

# The Social Economic Development Index: A New Measurement of Development

(Indeks Pembangunan Ekonomi Sosial: Satu Pengukur Pembangunan Baru)

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## ABSTRACT

*The human development index (HDI) is published annually by the United Nations Development Program and has played an influential role in the debate on human development for many years. However, it has been widely argued for several reasons that the HDI contains several weaknesses and is an inappropriate mechanism by which to measure human development. Additionally, the HDI does not take into account further important indicators, such as unemployment, poverty and environment, alongside GDP per capita; expected years of schooling and mean years of schooling; and life expectancy at birth. No index is perfect and the HDI of the UNDP reflects this fact. The present study proposes the social economic development index (SEDI) as a new means to measure the development level of countries. The SEDI uses more indicators than the three presently examined in the HDI. The study also suggests applying the development status matrix (DSM), which assists in classifying countries into groups according to development status, specifically focusing on the dynamic characteristics of underdeveloped countries. In conclusion, this study clearly demonstrates the importance of utilizing the SEDI and the DSM to measure a country's development.*

*Keywords: Development; economic development; human development; human development index; social-economic development index; ranking of countries; development status matrix*

## ABSTRAK

*Indeks pembangunan manusia (HDI) diterbitkan secara tahunan oleh Program Pembangunan Pertubuhan Bangsa-bangsa Bersatu dan telah memainkan peranan yang penting dalam isu pembangunan manusia dalam sekian lamanya. Walau bagaimanapun, ianya telah diperbahaskan dengan serius atas sebab HDI mempunyai beberapa kelemahan dan ianya dilihat sebagai satu mekanisme yang tidak sesuai dalam mengukur pembangunan manusia. HDI juga tidak mengambil kira petunjuk-petunjuk penting, seperti pengangguran, kemiskinan dan alam sekitar, bersama-sama KDNK per kapita; jangkaan tahun persekolahan dan min tahun persekolahan; dan jangka hayat semasa lahir. Tiada indeks yang sempurna dan HDI juga menggambarkan situasi ini. Kajian ini mencadangkan indeks pembangunan sosial ekonomi (SEDI) sebagai cara baru mengukur tahap pembangunan negara. SEDI menggunakan lebih banyak petunjuk daripada ketiga-tiga petunjuk yang digunakan untuk mengkaji HDI. Kajian ini juga mencadangkan penggunaan matriks status pembangunan (DSM), di mana ia membantu mengklasifikasi negara-negara ke dalam kumpulan mengikut status pembangunan, khususnya memfokus kepada ciri-ciri dinamik negara-negara mundur. Kesimpulannya, kajian ini dengan jelas menunjukkan kepentingan kepenggunaan SEDI dan DSM dalam mengukur pembangunan sesebuah negara.*

*Kata kunci: Pembangunan; pembangunan ekonomi; pembanguna manusia, indek pembangunan manusia; indeks pembangunan sosial-ekonomi; kedudukan negara-negara; matriks status pembangunan*

## INTRODUCTION

The approach to issues of development has gone through several transitions. Development initiatives initially focused upon economic growth during the 1950's (UN 1954), only to focus upon human resource development in the sixties (Anand & Ravallion 1993: 135); and socio economic development, with a new emphasis on poverty, in the 1970's. The contemporary focus of development initiatives is on human development, which emphasizes the development of human choices and recognizes the centrality of the people affected. The measurement of development is not only perceived to indicate the

expansion of commodities and wealth available to a community, but also to reflect the widening of human choices. The human development index (HDI) has been utilized by the United Nations Development Program (UNDP) to measure development since 1990 (UNDP 2011: 1). The HDI "is a summary measure of human development. It measures the average achievements in a country in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living" (UNDP 2011: 168).

Although the world has evolved since 1990, the human development approach continues to be committed to focusing upon unresolved issues. Such

issues range from poverty and deprivation to inequality and insecurity. In addition to the three dimensions of human development measured by HDI, new tables have continually been produced in a steady stream of human development reports, resulting in the creation of new indices designed to supplement the HDI (UNDP 2010: VI). In this study, a new simple composite index, namely, the Social-Economic Development Index (SEDI), is proposed as an alternative or a companion to the HDI. The SEDI is a composite index calculated from selected sub-indices of the economic development index and the social development index. As a result, the proposed index is argued to provide a better measurement of development. The remainder of the present paper is organized as follows: section 2 of this paper presents the manner in which development is measured. Section 3 presents the

methodology, while Section 4 presents the results. The final section includes the conclusions of the study.

## MEASURING DEVELOPMENT

Development is often treated as a multi-dimensional concept consisting of a number of distinct, separable dimensions (McGillivray & Noorbakhsh 2004). Extant theoretical research identifies a number of dimensions related to development level that can be social, physical, psychological or material in nature (Alkire 2002). The measure of a country's development is one of the most critical and highly debated issues in contemporary economic research (Craolici et al. 2010). As a result, studies attempt to calculate the composite index of

TABLE 1. Proposed Composite Development Indices

Bennett 1951	Consumption Level Index
Beckerman and Bacon 1966	Real Index of Consumption (RIC)
Drewnowski and Scott 1966	Level of Living Index (LLI)
United Nations Research Institute for Social Development (UNRISD) 1970	Socioeconomic Development Index (SID)
McGranahan, et al. 1972	General Index of Development (GID)
Morris 1979	Physical Quality of Life Index (PQLI)
Camp and Speidel 1987	Human Suffering Index (HSI)
UNDP 1990	Human Development Index (HDI)
UNDP 1995	Gender related Development Index (GDI) and the Gender Empowerment Measure (GEM)
Diener 1995	Combined Quality of Life Indices (CQLI)
Noorbakhsh 1996	Modified Human Development Index (MHDI)
UNDP 1997	Human Poverty Index (HPI)
Cherchye and Kuosmanen 2004	Constructs a meta-index of SD (MISD)
Chatterjee 2005	Measurement of Human Development: an alternative approach. The study first proposes a joint measure of the general level and concentration of the distribution of an ordered qualitative or a quantitative character. The measure is then applied to the distribution of prospective longevity, educational level and income, forming the basis of the alternative Human Development Index.
Borys 2005	Sustainable development indicators (SDI)
Marchante and Ortega 2006	Augmented version of the Human Development Index (AHDI)
Burd-Sharps, Lewis and Martins 2008	American Human Development Index (AHDI)
Engineer, King and Roy 2008	Calculate the modified indices for country members of the Organization for Economic Co-operation and Development (OECD) and compare them against the HDI of world countries generally.
EUROSTAT 2009	Sustainable Development in the European Union,(SDIEU)
New Economic Foundation 2009	Happy Planet Index,(HPI)
UNDP 2010	The inequality-adjusted HDI (IHDI), the gender inequality index (GII), the multidimensional poverty index (MPI)
Niels, 2010	Calibrated human Development Index (CDI)
Veljko et al. 2011	Ecological Footprint (EF)
Tolga, Bülent and Hakan 2011; Srinivasan 1994; Jordan 2004	Suggest the use of employment or unemployment dimensions in the HDI

