.18	43.01	40.17
Gambia	**37.20**	35.53	20.81	49.32	57.50	22.85
Yemen	**36.66**	35.13	21.38	15.98	59.70	51.13
Burundi	**36.17**	43.21	9.62	50.72	55.64	21.68
Cameroon	**35.51**	31.27	21.70	47.94	57.02	19.61
Niger	**35.37**	42.82	17.28	52.26	59.48	5.02
Sierra Leone	**35.24**	29.99	22.25	55.79	54.75	13.43
Mali	**35.23**	34.07	2.96	56.10	58.29	24.72
Togo	**35.11**	35.57	14.97	46.78	53.75	24.46
Iran	**35.06**	34.20	38.94	14.07	39.43	48.66
Egypt	**34.80**	35.47	43.15	15.84	36.04	43.48
Uganda	**34.31**	26.92	17.78	53.05	59.90	13.90
Guinea	**33.77**	33.60	0.00	44.13	60.12	30.99
Benin	**33.57**	30.32	13.03	51.29	52.35	20.87
Myanmar	**32.98**	27.14	40.79	21.72	53.01	22.23
Tanzania	**32.43**	19.79	15.00	43.92	57.57	25.87
Mauritania	**32.30**	43.48	21.95	27.89	60.53	7.65
Congo (Dem. Rep.)	**31.80**	32.85	25.66	46.51	54.01	0.00
Lebanon	**31.79**	0.00	49.78	8.61	29.43	71.13
Angola	**31.71**	30.23	18.68	36.44	55.13	18.07
Ethiopia	**31.53**	35.74	4.64	39.86	54.83	22.60
Liberia	**31.49**	9.22	18.35	52.39	57.25	20.26
United Arab Emirates	**30.96**	11.47	61.55	15.80	16.95	49.03

Nigeria	**30.87**	2.10	17.80	48.80	55.04	30.60
Congo (Rep.)	**30.45**	45.98	7.63	36.30	60.06	2.27
Sudan	**30.39**	20.94	28.71	15.76	57.10	29.43
Pakistan	**30.02**	20.95	32.66	1.19	48.77	46.51
Bangladesh	**29.92**	25.32	25.76	39.96	38.52	20.05
Bahrain	**29.60**	7.27	63.89	15.12	9.24	52.47
Oman	**29.31**	27.03	52.39	1.30	17.92	47.90
Saudi Arabia	**28.36**	23.34	63.05	3.52	19.65	32.25
India	**26.76**	17.03	37.91	17.53	43.99	17.34

Table 1: 2019 PCSDI classification

3 Final database

3.1 Countries analysed

With respect to the 2016 edition, an additional 15 countries have been analysed, bringing the total number to 148.

In order for a country to be included, information had to be available for at least 90 out of the 202 variables in the initial database. Countries not meeting this criterion were considered ineligible. While not an initial inclusion criterion, once the variable selection process was completed the countries included in the analysis had a high percentage of availability of the 57 indicators that were included in the index. In the worst case, data was available for 45 indicators, 79%.

3.2 Indicators

As in 2016, the initial database consisted of 202 variables. Following the guidance of the Coordinator-REEDES team, some binary variables (1/0) were combined with discrete variables in accordance with the decisions made in the first version of the index, bringing the real number of initial indicators to 196.

Once the preparation process was complete, the 2019 version featured 57 indicators, compared to the 49 in the 2016 version. Of those included, 37 are the same, 20 are new, and 12 from the first edition were eliminated.

The following table shows the indicators used in each version:

Code	Name	2016	2019
FIS1	General government revenue (% GDP)	1	1
FIS3	Variation rate of the Gini index before and after taxes and transfers	1	1
FIS5	Environment protection expenditure (% GDP)	1	
FIS6	Financial Secrecy Index	1	1
F2	Oversized banking sector	1	1
F4	Account at a financial institution: difference between men and women (%)		1
F5	External service, total debt/Exports of goods and services (%)	1	
EDU2	Out of School ratio primary	1	
EDU5	Survival rate to the last grade of secondary education, both sexes (%)	1	1
EDU8	Pupil-teacher ratio in pre-primary education	1	1
EDU9	Pupil-teacher ratio in primary education	1	1
EDU11	Net enrolment rate, primary, gender parity index (GPI)	1	
EDU14	Repetition rate in primary education (all grades), both sexes (%)	1	1
PS1	Public social protection expenditure (% of GDP)	1	1
PS5	Old age pension beneficiaries (%)	1	1
PS8	Benefits incidence in poorest quintile (%)	1	
IG1	Proportion of seats held by women in national parliaments (%)		1
IG2	Vulnerable employment, female (% of female employment)	1	1
IG5_6_7	Legislation against gender violence, sexual harassment and marital rape	1	1
IG11_12	Maternity and paternity leaves	1	1
IG14	Position at the UN in favour of the LGTBI community	1	1
S2	Healthy life expectancy at birth (years)	1	1
S3	Medical doctors (per 10 000 population)	1	1
S9	Universal Health Coverage Index		1
S11	Improved sanitation facilities (%population with access)	1	1
CIT1	Internet access in schools		1
CIT6	Percentage of students in tertiary education who are female	1	1
CIT13	Percentage of graduates from tertiary education who are female (%)	1	1
EM1	Unemployment rate		1
EM4	Share of unemployed receiving regular periodic social security unemployment benefits (%)		1
EM6	Vulnerable employment, total (% of total employment)	1	1

J3	Abolition of the death penalty		1
J4_5	Legality of homosexuality and equal marriage	1	1
J6	Ratification of UN Human Rights treaties	1	1
J8	Universal Jurisdiction	1	1
J9	Ratification of Rome Statute of the International Criminal Court	1	1
J10	Legislation on abortion		1
J13_14_15	Women's rights in the sphere of justice	1	1
PYS1	Military expenditure (% of GDP)	1	1
PYS3	Armed forces personnel (per 100,000 inhabitants)	1	1
PYS4	Ease of access to small arms and light weapons		1
PYS6	Participation in international arms treaties and conventions	1	1
PYS9	Nuclear and heavy weapons capabilities		1
PYS12	Plan of action to implement UN Security Council Resolution 1325		1
C3	Existence of a specific structure of cooperation and appreciation of its political rank	1	
C5	Contributions to UNWOMEN (GDP per capita)		1
C6	Contributions to UNEP (GDP per capita)		1
M4_5	Convention and Protocole relating to the Status of Refugees and International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families	1	1
P2	Artisanal fishing opportunities	1	
P4	Clean waters	1	1
P6	Marine biodiversity	1	
P9	Participation in IMO treaties, conventions and agreements	1	
DR9	Fertilizers use	1	1
B2	Ecological footprint of production (gha per person)	1	1
B10	Participation in international environmental agreements		1
B13	Biocapacity reserves/deficit (ha. per person)		1
EN1	Electricity production from renewable sources, excluding hydroelectric (% of total)		1
EN2	Ecological footprint of imports (gha per person)	1	1
EN4	Carbon dioxide emissions (metric tons per person)	1	1
U2	Improved sanitation facilities, urban sector (% of population with access)		1
U4	PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)		1
T1	Excess of tourism pressure	1	

IT3	Improved water sources, rural sector (% of the population with access)	1	1
IT4	Access to electricity (% population)	1	1
IT5	Internet users (per 100 people)		1
IN1	R&D expenditure (% GDP)	1	
IN5	Annual freshwater withdrawals, industry (% of total freshwater withdrawal)	1	1
IN7	Ratifications of the Right to Organise and Collective Bargaining Convention		1
IN8	Gender gap in employment in industrial sector (%)	1	

Table 2: Indicators included in each version of the PCSDI

3.3. Changes in the indicator definitions

Some indicators included in both versions have been redefined or corrected with respect to the 2016 version. The following table lists these changes:

Code	Name	Change
FIS6	Financial Secrecy Index	New way of calculating missing values following guidelines from the Tax Justice Network, the entity that devised this indicator
F2	Oversized banking sector	Original values maintained. The lower limit is established in the normalisation process, numerically obtaining the same result as in 2016
IG11_12	Maternity and paternity leaves	An index composed of IG11 and IG12 has been calculated
S3	Medical doctors (per 10 000 population)	Replaces number of physicians per 10,000 inhabitants
CIT6	Percentage of students in tertiary education who are female	The name of the variable has been updated
EM6	Vulnerable employment, total (% of total employment)	Data updated with the correct numbers. An error was detected in the concept of the indicator: it focused on differences between men and women. The total value of the percentage was changed. This makes the definition of the variable the same as EM9 (which therefore will be eliminated in the correlation analysis).
DR9	Fertilizers use	The calculation method has been changed. Instead of the last value, the average of the last 3 values from the last 6 years is used

Table 3: Redefined Indicators

4 Description of the methodology for devising the 2019 PCSDI

4.1 Preparation of the variables

First, the original database was built based on information from 241 countries for each of the 196 variables.

