SUSTAINABLE DEVELOPMENT INDEX

What the SDI is

The Sustainable Development Index (SDI) is a periodical index for 180 countries based on the integration of three key dimensions of similar relative weight: economical, social and environmental. The SDI is based on 30 specific variables from the three dimensions, all internationally validated.

Why we do it

Development is a concept largely discussed throughout the history of economics[1] . Several interpretations have been given of what it is and therefore of how it should be measured and promoted. However, during the past couple of decades this discussion has reached a new level.

Development, as a concept based exclusively on the generation of wealth – and thus the associated income – calculated through the Gross Domestic Product (GDP), shows weaknesses to attend to and above all measure progress in an integrated way. This is economic growth in harmony with an inclusive society in which the world's limited resources are protected and conserved.

Since 1987 the Brundtland Commission, on request by the United Nations, defined Sustainable Development as the one that allows "to satisfy the current generation's needs without compromising the possibility of the future ones to attend to their own needs," decision makers from different countries have been gradually incorporated this vision on public policies, powered by the academy and leading organisations' influence and the civil society demands.

With the aim of achieving this vision, several institutions have developed specific tools to measure, for instance, relevant social and environmental aspects with the objective of emphasising the need for attention in these aspects.

Through the SDI, a new tool developed by Acción RSE – The Chilean Business Council for Sustainable Development, and the School of Business and Economics of the University of Chile, concrete data is to be provided for public discussion on the model of development that countries require for achieving a society progressing sustainably, inclusively and with happy citizens.

1- About this, we recommend Desai (1994), Krugman (1994), Porter (2000), Deaton (2005), Arrow et al. (2008), Nourry (2008), Feenstra el al. (2009), Arrow et al. (2010), Klugman et al. (2011), IWI (2012) and Barnonsky et al. (2012), among others.

What is new about the SDI

The available indicators for each dimension of development – for instance, the Human Development Index of the United Nations for the Development Programme (HDI) for the social dimension, the Yale University Environmental Performance Index (EPI) for the environmental, and for the economical dimension the Global Competitiveness Index (GCI) of the Global Economic Forum – all carry a central problem of every multidimensional indicator: an arbitrary structure for adding all the components. Most of the applied international indexes respond to a subjective valuation by an expert panel which assesses the relative weights of each variable through criteria that are not revealed to public scrutiny, leaving a big gap for the questioning of the used method.

This problem not only grows in scale while developing an indicator that gathers the three base dimensions of Sustainable Development, but it also includes the additional difficulty of defining and justifying the substitution possibility between two or more elements.

The novelty of the SDI over other indexes lies on its non-structural character. The SDI is really a statistical space – or a confidence interval – where all forms of relative weight are concentrated in a group of relevant variables by dimension. Likewise, three substitution forms between dimensions are considered, which allows comparing different views for understanding development.

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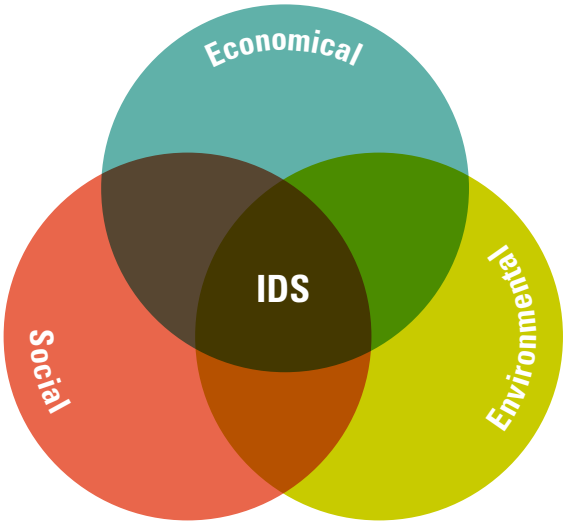


Methodology

For building the SDI, 10 variables from each of the dimensions of sustainability were chosen, with data from 1990 for180 countries. Data, which has been cleaned, filtered and normalised for the purpose of having a relative indicator which allows comparison between countries.