development utilizing different means, such as those presented below in Table 1.

One of the most interesting is the human development index (HDI), which was created by the UNDP as an indicator to measure quality of life in countries around the world (Booyesen 2002). HDI is composed of several indicators that measure a country's achievements in three main areas of human development: longevity, knowledge and economic standard of living (UNDP 1990: 11-12).

The strengths of the HDI—particularly its transparency, simplicity and popular resonance around the world—maintain its position at the forefront of a growing array of alternative measures to gross domestic product (GDP) as a measurement of the well-being of a country (Anand & Sen 2000).

Over the past 20 years, the HDI has been criticized on several bases, including:

1. Most critics take issue with the calculation of the HDI being the simple average of the sum of three equally weighted indices because the absolute value of each component will affect the level of the HDI. The selected extreme values would therefore affect the value of the index and the ranking order (Noorbakhsh 1998). Since the HDI represents an attainment index, choosing the simple average reflects the idea that each aspect of human development could make a positive and equally important contribution. Thus, the simple averaging of these components in a composite index is questionable, but assigning differing weights has been proven unnecessary (Stapleton and Garrod 2007). Other suggestions include expanding the HDI to include more dimensions ranging from gender equity to biodiversity (UNDP 2010: 13).
2. Mahlberg and Obersteiner (2001); Chowdhury and Squire (2006); and Lind (2010) criticize the HDI because of the manner in which each component is weighted: all components are weighted equally. While this is convenient, such an approach is also universally considered to be wrong. The ideal approach would presumably involve weighting individual components in relation to their respective impacts on development.
3. Cuffaro et al. (2008); Cracolici et al. (2010); Stapleton and Garrod (2007); and Tolga et al. (2011) criticize the HDI because of the high correlation between GDP and certain background variables, which typically serves the interests of developed countries. As a result, the HDI is not always parallel with GDP per capita. Countries that are rich in resources, such as those exporting oil, may have high per capita income levels while ranking low in terms of HDI. For example, while Oman and Saudi Arabia maintained considerably high per capita income levels (approaching US\$23,000 in 2007), the two countries only manage to attain 56th and 59th HDI rankings among all nations, respectively (Tolga et al. 2011). Therefore, in order to highlight

such deficiencies, it is beneficial to include further indicators in the calculation of the HDI.

4. Panigrahi and Sivramkrishna (2002); Morse (2003); Osberg and Sharpe (2003); Cherchye, Ooghe and Van Puyenbroeck (2008); and Lind (2010) criticize the HDI for issues concerning variables and ranking, which include:
  - a. The small number of variables (just three) incorporated into the ranking process. Suggestions pertaining to the modification of the HDI to include new variables are prevalent in economics literature.
  - b. The rankings associated with the HDI are often taken too seriously in public discourse. Such ranking may serve primarily as a policy instrument, particularly in high ranking developed countries. Since the underlying statistics are also uncertain, with uncertainty margins of several percent, the third decimal digit in the HDI is uncertain and the ensuing rankings can be at error in several points. Moreover, the rankings are sensitive to all HDI indicators and the reference minimum and maximum values used for scaling purposes.

After an examination of existing research, which typically suggests the use of a limited number of social and economic indicators to measure development and argues that the HDI is not a comprehensive measure of development (UNDP), the present study proposes the Social-Economic Development Index (SEDI) as a means to measure the level of development of a country. The newly proposed index, which includes the largest number of social and economic indicators available, alongside the Development Status Matrix (DSM) provide a more effective measure of the level of development of specific countries.

#### METHODOLOGY OF THE SOCIAL ECONOMIC DEVELOPMENT INDEX (SEDI)

The SEDI is a summary measure of social and economic development that measures the average achievements in a country based upon a variety of dimensions of social economic development. The evaluation focuses upon 12 principal indicators economic development and 12 principal indicators of social development.

#### SELECTION OF INDICATORS

Ideally, numerous potential measures would exist for each of the broad categories of development. In practice, however, development is multidimensional and cannot be reduced to one dimension because such a measure will necessarily include compilations of key economic, social and environmental indicators. The vast

array of indicators that can be linked with development makes establishing a designed to measure development difficult. Firstly, certain categories of development are difficult to measure (e.g. mental well-being). Such data is typically based upon surveys of achievements and upon the perceptions of observers, the latter of which involving an obvious element of subjectivity. In addition, data are often unavailable or incomplete, with complete data only being available for a small sample of countries. Certain composite indices are constructed from a variety of elements and sources in a manner that leads to criticism and challenges regarding the validity of the index. Thus, limitations and pitfalls are associated with data collection and analysis in the field of development. The ambit of the present study is to identify a set of indicators that is more broadly representative of development. The indicators are selected primarily

on the basis of the availability of data. Furthermore, certain indicators are selected primarily on the basis of the specific indicator contemporarily being utilized to assess key aspects of human development in the Successive Human Development Reports, including sustainability and empowerment; environment; health; education; demography; financial commitments; national accounts; trade and main production sectors; energy; technology; internet users; and infrastructure, in addition to the indicators used in existing composite indices. For example, the Human Development Index, the Inequality-adjusted HDI, Gender Inequality Index and Multidimensional Poverty Index are the result of efforts to measure development by the Human Development Report Office (HDRO). Tables 2 and 3, below, present the economic development indicators and social development indicators utilized in the SEDI.