4.1.1 Classification of variables by component and policy

In 2016, it was initially decided to structure the index into 5 components and 20 policies for which variables were identified to measure countries' PCSD. This structure was maintained in this version.

Component	Policy
Economic	Financial
	Tax
Social	Education
	Social Protection
	Equality
	Health
	Science and technology
	Employment
Global	Justice and human rights
	Peace and security
	Cooperation
	Human mobility and migration
Environmental	Fisheries
	Rural development and agriculture
	Biodiversity
	Energy
Productive	Urban planning
	Tourism
	Infrastructure and transport
	Industry

Table 4: Components and policies

4.1.2 Classification of variables according to their contribution to development

In the construction of the previous version of the index, it was found that not all variables contribute to development in the same way. It was therefore decided to classify the variables into two groups:

- **Variables that make a positive contribution** to development.
- **Variables that penalize** development, i.e. that make a negative contribution.

The same criteria and classification of variables used in 2016 was used in this version[1].

[1] In this version an error in variable J3 (abolition of the death penalty) was corrected (in 2016 it was considered a compensating variable but had been intended as a contributing variable).

4.1.3 Classification of countries

Countries have been grouped into six geopolitical regions according to the following classification:

- Group 1: OECD and accession and enhanced cooperation countries
- Group 2: South Asian and Pacific countries
- Group 3: Latin American and Caribbean countries
- Group 4: Eastern European and Central Asian countries
- Group 5: Sub-Saharan African countries
- Group 6: North African and Middle Eastern countries

Countries added in the 2019 edition are highlighted in yellow.

Country	Classification by World Bank income level (2015)	HDI classification (2015)	Classification by geopolitical region	Group
Albania	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Germany	High income	Very high HDI	Western Europe, USA and Canada	1
Angola	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Saudi Arabia	High income	Very high HDI	Middle East and North Africa	6
Algeria	Upper-middle income	High HDI	Middle East and North Africa	6
Argentina	High income	Very high HDI	Latin America and the Caribbean	3
Armenia	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Australia	High income	Very high HDI	Pacific and Oceania	1
Austria	High income	Very high HDI	Western Europe, USA and Canada	1
Azerbaijan	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Bangladesh	Lower-middle income	Middle HDI	South Asia	2
Barbados	High income	Very high HDI	Latin America and the Caribbean	3
Bahrain	High income	Very high HDI	Middle East and North Africa	6
Belgium	High income	Very high HDI	Western Europe, USA and Canada	1

Belize	Upper-middle income	High HDI	Latin America and the Caribbean	5
Benin	Low income	Low HDI	Sub-Saharan Africa	5
Belarus	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
Bolivia	Lower-middle income	Middle HDI	Latin America and the Caribbean	3
Bosnia and Herzegovina	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Botswana	Upper-middle income	High HDI	Sub-Saharan Africa	5
Brazil	Upper-middle income	High HDI	Latin America and the Caribbean	1
Bulgaria	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
Burkina Faso	Low income	Low HDI	Sub-Saharan Africa	5
Burundi	Low income	Low HDI	Sub-Saharan Africa	5
Bhutan	Lower-middle income	Middle HDI	South Asia	2
Cape Verde	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Cambodia	Lower-middle income	Middle HDI	East Asia	2
Cameroon	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Canada	High income	Very high HDI	Western Europe, USA and Canada	1
Czequia	High income	Very high HDI	Western Europe, USA and Canada	1
Chile	High income	Very high HDI	Latin America and the Caribbean	1
China	Upper-middle income	High HDI	East Asia	1
Cyprus	High income	Very high HDI	Central Asia and Eastern Europe	4

Colombia	Upper-middle income	High HDI	Latin America and the Caribbean	3
Congo (Republic of)	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Congo (Democratic Republic of)	Low income	Low HDI	Sub-Saharan Africa	5
South Korea	High income	Very high HDI	Pacific and Oceania	1
Ivory Coast	Lower-middle income	Low HDI	Sub-Saharan Africa	5
Costa Rica	Upper-middle income	High HDI	Latin America and the Caribbean	3
Croatia	High income	Very high HDI	Western Europe, USA and Canada	4
Cuba	Upper-middle income	High HDI	Latin America and the Caribbean	3
Denmark	High income	Very high HDI	Western Europe, USA and Canada	1
Dominican Republic	Upper-middle income	High HDI	Latin America and the Caribbean	3
Ecuador	Upper-middle income	High HDI	Latin America and the Caribbean	3
Egypt	Lower-middle income	Middle HDI	Middle East and North Africa	6
United Arab Emirates	High income	Very high HDI	Middle East and North Africa	6
Slovakia	High income	Very high HDI	Western Europe, USA and Canada	1
Slovenia	High income	Very high HDI	Western Europe, USA and Canada	1
Spain	High income	Very high HDI	Western Europe, USA and Canada	1
United States	High income	Very high HDI	Western Europe, USA and Canada	1
Estonia	High income	Very high HDI	Western Europe, USA and Canada	1
Ethiopia	Low income	Low HDI	Sub-Saharan Africa	5
Fiji	Upper-middle income	High HDI	Pacific and Oceania	2

Philippines	Lower-middle income	Middle HDI	East Asia	2
Finland	High income	Very high HDI	Western Europe, USA and Canada	1
France	High income	Very high HDI	Western Europe, USA and Canada	1
Gambia	Low income	Low HDI	Sub-Saharan Africa	5
Georgia	Lower-middle income	High HDI	Central Asia and Eastern Europe	4
Ghana	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Greece	High income	Very high HDI	Western Europe, USA and Canada	1
Guatemala	Upper-middle income	Middle HDI	Latin America and the Caribbean	3
Guinea	Low income	Low HDI	Sub-Saharan Africa	5
Guyana	Upper-middle income	Middle HDI	Latin America and the Caribbean	3
Honduras	Lower-middle income	Middle HDI	Latin America and the Caribbean	3
Hungary	High income	Very high HDI	Western Europe, USA and Canada	1
India	Lower-middle income	Middle HDI	South Asia	1
Indonesia	Lower-middle income	Middle HDI	East Asia	1
Iran	Upper-middle income	High HDI	Middle East and North Africa	6
Iraq	Upper-middle income	Middle HDI	Middle East and North Africa	6
Ireland	High income	Very high HDI	Western Europe, USA and Canada	1
Iceland	High income	Very high HDI	Western Europe, USA and Canada	1
Israel	High income	Very high HDI	Middle East and North Africa	1
Italy	High income	Very high HDI	Western Europe, USA and Canada	1

Jamaica	Upper-middle income	High HDI	Latin America and the Caribbean	3
Japan	High income	Very high HDI	Pacific and Oceania	1
Jordan	Upper-middle income	High HDI	Middle East and North Africa	6
Kazakhstan	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
Kenya	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Kyrgyzstan	Lower-middle income	Middle HDI	Central Asia and Eastern Europe	4
Kuwait	High income	Very high HDI	Middle East and North Africa	6
Lesotho	Lower-middle income	Low HDI	Sub-Saharan Africa	5
Latvia	High income	Very high HDI	Western Europe, USA and Canada	4
Lebanon	Upper-middle income	High HDI	Middle East and North Africa	6
Liberia	Low income	Low HDI	Sub-Saharan Africa	5
Lithuania	High income	Very high HDI	Western Europe, USA and Canada	4
Luxembourg	High income	Very high HDI	Western Europe, USA and Canada	1
North Macedonia	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Madagascar	Low income	Low HDI	Sub-Saharan Africa	5
Malaysia	Upper-middle income	Very high HDI	East Asia	2
Malawi	Low income	Low HDI	Sub-Saharan Africa	5
Maldives	Upper-middle income	High HDI	South Asia	2
Mali	Low income	Low HDI	Sub-Saharan Africa	5
Malta	High income	Very high HDI	Western Europe, USA and Canada	1