SUSTAINABLE DEVELOPMENT INDEX INDICATORS		
ECONOMICAL (10)	**ENVIRONMENTAL (10)**	**SOCIAL (10)**
GNI per capita	Sweet water extractions	Population in poverty conditions
Inflation rate	Stock of forests	Gini Index
Labour participation	Loss of forests	Life expectancy at birth
Gross national savings	SO2 Emissions by hectare	Intentional homicide rate
Monetary aggregates	Biomass protection	Unemployment rate
Gross fixed capital formation	Fish overexplotation	Average schooling
Fiscal balance	Composition of the electrical matrix	Schooling expectations
Current account balance	CO2 Emissions per capita	Improvement on sanitary facilities
Innovation and development expenditure	Ecological ratio	Prevalence of malnutrition
External debt	Adjusted net saving	Mortality in children less than 5 years

The variables were subjected to a non-structured weighted sum process, considering more than 10 million ways of weighing, with 5% intervals, which were then reduced to a random sample of 100,000 values per dimension.

Finally, a non-weighted aggregation under a Constant Substitution Elasticity (CSE)[2] function was developed. One random value for each dimension was taken, and then the same exercise was repeated 100,000 times, considering a unitary, infinite and zero elasticity.

Thus, the final result does not come as a whole, rather as three joint values that allow it to be compared in the assumption that a dimension's development allows it to completely substitute the other's deterioration, if it is not at all possible or if the case in between is considered.

The use of the CSE function is due to two reasons: first, the difficult conceptual justification on which substitution degree actually exists between sustainability dimensions. Secondly, the different assumptions about substitution elasticity between dimensions have a considerable effect on the index's final result. As an example, any random country's index which has a dimension that improves and another one that worsens, will have a substantially different SDI by assuming that the dimension that improves can replace the one that worsens, or if they are both complementary.

2- The CSE function refers to a type of aggregation which combines two or more inputs (dimensions in the case of SDI) according to a constant elasticity substitution. The latter determines the level in which the inputs (dimensions) are substituted. Typically three special cases are considered: a Cobb-Douglas function which implies a unitary substitution between dimensions, a Leontieff function which implies perfect complementarity between dimensions, and a linear function which implies a perfect substitution between the three dimensions.

To whom the SDI is directed

The SDI is a useful tool for several public interests, and it helps on the decision-making process of their respective competences.

Firstly, it provides quality information for analysing, proposing and making public policies due to the robust and comparable data on the situation and evolution of the countries, helping identifying improvement options in each of the dimensions.

Secondly, the SDI can become a key tool for contributing to the Sustainable Development of the territories in which companies operate, considering the impacts and the benefits private economical activities generate. Likewise, the SDI provides helpful information for analysing the companies´ own dependency with respect to the development of each country.

Finally, the indicator is also of interest to the academic world as a new methodological exercise, and for the civil society in general such as information of a country's situation compared to the rest of the countries, according to different ways of valuating the relevant variables.

What the SDI presents in this first stage

Today the tool counts with the SDI averages and the dimensions for 180 countries for the 1990-2011 period, according to different substitution degrees, which determines a ranking of countries. Likewise, it shows the statistical space estimates for a group of selected countries, and the analysis of its implications by dimension and at SDI level. Finally, it offers the study of correlation for each dimension and the SDI against already existing, ad hoc indicators (environmental dimension v/s EPI, social v/s HDI, economical v/s GCI, SDI v/s GNI per capita). In addition, the SDI shows the contrast between the presented intervals between countries and their implications in terms of complete, partial or null overlap

Future reaches

A next step to be taken is the building of an interactive virtual platform for allowing users to analyse the complete dimensions of the SDI by period and country, and ascribe their own subjective valuation to analyse how the confidence intervals change and thus the results shown by the SDI.

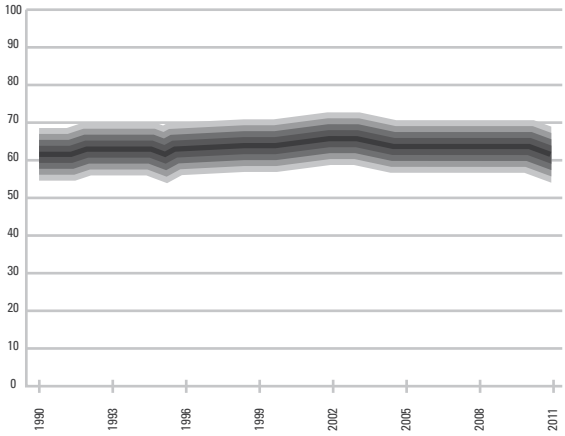
Sustainable Development Index, Ranking 2011