TABLE 2. Economic Development Indicators

Dimensions	Economic Indicators	INDICATOR_CODE
Agriculture Sector	Agricultural land (sq. km)	AG.LND.AGRI.K2
	Agriculture value added per worker (constant 2000 US\$)	EA.PRD.AGRI.KD
Economic Policy	GDP per capita, PPP (constant 2005 international \$)	NY.GDP.PCAP.PP.KD
	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG
	Exports of goods and services (constant 2000 US\$)	BX.GSR.GNFS.CD
External Debt	External debt stocks, total (DOD, current US\$)	DT.DOD.DECT.CD
Industrial Sector	Manufacturing, value added (constant 2000 US\$)	NV.IND.TOTL.KD
Services Sector	Service exports (BoP, current US\$)	BX.GSR.NFSV.CD
	Services, etc., value added (constant 2000 US\$)	NV.SRV.TETC.KD
Science & Technology	High-technology exports (current US\$)	TX.VAL.TECH.CD
Energy & Mining	Energy use (kg of oil equivalent per capita)	EG.USE.PCAP.KG.OE
Financial Sector	Total reserves (includes gold, current US\$)	FI.RES.TOTL.CD

TABLE 3. Social Development Indicators

Dimensions	Social Indicators	INDICATOR_CODE
Health	Life expectancy at birth, total (years)	SP.DYN.LE00.IN
	Health expenditure per capita, PPP (constant 2005 international \$)	SH.XPD.PCAP.PP.KD
	Mortality rate, infant (per 1,000 live births)	SP.DYN.IMRT.IN
Education	Expected years of schooling (of children under 7) (years)	-
	Mean years of schooling (of adults) (years)	-
Energy	Electric power consumption (kWh per capita)	EG.USE.ELEC.KH.PC
Infrastructure	Improved water source (% of population with access)	SH.H2O.SAFE.ZS
	Internet users (per 100 people)	IT.NET.USER.P2
Environment	CO2 emissions (metric tons per capita)	EN.ATM.CO2E.PC
The social living standard	Fertility rate, total (births per woman)	SP.DYN.TFRT.IN
	Household final consumption expenditure, PPP (constant 2005 international \$)	NE.CON.PRVT.PP.KD SP.POP.TOTL
Gender	Proportion of seats held by women in national parliaments (%)	SG.GEN.PARL.ZS

MAJOR SOURCES OF DATA USED IN  
THE SOCIAL ECONOMIC DEVELOPMENT  
INDEX (SEDI)

The SEDI relies on country-level data from the following organizations:

World Bank: the World Bank produces and compiles data on economic trends, as well as a broad array of other indicators. *World Development Indicators* is the primary source for most information regarding indicators utilized in the present paper. The details of the indicators used are available at: <http://data.worldbank.org/indicator/all>.

United Nations Development Program (UNDP): This specialized United Nations (UN) office produces international data on Human Development Indicators. The details of the indicators used are available at: <http://hdrstats.undp.org/en/indicators/default.html>

MISSING VALUES

In a few instances, relevant information could not be obtained from the aforementioned sources concerning particular countries. As a result, some data utilized in

TABLE 4. Major Sources of Indicators and Missing Values

Indicators	Data Source	Missing Values
Agricultural land (sq. km)	World Bank	
Agriculture value added per worker (constant 2000 US\$)	World Bank	
GDP per capita, PPP (constant 2005 international\$)	World Bank	
Inflation, consumer prices (annual %)	World Bank	Data for Chile, Lebanon and Maldives is obtained from the CIA fact book
Exports of goods and services (constant 2000 US\$)	World Bank	
External debt stocks, total (DOD, current US\$)	World Bank	
Manufacturing, value added (constant 2000 US\$)	World Bank	
Service exports (BoP, current US\$)	World Bank	
Services, etc., value added (constant 2000 US\$)	World Bank	
High-technology exports (current US\$)	World Bank	
Energy use (kg of oil equivalent per capita)	World Bank	Data for Burkina Faso, Burundi, Guinea, Madagascar, Mali and Uganda is obtained from the United Nations <i>Statistical Yearbook, 2009</i>
Total reserves (includes gold, current V\$)	World Bank	
Life expectancy at birth, total (years)	World Bank	
Health expenditure per capita, PPP (constant 2005 international \$)	World Bank	
Mortality rate, infant (per 1,000 live births)	World Bank	
Expected years of schooling (of children under 7) (years)	UNDP	
Mean years of schooling (of adults) (years)	UNDP	
Electric power consumption (kWh per capita)	World Bank	Data for Burkina Faso, Burundi, Guinea, Madagascar, Mali, Uganda is obtained from the CIA factbook
Improved water source (% of population with access)	World Bank	Data for Fiji, Lithuania, Romania is obtained from the United Nations <i>Statistical Yearbook, 2009</i> Data concerning Saudi Arabia is obtained from <a href="http://www.cdsi.gov.sa/pdf/alpha0000-01.pdf">http://www.cdsi.gov.sa/pdf/alpha0000-01.pdf</a>
Internet users (per 100 people)	World Bank	
CO2 emissions (metric tons per capita)	World Bank	
Fertility rate, total (births per woman)	World Bank	
Household final consumption expenditure, PPP (constant 2005 international \$)	World Bank	
Proportion of seats held by women in national parliaments (%)	World Bank	

the SEDI is obtained from the UN Statistics Division and the Central Intelligence Agency (CIA). The details of the indicators used are available at:

1. <http://mdgs.un.org/unsd/mdg/Data.aspx>
2. <https://www.cia.gov/library/publications/the-world-factbook/>

If data is not available in any international sources, the data available for the nearest two years in the time series data for the country is used. Otherwise the country is not included in the index. Table 4 demonstrates the data sources for each indicator, as well as the sources of the missing values.