Morocco	Lower-middle income	Middle HDI	Middle East and North Africa	6
Mauritius	Upper-middle income	High HDI	Sub-Saharan Africa	5
Mauritania	Lower-middle income	Low HDI	Sub-Saharan Africa	5
Mexico	Upper-middle income	High HDI	Latin America and the Caribbean	1
Moldavia	Lower-middle income	High HDI	Central Asia and Eastern Europe	4
Mongolia	Lower-middle income	High HDI	East Asia	2
Montenegro	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
Mozambique	Low income	Low HDI	Sub-Saharan Africa	5
Myanmar	Lower-middle income	Middle HDI	East Asia	2
Namibia	Upper-middle income	Middle HDI	Sub-Saharan Africa	5
Nepal	Low income	Middle HDI	South Asia	2
Nicaragua	Lower-middle income	Middle HDI	Latin America and the Caribbean	3
Niger	Low income	Low HDI	Sub-Saharan Africa	5
Nigeria	Lower-middle income	Low HDI	Sub-Saharan Africa	5
Norway	High income	Very high HDI	Western Europe, USA and Canada	1
New Zealand	High income	Very high HDI	Pacific and Oceania	1
Oman	High income	Very high HDI	Middle East and North Africa	6
Netherlands	High income	Very high HDI	Western Europe, USA and Canada	1
Pakistan	Lower-middle income	Middle HDI	South Asia	2

Panama	High income	High HDI	Latin America and the Caribbean	3
Paraguay	Upper-middle income	High HDI	Latin America and the Caribbean	3
Peru	Upper-middle income	High HDI	Latin America and the Caribbean	3
Poland	High income	Very high HDI	Western Europe, USA and Canada	1
Portugal	High income	Very high HDI	Western Europe, USA and Canada	1
Qatar	High income	Very high HDI	Middle East and North Africa	6
United Kingdom	High income	Very high HDI	Western Europe, USA and Canada	1
Rwanda	Low income	Low HDI	Sub-Saharan Africa	5
Romania	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
Russia	Upper-middle income	Very high HDI	Central Asia and Eastern Europe	4
El Salvador	Lower-middle income	Middle HDI	Latin America and the Caribbean	3
Senegal	Low income	Low HDI	Sub-Saharan Africa	5
Serbia	Upper-middle income	High HDI	Central Asia and Eastern Europe	4
Sierra Leone	Low income	Low HDI	Sub-Saharan Africa	5
Singapore	High income	Very high HDI	East Asia	2
Sri Lanka	Lower-middle income	High HDI	South Asia	2
South Africa	Upper-middle income	Middle HDI	Sub-Saharan Africa	1
Sudan	Lower-middle income	Low HDI	Sub-Saharan Africa	5
Sweden	High income	Very high HDI	Western Europe, USA and Canada	1
Switzerland	High income	Very high HDI	Western Europe, USA and Canada	1

Thailand	Upper-middle income	High HDI	East Asia	2
Tanzania	Low income	Low HDI	Sub-Saharan Africa	5
Tajikistan	Low income	Middle HDI	Central Asia and Eastern Europe	4
Togo	Low income	Low HDI	Sub-Saharan Africa	5
Trinidad and Tobago	High income	High HDI	Latin America and the Caribbean	3
Tunisia	Lower-middle income	High HDI	Middle East and North Africa	6
Turkey	Upper-middle income	High HDI	Central Asia and Eastern Europe	1
Ukraine	Lower-middle income	High HDI	Central Asia and Eastern Europe	4
Uganda	Low income	Low HDI	Sub-Saharan Africa	5
Uruguay	High income	Very high HDI	Latin America and the Caribbean	3
Uzbekistan	Lower-middle income	High HDI	Central Asia and Eastern Europe	4
Venezuela	Upper-middle income	High HDI	Latin America and the Caribbean	3
Vietnam	Lower-middle income	Middle HDI	East Asia	2
Yemen	Low income	Low HDI	Middle East and North Africa	6
Zambia	Lower-middle income	Middle HDI	Sub-Saharan Africa	5
Zimbabwe	Low income	Low HDI	Sub-Saharan Africa	5

Table 5: Countries included in the 2019 PCSDI

4.1.4 Initial screening of variables

Of the 196 initial variables, 16 were eliminated at the discretion of the Coordinator because they were difficult to apply or devise or because they failed to adequately measure the things they were intended to identify.

Code	Variable
FIS4	Tax structure (indirect tax revenues/total tax revenue)
F1	Market capitalization of listed companies (% GDP)
PS2	Public social security expenditure (%GDP)
IG12	Minimum mandatory duration of paid paternity leave (days)[2]
C1	Existence of a formal space for political participation in Cooperation
C3	Existence of a specific structure of cooperation and appreciation of its political rank
M1	Stock migratory (thousands)
M8	International migrant stock (% of population)
DR4	Rural poverty gap at national poverty lines (%)
B4	Change in forest area (thousand km2)
B5	Endangered species, mammals
B6	Endangered species, birds
B7	Endangered species, fishes
B8	Endangered species, plants
IN3	Unemployed from industrial manufacturing sector (% of total unemployed)
IN8	Gender gap in employment in industrial sector (%)

Table 6: Indicators removed because they were difficult to apply or devise

4.2 Screening based on missing values

Subsequently, variables for which no information was available for at least 80% of the countries were eliminated. This initial screening eliminated 61 variables and allowed 120 to remain.

[2] Variable IG12 data were used to calculate the compound variable IG11_12 (see Table 3)

Code	Name	Num. Obs.
FIS2	Social expenditure (% GDP)	99
FIS5	Environment protection expenditure (% GDP)	97
FIS7	Open Budget Index	105
F3	Investment portfolio (% GDP)	73
F5	External service, total debt/Exports of goods and services (%)	111
F6	Service public debt and public guaranteed / tax revenue (%)	36
EDU1	Out of school ratio secondary	112
EDU6	Net intake rate to grade 1 of primary education, both sexes (%)	115
EDU12	Net enrolment rate, secondary, gender parity index (GPI)	114
PS4	Pension, benefit level (%GDP per capita)	89
PS6	Women of retirement age who do not receive old-age pension	34
PS8	Benefits incidence in poorest quintile (%)	64
IG4	Gender wage gap by economic activity	112
S4	Total density per 100 000 population: Health posts	83
S5	Contraceptive prevalence - modern and traditional methods (%): urban	76
S6	Contraceptive prevalence - modern and traditional methods (%): rural	80
S12	Demand for family planning satisfied (%): urban	53
S13	Demand for family planning satisfied (%): rural	53
CIT2	Researchers per million inhabitants (FTE)	114
CIT3	Technicians per million inhabitants (FTE)	101
CIT5	GERD - Financed by government as % of GDP (Calculated data in '000 PPP $, constant prices - 2005)	93
CIT9	Researchers (FTE) - % Female	94
CIT10	Percentage of households with Internet access	113
CIT12	Percentage of households with mobile-cellular telephone	52
EM3	Share of long term unemployment in the total unemployment (%)	108
EM5	Percentage of unemployed not receiving unemployment benefit in contributory and non-contributory schemes	81
EM8	Share of working poor in total employment (%)	111
J1	Number of judges per 100,000 inhabitants	95

J12	Number of judges /magistrates women per 100.000 population	74
PYS2	Military expenditure (% of GDP) /social expenditure (% GDP)	35
PYS5	Homicide rate with firearms per 100.000 inhabitants	113
C4	Aid's Transparency Index	19
P2	Artisanal fishing opportunities	114
P3	Livelihoods and economies	112
P4	Clean waters[3]	114
P5	Carbon storage	87
P6	Marine biodiversity	114
P7	Marine trophic index	113
P8	Marine protected areas (% of territorial waters)	113
P10	Gender wage gap in fishing	42
P11	Gender gap in employment of the fisheries sector	77
P12	Gender gap in employment of the fisheries sector and aquaculture	54
DR1	Poverty gap at the level of rural poverty line (%)	52
DR3	Rural poverty headcount ratio at national poverty lines (% of rural population)	71
DR5	Gini Index for farmland	88
DR10	Use of pesticides (tonnes of nutrients per 1000 Ha)	86
DR13	Distribution of agricultural holders by sex (% female)	92
B9	Environmental protection expenditure as % of GDP	97
U1	Incidence of poverty, based on the urban poverty line (% of urban population)	71
U3	Population living in slums as a proportion of the urban population	106
U6	City prosperity index	66

Table 7: Indicators removed due to lack of observations

4.3 Descriptive statistics and correlation

Numerical and graphic techniques provided by descriptive statistics were used to discover the structure of the database. Data distribution and structure were analysed using scatter and boxplot diagrams of each variable identifying outliers, extremes, missing data and potentially incorrect values. The mean was taken as a reference as a measure of position, while standard deviation was chosen to analyse the dispersion of the observations.