01- Norway	**61**- Belize	**121**- Papua New Guinea
02- Switzerland	**62**- Omán	**122**- India
03- Sweden	**63**- Azerbaijan	**123**- Georgia
04- Austria	**64**- Bangladesh	**124**- Birmania
05- IIceland	**65**- Malta	**125**- Cambodia
06- Singapore	**66**- Surinam	**126**- Zambia
07- Japan	**67**- Paraguay	**127**- Laos
08- Antigua and Barbuda	**68**- Bostwana	**128**- El Salvador
09- Brunei	**69**- Poland	**129**- Moldavia
10- New Zealand	**70**- Lithuania	**130**- Jordan
11- Canada	**71**- Cameroon	**131**- Ethiopia
12- Finland	**72**- Colombia	**132**- Granada
13- Korea	**73**- Sri Lanka	**133**- Tanzania
14- Australia	**74**- Vietnam	**134**- Namibia
15- Germany	**75**- Guyana	**135**- Rwanda
16- China	**76**- Argentina	**136**- Republic of Congo
17- Denmark	**77**- Libya	**137**- Nicaragua
18- The Netherlands	**78**- Ecuador	**138**- Malawi
19- Luxembourg	**79**- Bulgaria	**139**- Burkina Faso
20- Bhutan	**80**- Morocco	**140**- Syria
21- Slovenia	**81**- Saudi Arabia	**141**- Chad
22- Bahamas	**82**- Romania	**142**- Kenya
23- Dominica	**83**- Mauritius	**143**- Angola
24- Thailand	**84**- Philippines	**144**- Tajikistan
25- France	**85**- Kiribati	**145**- Madagascar
26- Croatia	**86**- Samoa	**146**- Dominican Republic
27- Czech Republic	**87**- Iran	**147**- Democratic Republic of Congo
28- Israel	**88**- Benín	**148**- Zimbabwe
29- Malaysia	**89**- Uruguay	**149**- Cape Verde
30- Hong-Kong	**90**- Greece	**150**- Guatemala
31- Vanuatu	**91**- Bahrain	**151**- Central African Republic
32- Qatar	**92**- Kirghizstan	**152**- Haití
33- Tonga	**93**- Lebanon	**153**- Trinidad and Tobago
34- Latvia	**94**- Mexico	**154**- Nigeria
35- Nepal	**95**- Bolivia	**155**- Jamaica
36- Belgium	**96**- Turkey	**156**- Liberia
37- United Arab Emirates	**97**- Barbados	**157**- Gambia
38- United Kingdom	**98**- Saint Kitts and Nevis	**158**- Pakistan
39- Estonia	**99**- Equatorial Guinea	**159**- East Timor
40- Gabon	**100**- Saint Vincent and the Grenadines	**160**- Mali
41- Perú	**101**- Macedonia	**161**- Guinea-Bissau
42- Algeria	**102**- Kazakhstan	**162**- Costa Rica
43- Albania	**103**- Armenia	**163**- Níger
44- Italy	**104**- Portugal	**164**- Afghanistan
45- Ivory Coast	**105**- Tunisia	**165**- Eritrea
46- Venezuela	**106**- Serbia	**166**- Solomon Islands
47- Chile	**107**- Ghana	**167**- Lesotho
48- Brazil	**108**- Saint Lucia	**168**- São Tomé and Príncipe
49- Montenegro	**109**- Senegal	**169**- Iraq
50- Cyprus	**110**- Mozambique	**170**- Djibouti
51- Panamá	**111**- Ukraine	**171**- South Africa
52- The United States	**112**- Bosnia and Herzegovina	**172**- Sierra Leone
53- Slovakia	**113**- Egypt	**173**- Burundi
54- Indonesia	**114**- Uzbekistan	**174**- Yemen
55- Belarus	**115**- Maldives	**175**- Comoros
56- Kuwait	**116**- Turkmenistan	**176**- Mauritania
57- Hungary	**117**- Seychelles	**177**- Guinea
58- Spain	**118**- Togo	**178**- Sudan
59- Russia	**119**- Mongolia	**179**- Tuvalu
60- Ireland	**120**- Honduras	**180**- Swaziland

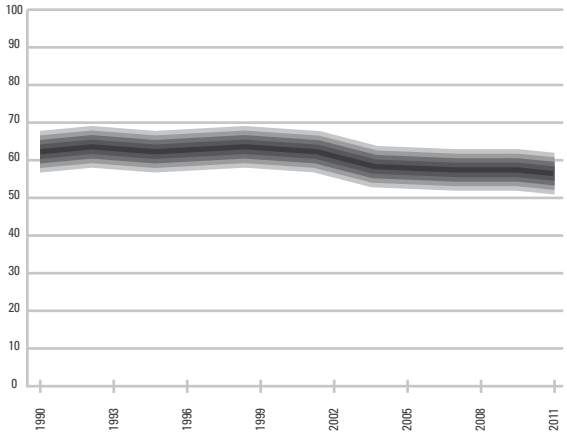
SDI 1990-2011

The chart shows the confidence interval of the respective dimension or SDI. Ten to 90% confidence intervals are included, whose colours become more intense as the significance level decreases. These intervals summarize the country's result considering all the possible forms of valorization presenting the space where the development of each country is positioned, at different levels of significance.