#### DATA AVAILABILITY DETERMINES SEDI COUNTRY COVERAGE

Data availability determines the SEDI country coverage. To enable cross-country comparisons, the SEDI is calculated based upon data from leading international data agencies and other credible data sources. However, a number of countries data are omitted from the present study due to the inability to obtain data from the aforementioned agencies relating to one or more indicators. As a result, the present study calculates the SEDI for 2005 in 118 member States of the UN.

#### STEPS TO ESTIMATE THE SOCIAL-ECONOMIC DEVELOPMENT INDEX

There are five steps to calculating the SEDI:

##### Step 1. Determine (goalposts) values

The first step is determining goalposts for each indicator need to be set in order to transform the indicators into indices between 0 and 1. Determine goalposts are based on calculating the average and standard deviations of all countries under study for each indicator.

##### Step 2. Calculating the STANDARDIZE ( $x$ , mean, standard\_dev)

Standardized values are calculated for each indicator in the economic development index and social development index, the equation for the normalized value (Kothari, 1978, p. 99) is as follows:

$$Z = \frac{X - \mu}{\sigma} \quad \dots (1)$$

Where:

$Z$  = the standard variate or number of standard deviations from  $x$  to the mean of the distribution.

$X$  = the value you want to normalize.

$\mu$  = the arithmetic mean of the distribution.

$\sigma$  = the standard deviation of the distribution.

The mark of standardized values must be changed for indicators that are inversely related to development, so that negative values become positive and positive values become negative. This is accomplished by multiplying the standardized value by negative one (-1). For example, countries with a low inflation are better than those with a high inflation rate, because inflation indicators are inversely related to development. If cash income and the rate of inflation increase at the same rate, the real income will remain constant and will not indicate an improvement in standard of living of the individual. Whereas if the cash income increases at a rate lower than the rate of inflation, real per capita income declines alongside the standard of living.

Hereinafter, the following indicators are considered to relate inversely with development:

1. Inflation, consumer prices (annual %).
2. External Debt stocks.
3. Mortality rate, infant (per 1,000 live births).
4. Fertility rate, total (births per woman).
5. Co2 emissions

##### Step 3. Finding areas under the standard normal curve, NORMSDIST ( $z$ )

After calculating the standardized values for each indicator, the values areas under the standard normal distribution curve must be determined.

The standard normal distribution is a normal distribution with mean 0 and standard deviation 1. Fifty percent of the total area under the curve is to the left of 0 and 50 % of the total area under the curve is to the right of 0. The total area under a standard normal curve is exactly 1.0.

##### Step 4. Calculating the sub-indices

1. After finding normal distribution areas under the standard normal curve, the following sub-indices must be calculated: Economic Development Index (EDI): measures the average achievements in a country based upon 12 indicators combined in eight basic dimensions for economic development (Table 2).

2. Social Development Index (SDI): measures the average achievements in a country based upon 12 indicators combined in seven basic dimensions for social development (Table 3).

##### Step 5. Aggregating the sub-indices to produce the Social-Economic Development Index

The SEDI is the sum of the social development index (SDI) and economic development index (EDI)

$$SEDI = SDI + EDI \quad \dots (2)$$

The values of the index range between 0 and 2, where values close to 0 indicate very low of development. On the

other hand, values close to 2 indicate that the country has a very high level of development. Figure 1, below, shows agraphical presentation of the calculation of the SEDI.

Countries are classified into four groups on the basis of SDI and EDI:

1. Countries that have economic and social development higher than arithmetic mean *for all countries under study*.
2. Countries that have economic and social development less than arithmetic mean *for all countries under study*.
3. Countries that have economic development higher than general mean and social development less than arithmetic mean *for all countries under study*.
4. Countries that have economic development less than general arithmetic mean and social development higher than arithmetic mean *for all countries under study*.

Figure 2 illustrates the classification of the four groups.

DEVELOPMENT STATUS MATRIX (DSM)

Development status can be classified into four distinct groups on the basis of GDP per capita on the country level divided by GDP per capita on the world level, compared to the growth rate of GDP per capita at the country level divided by growth rate in GDP per capita at the world level. Table 5 illustrates the classification of the four groups in accordance with the DSM.

Status one: Such status is attained by countries that do not require the efforts and investment of the government for the purposes of development and the problems are limited