[3] Variable P4 (Clean Waters) was excluded at this point of the process due to lack of data, although it was subsequently brought back under environmental component requirements as we will see in section 4.5.4.

A correlation analysis of the variables by components was conducted to identify those that correlate significantly to one another, and the variables found to be quantifying the same information within the same component were eliminated.

Thirteen of the least significant variables from among the correlates were thus eliminated. A total of 107 variables remained in the analysis after this process.

Code	Name	Degree of correlation	Related Variables
EDU4	Survival rate to the last grade of primary education, both sexes (%)	0.807	EDU9
EDU10	Pupil-teacher ratio in secondary education	0.733	EDU9
PS3	Total public pension spending (%GDP)	0.809	PS1
PS7	Age dependency ratio (% of working-age population)	-0.752	S2
IG13	Gap between paid paternity and maternity leaves (in calendar days)	0.98	IG11_12
S1	Life expectancy at birth (years)	0.995	S2
S7	Health expenditure, public (% of GDP)	0.764	PS1
CIT11	Percentage of households with computer	0.819	S2
EM9	Vulnerable employment, total (% of total employment)	1	EM6
PYS10	Contributions to UNDP (GDP per capita)	1	C2
PYS11	Contributions to UNEP (GDP per capita)	1	C6
EN3	Vulnerability index	0.895	B1
EN6	Population without access to electricity (%)	0.753	B1

Table 8: Variables eliminated in the correlation analysis

4.4 Selection of categorical variables

There are several variables, which we call categorical, that have either been devised from binary variables (ratification of a treaty, yes/no answers) or have only a few possible discrete values. The decision was made to not include these variables in the main component analysis and to select them based on the theoretical criteria of the Coordinator's Committee of Experts.

For the purposes of this analysis, categorical variables are considered to have six or fewer discrete values. Above that number, there is a rise in the number of possible values and the variables can be considered to represent quantitative information. It is therefore deemed appropriate to include them in the main component analysis.

At the discretion of the Coordinadora REEDES, 11 of these variables were eliminated and 96 kept in the analysis.

Code	Name	Chosen (Yes/No)
EDU3	Official entrance age to pre-primary education (years)	No
PS9	Number of social security policy areas covered by a statutory programme	No
IG3	Existence of quota for women as electoral law	No
IG5_6_7	Legislation against gender violence, sexual harassment and marital rape	Yes
IG8	Does the constitution guarantee equality before the law?	No
IG14	Position at the UN in favour of the LGTBI community	Yes
J2	Existence of a small claims court or a fast track procedure for small claims	No
J3	Abolition of the death penalty	Yes
J4_5	Legality of homosexuality and equal marriage	Yes
J9	Ratification of Rome Statute of the International Criminal Court	Yes
J10	Legislation on abortion	Yes
J11	Existence of laws against gender violence	No
J13_14_15	Women's rights in the sphere of justice	Yes
PYS4	Ease of access to small arms and light weapons	Yes
PYS7	International treaties and conventions on security	No
PYS8	Member countries of the EITI initiative	No
PYS12	Plan of action to implement UN Security Council Resolution 1325	Yes
M4_5	Convention and Protocole relating to the Status of Refugees and International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families	Yes
DR11	International Treaty on Plant Genetic Resources for Food and Agriculture	No
DR12	International Plant Protection Convention	No
EN5	Doha's amendment to the Kyoto Protocol	No
IN7	Ratifications of the Right to Organise and Collective Bargaining Convention	Yes

Table 9: Selection of categorical variables

4.5 Principal component analysis

Principal component analysis (PCA) was performed to determine the combinations of variables in a set that are best able to summarize the total body of information. The procedure consists of finding common underlying components in the set that supposedly explain the same reality. The amount of information collected by each of these components is measured by the total variance of all the variables corresponding to the linear combination. Hence, the first principal component will be the combination of variables that explain the greatest amount of total variance; the second principal component will be the linear combination that explains the second largest amount of variance and that is uncorrelated with the first, and so on.

The selection of the final variables included in the PCSDI was made based on the confluence of a statistical criterion (the results of the PCA that identify the most representative variables for each component), and a criterion based on the theoretical framework. The analysis was performed by groups of variables, the components and, within them, a separate analysis of the variables that contribute to and penalize development as we saw in 4.1.2, with the exceptions indicated in each analysis.

In order to apply the PCA technique, we first had to assess whether the sample of data was suitable for that tool. The decision was based on Kaiser-Meyer-Olkin (KMO) statistic and the Bartlett sphericity test. The Kaiser-Meyer-Olkin sample adequacy measurement confirms whether partial correlations between variables are small or not. Bartlett's sphericity test checks whether the correlation matrix is an identity matrix, which would indicate that the factorial model is inadequate. We will take a KMO threshold value of greater than 0.5.

As mentioned earlier, the Principal Components Analysis methodology does not apply to categorical variables. Where it became necessary to reduce the number of these categorical variables in a component, the criteria of the expert group of the Coordinadora - REEDES was applied.

4.5.1 Economic component

Principal component analysis is not applied to this component because the number of variables is already very small and does not need to be reduced any further. Therefore, a total of five variables was selected, two of which contributed to and three of which penalize development.

Code	Variable	Contribute / Penalize
FIS1	General government revenue (% GDP)	Contribute
FIS3	Variation rate of the Gini index before and after taxes and transfers	Contribute
FIS6	Financial Secrecy Index	Penalize
F2	Oversized banking sector	Penalize
F4	Account at a financial institution: difference between men and women (%)	Penalize

Table 10: Selected economic component variables

4.5.2 Social component

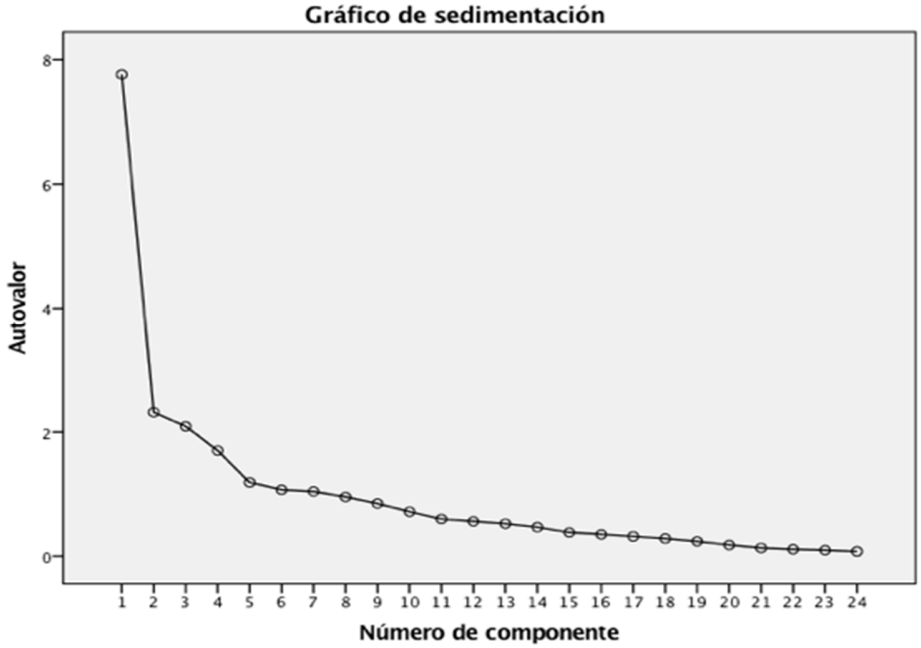
The categorical variables that passed the previous filter in the social component are IG5_6_7 and IG14 which, for the reasons mentioned above, were selected based on theoretical criteria and were not subjected to principal component analysis. PCA was applied to the rest of the variables.