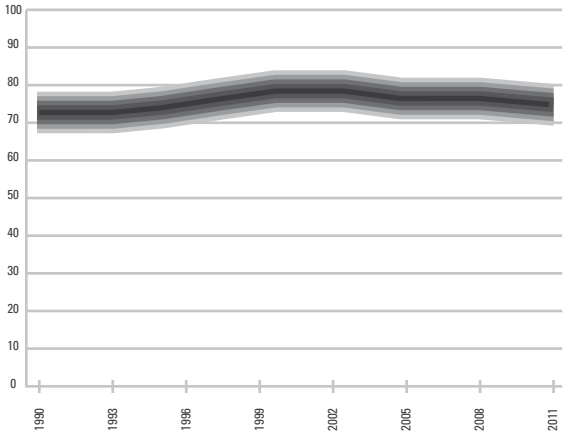
China



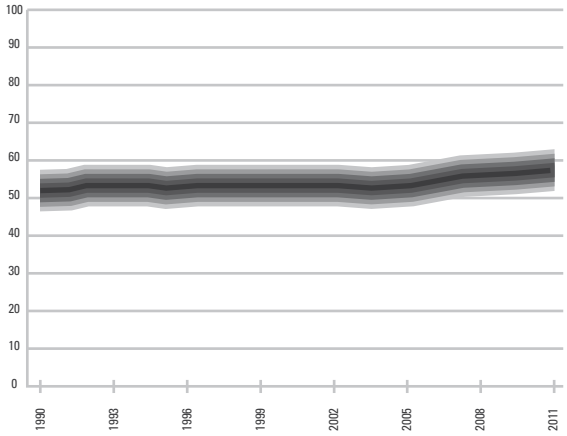
EEUU



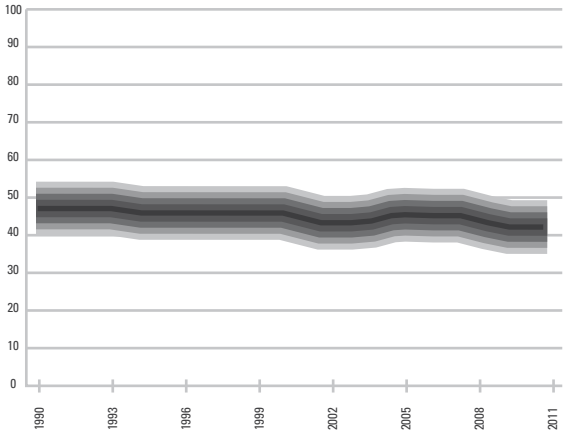
Norway



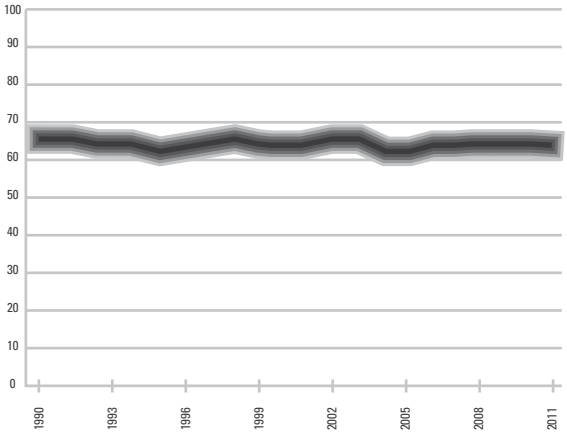
Brazil



Nigeria



Australia



Note: The chart represents SDI under perfect substitution elasticity.

For information about the results, which include the ranking of 180 countries, SDI and its components, SDI tendencies, SDI under different substitution assumptions and confidence intervals for a select group of countries, please refer to
www.accionrse.cl

For additional information please contact Eduardo Ordóñez, Head of Development Area BCSD Chile at eduardo.ordonez@accionrse.cl or at +562 2733 0100.

ACCION RSE
Empresas por un Desarrollo Sustentable

FACULTAD
ECONOMÍA Y
NEGOCIOS
UNIVERSIDAD DE CHILE

Photography
CIFOR, Meraj Chhaya, Sakura chihaya, Nigel Durrant, Nosha, eGuide travel , Israel tourism, JR.