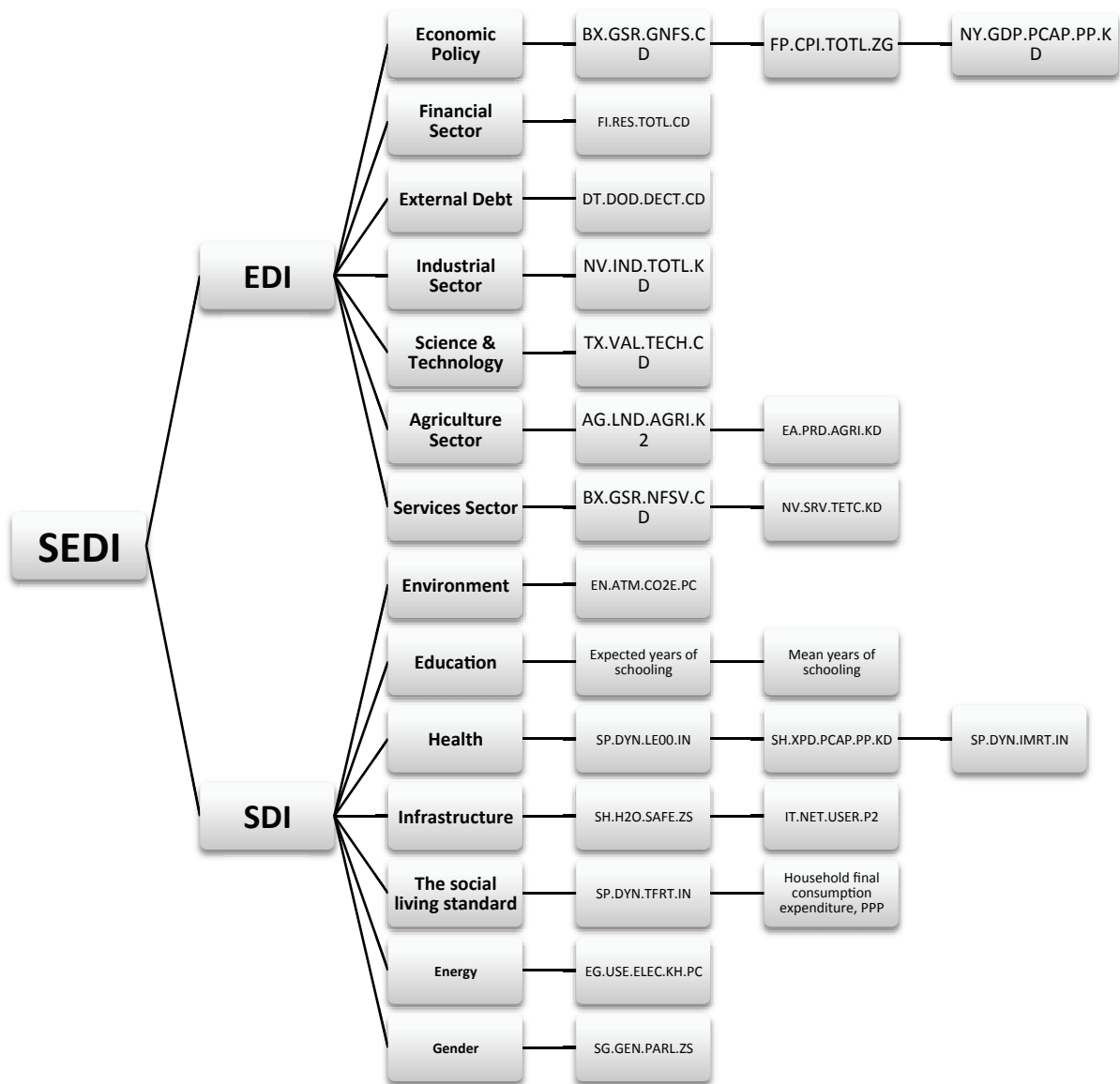


FIGURE 1. Calculating the Social-Economic Development Index—Graphical Presentation

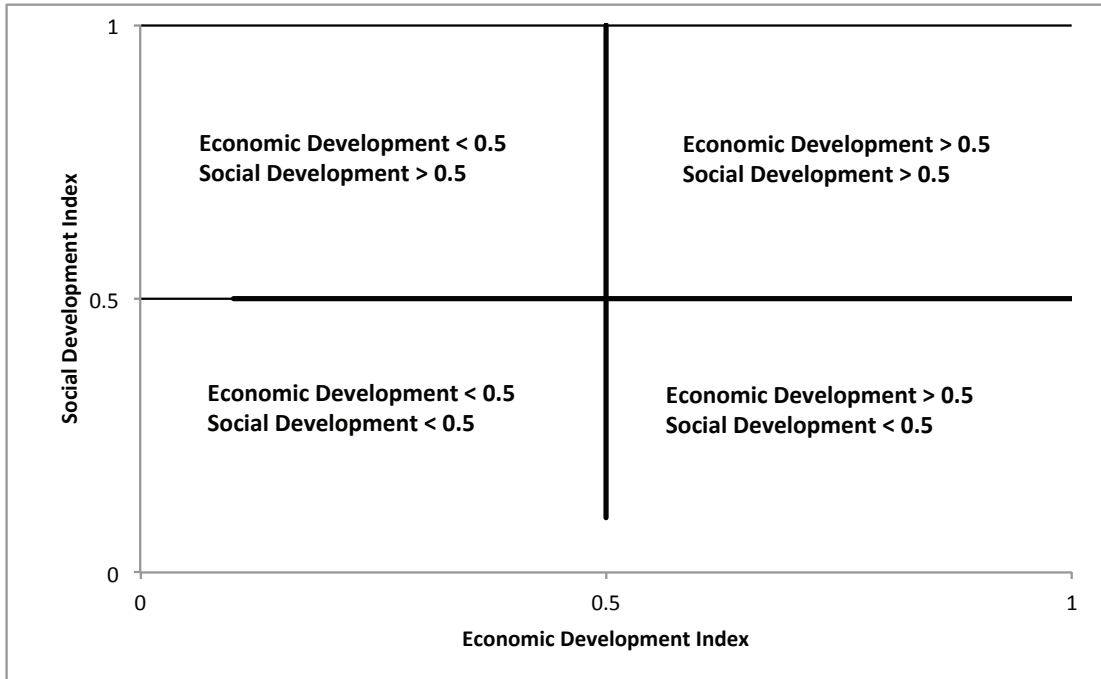


FIGURE 2. Classification of the Four Groups

Note: Mathematical mean for all countries under study=0.50

TABLE 5. Classifications of the Development Status Matrix (DSM)

$\frac{\text{Country GDP per capita}}{\text{The world GDP per capita}}$ $\frac{\text{Growth rate of country GDP per capita}}{\text{Growth rate of the world GDP per capita}}$	High (>1)	Low (<1)
	High (>1)	Low (<1)
	Accumulation of economic activities in the country (S1)	Require procedures to stimulate the development (S3)
	The country could be confronting economic problems in the future (S2)	Future development potential is not clear (S4)

to the accumulation of excessive economic activities or environmental problems on some occasions.

Status two: Such status is attained by countries that require special procedures to stimulate development, such as the improvement of infrastructure, to stimulate the continued growth of the industrial base. Furthermore, countries attaining this status may face economic problems in the future.

Status three: Such status is attained by countries that may confront future economic problems, such as depression and inflation. As a result, the common policy for development

must focus on the rebuilding process of the declining sectors.

Status four: Such status is attained by countries that need to re-develop various sectors of the economy to such an extent that the future development potential of such countries is unclear.

The advantage of the DSM is that the matrix places emphasis on the dynamic nature of the characteristics of development status. As such, the DSM not only identifies prosperous countries and non-prosperous countries, but also prosperous countries that may potentially become non-prosperous countries and *vice versa*.



Example: Germany

Tables 6 and 7 illustrate economic and social development indicators, respectively, in Germany in 2005.