Contributing variables

KMO and Bartlett test		
Kaiser-Meyer-Olkin measurement of sampling adequacy		.853
Bartlett's sphericity test	Approx. Chi-squared	1408.886
	gl	276
	Sig.	.000

Total variance explained							
	Initial eigenvalues			Sums of extraction of squared charges			Sums of rotation of squared charges
Com	Total	% variance	% cumulative	Total	% variance	% cumulative	Total
1	7.763	32.345	32.345	7.763	32.345	32.345	6.556
2	2.316	9.649	41.994	2.316	9.649	41.994	3.088

3	2.089	8.706	50.700	2.089	8.706	50.700	2.321
4	1.701	7.087	57.788	1.701	7.087	57.788	1.477
5	1.186	4.944	62.731	1.186	4.944	62.731	1.447
6	1.069	4.453	67.184	1.069	4.453	67.184	1.155
7	1.041	4.339	71.523	1.041	4.339	71.523	1.121
8	.953	3.970	75.492				
9	.847	3.531	79.024				
10	.716	2.981	82.005				
11	.598	2.490	84.495				
12	.561	2.337	86.832				
13	.523	2.178	89.010				
14	.467	1.946	90.955				
15	.381	1.588	92.544				
16	.350	1.460	94.003				
17	.318	1.326	95.330				
18	.283	1.181	96.511				
19	.239	.995	97.506				
20	.180	.750	98.256				
21	.132	.552	98.807				
22	.112	.465	99.272				
23	.097	.404	99.677				
24	.078	.323	100.000				



Rotated component matrix [a]							
	Component						
	1	2	3	4	5	6	7
EDU5	.583						
EDU7					.727		
EDU11							
PS1	.628	.590					
PS5	.730						
PS10		.610					
IG1		.783					
IG9		.805					
IG10				.756			
IG11_12							.843
S2	.854						

S3b	.747						
S8						.926	
S9	.877						
S11	.906						
CIT1	.583		.635				
CIT4					.772		
CIT6	.751						
CIT7			.665				
CIT8			.867				
CIT13	.688						
EM2				.610			
EM4	.509	.537					
EM7		.502	-.543				

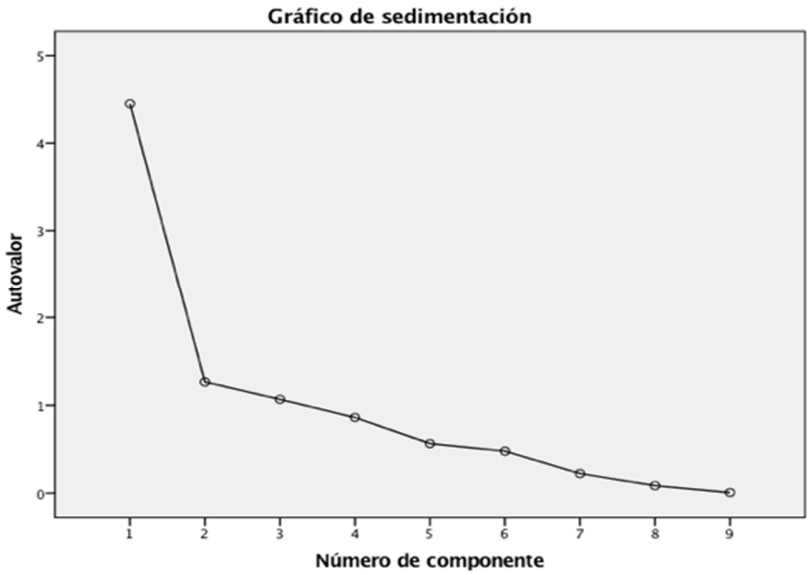
Extraction method: principal component analysis.
Rotation method Varimax with Kaiser normalisation.[a]

a. Rotation converged in 8 iterations.

Penalizing Variables

KMO and Bartlett test		
Kaiser-Meyer-Olkin measurement of sampling adequacy		.774
Bartlett's sphericity test	Approx. Chi-squared	969.521
	gl	36
	Sig.	.000

Total variance explained							
	Initial eigenvalues			Sums of extraction of squared charges			Sums of rotation of squared charges
Com	Total	% variance	% cumulative	Total	% variance	% cumulative	Total
1	4.452	49.464	49.464	4.452	49.464	49.464	3.684
2	1.264	14.048	63.513	1.264	14.048	63.513	2.024
3	1.067	11.854	75.366	1.067	11.854	75.366	1.075
4	.861	9.565	84.932				
5	.563	6.258	91.190				
6	.478	5.312	96.501				
7	.223	2.472	98.973				
8	.085	.946	99.920				
9	.007	.080	100.000				



Rotated component matrix [a]			
	Component		
	1	2	3
EDU2		.922	
EDU8	.652		
EDU9	.858		
EDU13		.901	
EDU14	.699		
IG2	.919		
S10			.716
EM1			.740
EM6	.909		

Extraction method: principal component analysis.
Rotation method Varimax with Kaiser normalisation.[a]

a. Rotation converged in 5 iterations.

For variables that contribute to and penalize development, the variance explained is very low as from the second component, i.e. it is more difficult to identify common trends. Therefore, only the first component was used to select the indicators of both groups.

Subsequent component adjustments

After the PCA, some indicators were adjusted to ensure the proper representation of the concepts we wanted to reflect in the PCSDI and that could have been distorted or not sufficiently gathered in the opinion of the group of experts of the Coordinator-REEDES. Hence, it was also decided to keep the contributing indicators (IG1, IG11_12) and the penalizing variable (EM1) in the index.

As a result of the analysis, 11 variables that contribute to and 3 variables that penalize development were eliminated.

Code	Variable
EDU7	Expenditure on education (% government expenditure)
EDU11	Net enrolment rate, primary, gender parity index (GPI)
PS10	Ratification of ILO social security Conventions
IG9	Women's share of government ministerial positions
IG10	Firms with female participation in ownership (%)
S8	Domestic health public expenditure (% total health expenditure)
CIT4	Government expenditure on tertiary education as % of GDP (%)
CIT7	Quality of scientific research institutions
CIT8	Government procurement of advanced tech products
EM2	Employment rate
EM7	Ratification of ILO Fundamental Conventions

Table 11.a: Variables contributing to the social component discarded in the PCA

Code	Variable
EDU2	Out of School ratio primary
EDU13	Out of School Ratio children of primary school age, % female
S10	PM2.5 pollution, population exposed to levels exceeding WHO guideline value (%)

Table 11.b: Variables penalizing in the social component discarded in the PCA

As a result of this process and the analysis of categorical variables (section 4), a total of 21 variables were selected for this component, 15 of which contribute to and 6 of which penalize development.

Code	Variable	Contribute / Penalize
EDU5	Survival rate to the last grade of secondary education, both sexes (%)	Contribute
EDU8	Pupil-teacher ratio in pre-primary education	Penalize
EDU9	Pupil-teacher ratio in primary education	Penalize
EDU14	Repetition rate in primary education (all grades), both sexes (%)	Penalize
PS1	Public social protection expenditure (% of GDP)	Contribute
PS5	Old age pension beneficiaries (%)	Contribute
IG1	Proportion of seats held by women in national parliaments (%)	Contribute
IG2	Vulnerable employment, female (% of female employment)	Penalize
IG5_6_7	Legislation against gender violence, sexual harassment and marital rape	Contribute
IG11_12	Maternity and paternity leaves	Contribute

IG14	Position at the UN in favour of the LGTBI community	Contribute
S2	Healthy life expectancy at birth (years)	Contribute
S3	Medical doctors (per 10 000 population)	Contribute
S9	Universal Health Coverage Index	Contribute
S11	Improved sanitation facilities (%population with access)	Contribute
CIT1	Internet access in schools	Contribute
CIT6	Percentage of students in tertiary education who are female	Contribute
CIT13	Percentage of graduates from tertiary education who are female (%)	Contribute
EM1	Unemployment rate	Penalize
EM4	Share of unemployed receiving regular periodic social security unemployment benefits (%)	Contribute
EM6	Vulnerable employment, total (% of total employment)	Penalize

Table 11.c: Selected social component variables

4.5.3 Global component

Before the PCA was applied, the global component had many categorical variables that passed the theoretical filter and were therefore selected for inclusion in the PCSDI: J3, J4_5, J9, J10, J13_14_15, PYS4, PYS12 and M4_5.

After applying the aforementioned filter, only four development-penalizing variables (PYS1, PYS3, PYS4 and PYS9) remained. We therefore decided against further reducing that number through additional PCA.

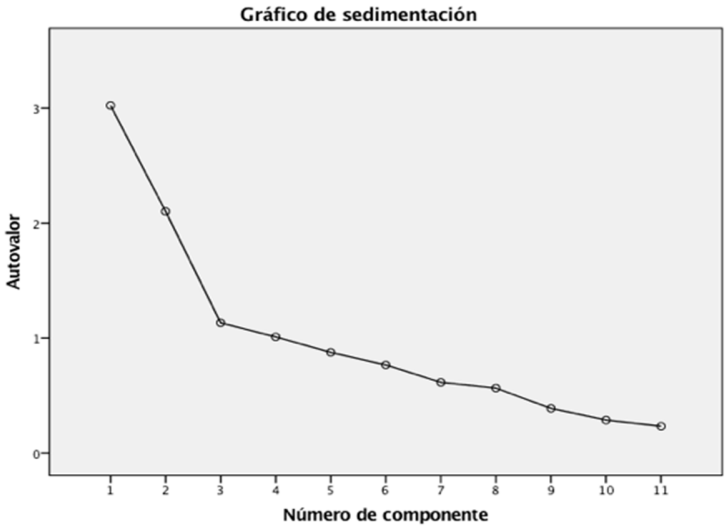
Hence, the principal component analysis was only applied to the non-categorical variables that contribute to development, i.e. J6, J7, J8, PYS6, C2, C5, C6, M2, M3, M6 and M7.

Contributing variables

KMO and Bartlett test		
Kaiser-Meyer-Olkin measurement of sampling adequacy		.677
Bartlett's sphericity test	Approx. Chi-squared	363.531
	gl	55
	Sig.	.000

Total variance explained

Com	Initial eigenvalues			Sums of extraction of squared charges			Sums of rotation of squared charges
	Total	% variance	% cumulative	Total	% variance	% cumulative	Total
1	3.024	27.487	27.487	3.024	27.487	27.487	2.782
2	2.102	19.113	46.599	2.102	19.113	46.599	2.260
3	1.133	10.301	56.900	1.133	10.301	56.900	1.172
4	1.010	9.183	66.083	1.010	9.183	66.083	1.055
5	.876	7.962	74.045				
6	.766	6.964	81.009				
7	.615	5.593	86.602				
8	.565	5.134	91.736				
9	.389	3.534	95.270				
10	.287	2.610	97.880				
11	.233	2.120	100.000				



Rotated component matrix [a]				
	Component			
	1	2	3	4
J6		.845		
J7	.633			
J8		.738		
PYS6		.816		
C2	.780			
C5	.840			
C6	.727			
M2			.687	
M3				.934
M6	.685		.526	
M7			.533	

Extraction method: principal component analysis.
Rotation method Varimax with Kaiser normalisation.[a]

a. Rotation converged in 5 iterations.

For the block of variables that contribute to development, the variance explained is significant for the first two components. Therefore, the most representative variables of these components were selected.

Subsequent component adjustments

After the PCA, some indicators were adjusted to ensure the proper representation of the concepts we wanted to reflect in the PCSDI and that could have been distorted. Despite their eligibility according to the PCA, we decided to eliminate contributing indicators J7, C2 and M6, at the discretion of the team made up of Smart & City personnel and experts from the Coordinadora-REEDES. And, owing to their theoretical significance, we decided to keep variables J6, J8 and PYS6 although they would not have been selected had the PCA been applied.

As a result, the 6 variables contributing to development (listed in the following table) were eliminated:

Code	Name
J7	The Worldwide Governance Indicators
C2	Contributions to UNDP (GDP per capita)
M2	Ease of hiring foreign labour
M3	Refugees and people in refugee-like situations (% total population)
M6	Country capacity to retain talent
M7	Visa requirements when visiting the country

Table 12.a: Variables contributing to the global component discarded in the PCA

Hence, the component was left with a total of 16 variables, 12 of which contributed to and three of which penalize development.

Code	Name	Contribute / Penalize
J3	Abolition of the death penalty	Contribute
J4_5	Legality of homosexuality and equal marriage	Contribute
J6	Ratification of UN Human Rights treaties	Contribute
J8	Universal Jurisdiction	Contribute
J9	Ratification of Rome Statute of the International Criminal Court	Contribute
J10	Legislation on abortion	Contribute
J13_14_15	Women's rights in the sphere of justice	Contribute
PYS1	Military expenditure (% of GDP)	Penalize
PYS3	Armed forces personnel (per 100,000 inhabitants)	Penalize
PYS4	Ease of access to small arms and light weapons	Penalize
PYS6	Participation in international arms treaties and conventions	Contribute
PYS9	Nuclear and heavy weapons capabilities	Penalize

PYS12	Plan of action to implement UN Security Council Resolution 1325	Contribute
C5	Contributions to UNWOMEN (GDP per capita)	Contribute
C6	Contributions to UNEP (GDP per capita)	Contribute
M4_5	Convention and Protocole relating to the Status of Refugees and International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families	Contribute

Table 12.b: Selected global component variables

4.5.4 Environmental component

The composition of the environmental component has been thoroughly revised since, in the opinion of the team of experts of the Coordinator-REEDES, its performance in the previous edition was not entirely satisfactory. With a view to improving it, the indicators comprising the component have been evaluated and reviewed by the group of experts. After this theoretical review process, only a small number of variables remained in the analysis and applying the PCA was therefore not considered appropriate.

In this process, 3 variables contributing to development were eliminated:

Code	Name
P9	Participation in IMO treaties, conventions and agreements
DR2	Improved sanitation facilities, rural (% of population with access)
DR8	Product diversification index of exports

Table 13.a: Variables contributing to the environmental component that were discarded

Seven variables penalizing development were also eliminated:

Code	Name
P1	Consumption ecological footprint, fishing grounds areas
DR6	Merchandise trade specialization index, primary commodities, excluding fuels
DR7	Product concentration index of exports
B1	Global Hunger Index
B3	Average annual deforestation
B11	Lack of access to an improved water source (% of rural population)
B12	Lack of access to an improved water source (% of urban population)

Table 13.b: Variables penalizing in the environmental component that were discarded

To complete the analysis, we decided to add two additional variables. One was variable “P4**.** Clean Waters” which had been eliminated due to lack of observations in step 4.2. In order to do so, the lack of information on the marine environment. This particular variable was chosen owing

both to the significance of the concept it represents (water quality) among the variables related to the health of the oceans and the fact that it had the highest number of observations (114). A further new variable was identified, “B13. Biocapacity Reserve/Deficit”, especially relevant to this component and consistent with the PCSDI theoretical framework measuring the relationship between the country's biocapacity and its ecological footprint.

The component is therefore comprised of a total of eight variables, four of which contribute to and four of which penalize development.