TABLE 6. Indicators of Economic Development in Germany: 2005

Economic Development Indicators	Value in 2005
Agricultural land (sq. km)	170310
Agriculture value added per worker (constant 2000 US\$)	27215.38
GDP per capita, PPP (constant 2005 international \$)	31363.52
Inflation, consumer prices (annual %)	1.557
Exports of goods and services (constant 2000 US\$)	1147012763557.19
External debt stocks, total (DOD, current US\$)	0
Manufacturing, value added (constant 2000 US\$)	525831509121.06
Service exports (BoP, current US\$)	163869193741.69
Services, etc., value added (constant 2000 US\$)	1232658301087.16
High-technology exports (current US\$)	142454438000
Energy use (kg of oil equivalent per capita)	4107.001
Total reserves (includes gold, current US\$)	101675936214.08

TABLE 7. Indicators of Social Development in Germany: 2005

Social Development Indicators	Value in 2005
Life expectancy at birth, total (years)	78.93
Health expenditure per capita, PPP (constant 2005 international \$)	3354.65
Mortality rate, infant (per 1,000 live births)	3.9
Expected years of schooling (of children under 7) (years)	15.9
Mean years of schooling (of adults) (years)	12.2
Electric power consumption (kWh per capita)	7113.4142
Improved water source (% of population with access)	100
Internet users (per 100 people)	68.66
CO2 emissions (metric tons per capita)	9.817
Fertility rate, total (births per woman)	1.34
Household final consumption expenditure, PPP (constant 2005 international \$)	17919.176
Proportion of seats held by women in national parliaments (%)	31.8

#### STEPS TO ESTIMATE THE SEDI IN GERMANY

Step 1. Determine (goalposts) values by calculating the mean and standard deviation for all countries under study for each indicator in 2005.

Step 2. Calculate the standardize values ( $x$ , mean, standard\_dev) for each indicator in Germany.

Tables 8 and 9 illustrate the calculation of the goalposts for indicators (on level all countries) and standardized values in Germany.

Step 3. Find the area under the standard normal curve

Step 4. Calculate the average of the values area under the standard curve for the indicators in each index.

Tables 10 and 11 illustrate the values of the area under the standard normal curve for the indicators; and the average of these values in the EDI and SDI, respectively.

Step 5. Aggregate the sub-indices to produce the SEDI

The SEDI is the sum of the EDI and the SDI.

TABLE 8. Calculating Standardized for EDI in Germany-2005

Indicators	Mean for all countries under study ( $\mu$ )	Standard Deviation for all countries under study ( $\sigma$ )	Standardized
AG.LND.AGRI.K2	359293.66	840153.15	-0.22494
EA.PRD.AGRI.KD	9310.058522	13755.705	1.30167
NY.GDP.PCAP.PP.KD	12261.1363	12610.94437	1.51475
FP.CPI.TOTL.ZG	5.637	4.675	0.872635
BX.GSR.GNFS.CD	96613894390	208296441022.426	5.04281
DT.DOD.DECT.CD	34.46	35.64	0.96676
NV.IND.TOTL.KD	79667696837.013	272922949659.412	1.63476
BX.GSR.NFSV.CD	19584957855.158	46368613133	3.11168
NV.SRV.TETC.KD	188208626911.09	809880502462.96	1.28963
TX.VAL.TECH.CD	11745937164.322	33940269213.405	3.85113
EG.USE.PCAP.KG.OE	2087.09	2335.578	0.86484
FI.RES.TOTL.CD	34529050319	112889528783.553	0.59480

Note: The sign of standardized FP.CPI.TOTL.ZG and DT.DOD.DECT.CD change because the indicators are inversely related with development.

TABLE 9. Calculating Standardized Values for SDI in Germany-2005

Indicators	Mean( $\mu$ )	STDV ( $\sigma$ )	Standardized
SP.DYN.LE00.IN	69.67	9.471	0.97798
SH.XPD.PCAP.PP.KD	991.687	1278.65	1.84801
SP.DYN.IMRT.IN	28.015	26.82	0.89916
Expected years of schooling	12.572	3.047	1.09211
Mean years of schooling	7.737	2.919	1.528641
EG.USE.ELEC.KH.PC	3510.054	4727.959	0.76214
SH.H2O.SAFE.ZS	88.847	14.475	0.77049
IT.NET.USER.P2	23.596	24.686	1.82549
EN.ATM.CO2E.PC	4.662	4.924	-1.04688
SP.DYN.TFRT.IN	2.656	1.396	0.94264
NE.CON.PRVT.PP.KD	4.6618736	4.924	1.04688
SP.POP.TOTL			
SG.GEN.PARL.ZS	16.458	9.6702	1.58656

Note: The sign of standardized SP.DYN.IMRT.IN, and EN.ATM.CO2E.PC and SP.DYN.TFRT.IN change because the indicators are inversely related with development.

TABLE 10. Economic Development Index (EDI) in Germany-2005

Indicators	Mean	STDV	Standardized	Area under curve
AG.LND.AGRI.K2	359293.66	840153.15	-0.22493954	0.41101
EA.PRD.AGRI.KD	9310.058	13755.705	1.30166512	0.90348
NY.GDP.PCAP.PP.KD	12261.136	12610.944	1.514746674	0.93508
FP.CPI.TOTL.ZG	5.637	4.675	0.872635643	0.80857
BX.GSR.GNFS.CD	96613894390	208296441022.426	5.042807568	1
DT.DOD.DECT.CD	34.46	35.64	0.96675824	0.83317
NV.IND.TOTL.KD	79667696837.013	272922949659.412	1.634761067	0.94895
BX.GSR.NFSV.CD	19584957855.158	46368613133	3.111678917	0.99907
NV.SRV.TETC.KD	188208626911.09	809880502462.96	1.289634299	0.90141
TX.VAL.TECH.CD	11745937164.322	33940269213.405	3.851133296	0.99994
EG.USE.PCAP.KG.OE	2087.09	2335.578	0.8648444	0.80644
FI.RES.TOTL.CD	34529050319	112889528783.553	0.59480172	0.72401
			Average	0.856

TABLE 11. Social Development Index (SDI) in Germany-2005

Indicators	Mean	STDV	Standardized	Area under curve
SP.DYN.LE00.IN	69.67	9.471	0.97798	0.83596
SH.XPD.PCAP.PP.KD	991.687	1278.65	1.8480	0.9677
SP.DYN.IMRT.IN	28.015	26.82	0.89916	0.81572
Expected years of schooling	12.572	3.047	1.09211	0.86261
Mean years of schooling	7.737	2.919	1.5286	0.93682
EG.USE.ELEC.KH.PC	3510.054	4727.959	0.76214	0.77701
SH.H2O.SAFE.ZS	88.847	14.475	0.77049	0.7795
IT.NET.USER.P2	23.596	24.686	1.82549	0.96604
EN.ATM.CO2E.PC	4.662	4.924	-1.04688	0.14758
SP.DYN.TFRT.IN	2.656	1.396	0.94264	0.82707
<u>NE.CON.PRVT.PP.KD</u> SP.POP.TOTL	4.6618736	4.924	1.04688	0.85242
SG.GEN.PARL.ZS	16.458	9.6702	1.58656	0.94369
			Average	0.809

$$SEDI = SDI + EDI = 0.856 + 0.809 = 1.66$$

Figure 3 illustrates the *SDI* and *EDI* in Germany compared with the general arithmetic mean for all countries examined in the present study.

- Determine GDP per capita in Germany (= \$31363.52 in 2005) and GDP per capita in the world level (= \$8840.14 in 2005).
- Determine growth rate GDP per capita in Germany (= 0.753 in 2005) and growth rate GDP per capita in the world level (= 3.556 in 2005).

DEVELOPMENT STATUS MATRIX (DSM) IN GERMANY

To apply the *DSM* to data obtained on Germany (World Bank Data, 2005):

To calculate DSM:

1. Divide the GDP per capita in Germany by the GDP per capita at the world level, which results

$$\text{in } \left( \frac{31363.52}{8840.14} = 3.548 > 1 \right).$$

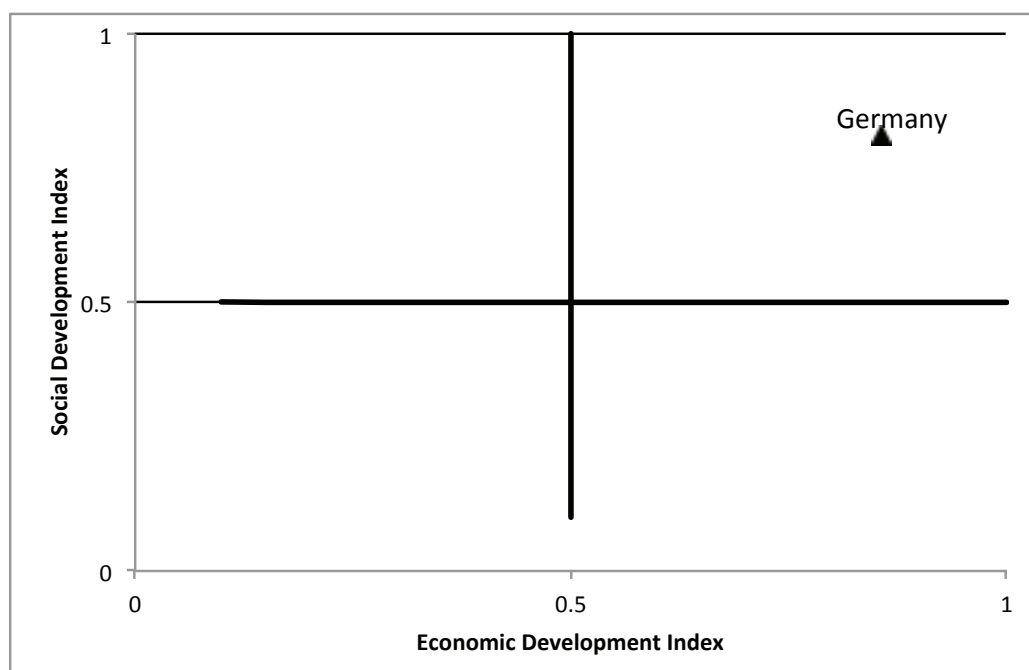


FIGURE 3. SEDI in Germany Compared with the General Mean of Countries Examined in the Present Study

Note: Arithmetic mean for all countries under study = 0.50

2. Divide the growth rate of GDP per capita in Germany by the growth rate of GDP per capita at the world level, which results in  $\left(\frac{0.753}{3.556} = 0.212 < 1\right)$ .

Based upon the results of the DSM, the S2 status of Germany indicates that this country could face economic problems in the future.

## RESULTS

SEDI classifications are statistical and based upon hierarchical cluster analysis by centroid clustering method. Following analysis, the countries are classified into the four following groups:

1. Countries with a very high level of development, where the value of index is higher than 1.37.
2. Countries with a high level of development, where the value of index is between 1.03 and 1.369.
3. Countries with a medium level of development, where the value of index is between 0.727 and 1.029.
4. Countries with a low level of development, where the value of index is less than 0.727.

Following the classification of the 118 countries into four different categories, the number of countries in each group is found to differ. 21 countries attain a very high level of development status according to the SEDI, while 25 countries attain a high level of development status; 48 countries attain a medium level of development status; and 24 countries attain a low level of development status. Table 12 illustrates the results of the SEDI and the DSM.