Code	Name	Contribute / Penalize
P4	Clean waters	Contribute
DR9	Fertilizers use	Penalize
B2	Ecological footprint of production (gha per person)	Penalize
B13	Biocapacity reserves/deficit (ha. per person)	Contribute
B10	Participation in international environmental agreements	Contribute
EN1	Electricity production from renewable sources, excluding hydroelectric (% of total)	Contribute
EN2	Ecological footprint of imports (gha per person)	Penalize
EN4	Carbon dioxide emissions (metric tons per person)	Penalize

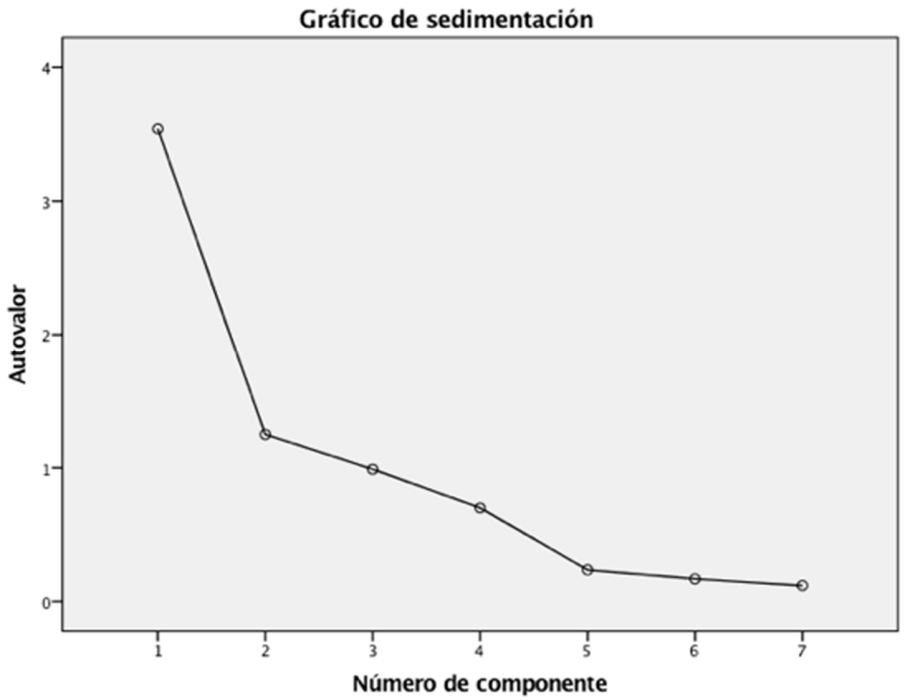
Table 13.c: Selected environmental component variables

4.5.5 Productive component

Contributing variables

KMO and Bartlett test		
Kaiser-Meyer-Olkin measurement of sampling adequacy		.774
Bartlett's sphericity test	Approx. Chi-squared	490.958
	gl	21
	Sig.	.000

Total variance explained							
	Initial eigenvalues			Sums of extraction of squared charges			Sums of rotation of squared charges
Com	Total	% variance	% cumulative	Total	% variance	% cumulative	Total
1	3.541	50.579	50.579	3.541	50.579	50.579	3.497
2	1.248	17.830	68.409	1.248	17.830	68.409	1.292
3	.989	14.122	82.532				
4	.700	9.994	92.526				
5	.236	3.371	95.897				
6	.168	2.407	98.303				
7	.119	1.697	100.000				



Rotated component matrix [a]		
	Component	
	1	2
U2	.934	
T4		.784
IT3	.882	
IT4	.922	
IT5	.888	
IT10		.511
IN1		.579

Extraction method: principal component analysis.
Rotation method Varimax with Kaiser normalization.[a]

a. Rotation converged in 3 iterations.

The first component explains more than half of the variance and therefore the variables that saturate this component were selected. Consequently, the following 3 following variables were eliminated:

Code	Name
T4	Terrestrial and marine protected areas (% of total area)
IT10	Enrolment in primary education, women (%)
IN1	R&D spending (% GDP)

Table 14.a: Variables contributing to the productive component discarded in the PCA

Penalizing Variables

After conducting these tests, it was not considered appropriate to apply the PCA to the group of variables penalizing development because the result of the KMO test was below 0.5, outside the range of validity. Selection of the variables penalizing the development for this component was assessed by the Coordinadora-REEDES expert group. As a result of this process, the following 7 variables were eliminated:

Code	Name
U5	Intentional homicides (per 100,000 people)
T1	Excess of tourism pressure
T2	Economic vulnerability due to touristic sector
IT6	CO2 emissions generated by the transport sector as % of total fuel combustion
IN2	Agricultural raw materials exports (% of merchandise exports)
IN4	Import energy (% energy use)
IN6	CO2 Emissions (metric tons per person)

Table 14.b: Variables penalizing in the productive component that were discarded

Seven variables were selected as a result of this analysis, five contributing to and two penalizing development.

Code	Variable	Contribute / Penalize
U2	Improved sanitation facilities, urban sector (% of population with access)	Contribute
U4	PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	Penalize
IT3	Improved water sources, rural sector (% of the population with access)	Contribute
IT4	Access to electricity (% population)	Contribute
IT5	Internet users (per 100 people)	Contribute
IN5	Annual freshwater withdrawals, industry (% of total freshwater withdrawal)	Penalize
IN7	Ratifications of the Right to Organise and Collective Bargaining Convention	Contribute

Table 14.c: Selected productive component variables

4.6 Normalisation

To be able to work with the variables and add them to the index, a normalization process was carried out using the Min-Max method which transforms the variables so that they vary in a range between 0 and 1. As a general rule, the maximum and minimum normalisation reference values correspond to the highest and lowest value of the set of countries. However, where outliers or extreme values were found, the criteria described below were applied to prevent these values from excessively determining the range of the indicator and from masking significant differences between the rest of the countries:

- For the 'worst' values:
    - Minimum value represented by the 2.5 percentile (or maximum value by the 97.5 percentile for variables penalizing development).
- For the 'best' values:
    - Maximum value represented by the first value excluding outliers
    - Maximum value represented by the first value excluding extreme values

For certain indicators (such as those measuring gender gaps or related to level of education) reference values widely accepted or defined by experts were used to establish maximum and minimum values. Table 15 shows the maximum and minimum values used for the normalization process for each variable:

Variable	Name	Maximum limit	Minimum limit	Maximum criteria	Minimum criteria
FIS1	General government revenue (% GDP)	53.8210	5.2610	Maximum value excluding outliers	Minimum value
FIS3	Variation rate of the Gini index before and after taxes and transfers	0.4696	-0.2055	Maximum value	Minimum value
FIS6	Financial Secrecy Index	1589.5739	7.9261	Maximum value	Minimum value
F2	Oversized banking sector	10.6798	1.0000	Value defined by experts	Value defined by experts
F4	Account at a financial institution: difference between men and women (%)	23.4739	0.0000	P 97.5 percentile	Optimal value sought
EDU5	Survival rate to the last grade of secondary education, both sexes (%)	99.9332	60.4741	Maximum value	P 2.5 percentile
EDU8	Pupil-teacher ratio in pre-primary education	38.0264	4.9126	P 97.5 percentile	Minimum value
EDU9	Pupil-teacher ratio in primary education	58.3432	8.1685	Maximum value	Minimum value
EDU14	Repetition rate in primary education (all grades), both sexes (%)	22.8849	0.0064	Maximum value	Minimum value
PS1	Public social protection expenditure (% of GDP)	33.0000	1.0000	Maximum value	Minimum value
PS5	Old age pension beneficiaries (%)	100.0000	0.0000	Maximum value	Minimum value

IG1	Proportion of seats held by women in national parliaments (%)	50.0000	0.0000	Optimal value sought	Minimum value
IG2	Vulnerable employment, female (% of female employment)	96.6000	1.1025	Maximum value	P 2.5 percentile
IG5_6_7	Legislation against gender violence, sexual harassment and marital rape	3.0000	0.0000	Maximum value	Minimum value
IG11_12	Maternity and paternity leaves	0.7186	0.0123	Maximum value	Minimum value
IG14	Position at the UN in favour of the LGTBI community	1.0000	-1.0000	Maximum value	Minimum value
S2	Healthy life expectancy at birth (years)	74.9000	44.4000	Maximum value	Minimum value
S3	Medical doctors (per 10 000 population)	53.9960	0.1570	Maximum value excluding outliers	Minimum value
S9	Universal Health Coverage Index	80.0000	30.0000	Maximum value	Minimum value
S11	Improved sanitation facilities (%population with access)	100.0000	10.9000	Maximum value	Minimum value
CIT1	Internet access in schools	6.2000	1.6000	Maximum value	Minimum value
CIT6	Percentage of students in tertiary education who are female	0.5000	0.2916	Optimal value sought	Minimum value
CIT13	Percentage of graduates from tertiary education who are female (%)	50.0000	31.1667	Optimal value sought	P 2.5 percentile
EM1	Unemployment rate	17.9000	0.1000	Maximum value excluding outliers	Minimum value
EM4	Share of unemployed receiving regular periodic social security unemployment benefits (%)	90.5000	0.0000	Maximum value	Minimum value
EM6	Vulnerable employment, total (% of total employment)	92.1500	2.0063	Maximum value	P 2.5 percentile
J3	Abolition of the death penalty	1.0000	0.0000	Maximum value	Minimum value
J4_5	Legality of homosexuality and equal marriage	1.0000	0.0000	Maximum value	Minimum value
J6	Ratification of UN Human Rights treaties	22.0000	3.0000	Optimal value	Minimum value

J8	Universal Jurisdiction	9.0000	0.0000	Maximum value	Minimum value
J9	Ratification of Rome Statute of the International Criminal Court	1.0000	0.0000	Maximum value	Minimum value
J10	Legislation on abortion	4.0000	1.0000	Maximum value	Minimum value
J13_14_15	Women's rights in the sphere of justice	1.0000	0.0000	Maximum value	Minimum value
PYS1	Military expenditure (% of GDP)	7.3418	0.1227	Maximum value excluding extremes	Minimum value
PYS3	Armed forces personnel (per 100,000 inhabitants)	1795.5617	38.6944	Maximum value excluding extremes	Minimum value
PYS4	Ease of access to small arms and light weapons	5.0000	1.0000	Maximum value	Minimum value
PYS6	Participation in international arms treaties and conventions	8.0000	1.0000	Maximum value	Minimum value
PYS9	Nuclear and heavy weapons capabilities	5.0000	1.0000	Maximum value	Minimum value
PYS12	Plan of action to implement UN Security Council Resolution 1325	1.0000	0.0000	Maximum value	Minimum value
C5	Contributions to UNWOMEN (GDP per capita)	400.9086	0.0000	Maximum value excluding extremes	Minimum value
C6	Contributions to UNEP (GDP per capita)	238.0446	0.0000	Maximum value excluding extremes	Minimum value
M4_5	Convention and Protocole relating to the Status of Refugees and International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families	3.0000	0.0000	Maximum value	Minimum value
P4	Clean waters	94.0000	28.0000	Maximum value	Minimum value
DR9	Fertilizers use	249.1608	0.5467	P 97.5 percentile	Minimum value
B2	Ecological footprint of production (gha per person)	13.7800	0.5502	Maximum value	Minimum value
B10	Participation in international environmental agreements	14.0000	7.0000	Maximum value	Minimum value

B13	Biocapacity reserves/deficit (ha. per person)	12.6400	-8.0417	Maximum value excluding extremes	P 2.5 percentile
EN1	Electricity production from renewable sources, excluding hydroelectric (% of total)	60.6961	0.0000	Maximum value	Minimum value
EN2	Ecological footprint of imports (gha per person)	9.8097	0.0505	Maximum value excluding extremes	Minimum value
EN4	Carbon dioxide emissions (metric tons per person)	21.2852	0.0354	Maximum value excluding extremes	Minimum value
U2	Improved sanitation facilities, urban sector (% of population with access)	100.0000	24.0350	Maximum value	P 2.5 percentile
U4	PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	86.4852	5.5466	P 97.5 percentile	Minimum value
IT3	Improved water sources, rural sector (% of the population with access)	100.0000	38.6500	Maximum value	P 2.5 percentile
IT4	Access to electricity (% population)	100.0000	13.3690	Maximum value	P 2.5 percentile
IT5	Internet users (per 100 people)	98.2000	2.2202	Maximum value	Minimum value
IN5	Annual freshwater withdrawals, industry (% of total freshwater withdrawal)	88.1200	0.5913	Maximum value excluding extremes	P 2.5 percentile
IN7	Ratifications of the Right to Organise and Collective Bargaining Convention	1.0000	0.0000	Maximum value	Minimum value

Table 15: Maximum and minimum limits for the normalisation of variables

4.7 Imputation of missing data

Then, country information was completed for those variables where information was unavailable. This was done using approximate values calculated from the average performance of the group in which the country in question was placed (according to the classification proposed in 4.1.3). For example, the missing value of indicator "X" of country "j" of the block of countries "1" was replaced by the average of indicator "X" of all countries in block "1". This average was calculated

with the original data of the indicator; normalization and, where appropriate, the corresponding limits, were then applied.

For the categorical variables, this approximation was made using the moda.

4.8 PCSDI calculation

The index was calculated using the same methodology as in 2016. The PCSDI is calculated hierarchically:

LEVEL 1: Calculation of a synthetic indicator for each component as the average of the indicators that contribute to, minus the average of those that penalize development:

$$I_{component} = \sum_{1}^{N+} \frac{Xi}{N+} - \sum_{1}^{N-} \frac{Yj}{N-}$$

For each component, it was decided to assign equal weight to all the variables of the block of variables contributing to development, and to all the variables of the block of variables penalizing development.

LEVEL 2: Normalisation of the synthetic indicator for each block of policies, applying normalisation of the range between the minimum value of each component and the full scale 100.

$$I_{normalised} = \frac{I_{component} - I_{min\,component}}{100 - I_{\min component}}$$

The normalisation method was modified at this level whereas in the previous edition the Min-Max technique was applied. Thus, the margin for improvement in PCD issues is better represented for the best ranked countries that were previously awarded scores closer to the maximum end of the scale.

LEVEL 3: Aggregation of the five synthetic indicators corresponding to the components using their arithmetic mean. As in level 1, it was decided to assign equal weight to all components.

Annex: Categorical Variables

Code	Name of the variable	Num. of possible values	Num. of existing values	Included in the 2019 PCSDI
EDU3	Official entrance age to pre-primary education (years)	4	4	No
PS9	Number of social security policy areas covered by a statutory programme	9	8[4]	No
PS10	Ratification of ILO social security Conventions	22	22	No
IG3	Existence of quota for women as electoral law	2	2	No
IG5_6_7	Legislation against gender violence, sexual harassment and marital rape	4	4	Yes
IG8	Does the constitution guarantee equality before the law?	2	2	No
IG14	Position at the UN in favour of the LGTBI community	3	3	Yes
EM7	Ratification of ILO Fundamental Conventions	9	8	No
J2	Existence of a small claims court or a fast track procedure for small claims	2	2	No
J3	Abolition of the death penalty	3	3	Yes
J4_5	Legality of homosexuality and equal marriage	3	3	Yes
J6	Ratification of UN Human Rights treaties	23	19	Yes
J8	Universal Jurisdiction	19	17	Yes

[4]The PS9 variable has 8 existing values and therefore, during the indicator selection process, it was to be treated as a quantitative variable and be included in the principal component analysis of its component. However, due to a procedural error it was treated as categorical, and discarded in step 4.4, selection of categorical variables.

J9	Ratification of Rome Statute of the International Criminal Court	2	2	Yes
J10	Legislation on abortion	4	4	Yes
J11	Existence of laws against gender violence	4	4	No
J13_14_15	Women's rights in the sphere of justice	4	4	Yes
PYS4	Ease of access to small arms and light weapons	5	5	Yes
PYS6	Participation in international arms treaties and conventions	9	7	Yes
PYS7	International treaties and conventions on security	5	3	No
PYS8	Member countries of the EITI initiative	2	2	No
PYS12	Plan of action to implement UN Security Council Resolution 1325	2	2	Yes
M4_5	Convention and Protocole relating to the Status of Refugees and International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families	4	4	Yes
P9	Participation in IMO treaties, conventions and agreements	50	43	No
DR11	International Treaty on Plant Genetic Resources for Food and Agriculture	2	2	No
DR12	International Plant Protection Convention	2	2	No
B10	Participation in international environmental agreements	15	7	Yes
EN5	Doha's amendment to the Kyoto Protocol	2		No
IN7	Ratifications of the Right to Organise and Collective Bargaining Convention	2		Yes