The main contribution of the SEDI is measuring the level of development in the countries. According to the SEDI, 21 countries attain very high level of development status due to their respective high achievements in economic and social fields. Additionally, the fact that the 21 countries are typically described as "top performers" can be explained by the fact that progress in economic and social fields is generally viewed as a driver in successful development. The USA ranks highest in this category, followed by Germany and Japan. The category consists of European countries, Australia, Canada, South Korea and the USA. Moreover, 25 countries attain a high level of development status. Slovenia ranks highest in this category, followed by the Czech Republic and Greece. Interestingly, some countries attain a medium level of human development according to the HDI in this category (UNDP2005, p. 219), but attain a high level of development according to the SEDI, such as China, Malaysia, Saudi Arabia, Russia, Belarus, and Brazil. The explanation for the variance in status is that the HDI assesses development based upon only three equally weighted indicators, while the SEDI assesses development in terms of both economic development and social development, which

are calculated based upon the twelve indicators in their respective indices. Therefore, some countries attain levels of economic and social development above the average of countries under study, (0.5) such as Russia and Malaysia. On the other hand, some countries only have high economic development, such as China, Saudi Arabia, and Brazil, while other countries only have high social development like Belarus. 48 countries attain a medium level of development status. Macedonia ranks highest in this category, followed by South Africa and Thailand. The countries in this category are typically described as less-developed countries. Moreover, 24 countries attain a low level of development status. Honduras attains the highest position in this category, followed by Guatemala and Pakistan. The countries in this category are typically described as least-developed countries.

There are four scenarios that emerge following the calculation of the economic and social development indices for the countries under study:

The first scenario : Countries attain a level of economic and social development higher than the average of countries examined in the present study (0.5). For example, Germany attains a value of 0.856 on the economic development index (0.856) and a value of 0.809 on the social development index, as shown in Figure (3). Both economic and social development values are above the average of the countries examined in the present study, as is the case with the remaining countries in this category.

The second scenario: Countries attain a level of economic development status higher than the average of countries examined in the present study (0.5), but attain a level of social development lower than the average of countries examined in the present study (0.5). For example, China attains a value of 0.755 on the economic development index, but only attains a value of 0.468 in regards to social development. Brazil, Saudi Arabia and India are further examples of this scenario.

The third scenario : Countries attain a level of economic development status lower than the average of countries examined in the present study (0.5), but attain a level of social development higher than the average of countries examined in the present study (0.5). For example, Estonia only attains

TABLE 12. The Social-Economic Development Index (SEDI) and the Development Status Matrix (DSM)

SEDI rank (2005)	SEDI Value	EDI	SDI	Country GDP per capita The world GDP per capita	Growth rate of country GDP per capita Growth rate of the world GDP per capita	DSM	
VERY HIGH SOCIAL – ECONOMIC DEVELOPMENT							
1	United States	1.718	0.951	0.767	4.812	0.860	S2
2	Germany	1.665	0.856	0.809	3.548	0.212	S2
3	Japan	1.639	0.897	0.742	3.429	0.544	S2
4	Canada	1.589	0.788	0.801	3.963	0.849	S2
5	United Kingdom	1.567	0.821	0.746	3.703	0.611	S2
6	France	1.558	0.835	0.723	3.341	0.514	S2
7	Australia	1.529	0.719	0.810	3.699	0.799	S2
8	Sweden	1.511	0.686	0.826	3.702	0.889	S2
9	Norway	1.499	0.661	0.838	5.351	0.770	S2
10	Belgium	1.497	0.698	0.800	3.634	0.482	S2
11	Switzerland	1.480	0.683	0.797	4.048	0.743	S2
12	Korea, Rep.	1.476	0.749	0.727	2.577	1.113	S1
13	Italy	1.464	0.761	0.702	3.184	0.184	S2
14	Spain	1.457	0.685	0.772	3.097	1.016	S1
15	Finland	1.451	0.638	0.812	3.471	0.820	S2
16	Denmark	1.448	0.648	0.800	3.757	0.688	S2
17	Austria	1.430	0.638	0.791	3.776	0.692	S2
18	Netherlands	1.429	0.758	0.671	3.971	0.575	S2
19	Luxembourg	1.403	0.626	0.777	7.728	1.527	S1
20	Iceland	1.402	0.584	0.818	3.950	2.103	S1
21	Ireland	1.371	0.641	0.730	4.369	1.692	S1
HIGH SOCIAL – ECONOMIC DEVELOPMENT							
22	Slovenia	1.287	0.567	0.720	2.658	1.263	S1
23	Czech Republic	1.266	0.558	0.708	2.303	1.776	S1
24	Greece	1.233	0.541	0.692	2.780	0.641	S2
25	Malta	1.230	0.532	0.698	2.372	1.129	S1
26	China	1.223	0.755	0.468	0.465	3.178	S3
27	Portugal	1.205	0.521	0.685	2.409	0.213	S2
28	Slovak Republic	1.196	0.508	0.688	1.828	1.874	S1
29	Poland	1.192	0.524	0.669	1.559	1.017	S1
30	Estonia	1.182	0.484	0.699	1.872	2.653	S1
31	Hungary	1.173	0.525	0.648	1.918	1.097	S1
32	Saudi Arabia	1.165	0.699	0.467	2.308	1.562	S1
33	Cyprus	1.152	0.507	0.645	2.764	1.110	S1
34	Mexico	1.140	0.592	0.549	1.379	0.901	S2
35	Croatia	1.139	0.487	0.652	1.736	1.204	S1
36	Russian Federation	1.132	0.579	0.553	1.341	1.793	S1
37	Lithuania	1.102	0.437	0.665	1.608	2.194	S1
38	Malaysia	1.100	0.542	0.558	1.306	1.499	S1
39	Barbados	1.095	0.465	0.629	2.032	0.895	S2
40	Latvia	1.091	0.429	0.662	1.477	2.981	S1
41	Argentina	1.057	0.443	0.614	1.225	2.581	S1
42	Chile	1.048	0.444	0.604	1.376	1.563	S1
43	Trinidad and Tobago	1.048	0.486	0.562	2.269	1.631	S1
44	Belarus	1.037	0.403	0.634	0.966	2.198	S1
45	Bulgaria	1.034	0.413	0.621	1.111	1.788	S1
46	Brazil	1.032	0.534	0.498	0.963	0.889	S4

MEDIUM SOCIAL – ECONOMIC DEVELOPMENT							
47	Macedonia, FYR	0.988	0.404	0.584	0.866	1.154	S3
48	South Africa	0.975	0.511	0.464	0.972	1.484	S3
49	Thailand	0.967	0.480	0.488	0.755	1.295	S3
50	Romania	0.952	0.395	0.557	1.060	1.173	S1
51	Uruguay	0.949	0.384	0.566	1.095	2.098	S1
52	Lebanon	0.941	0.434	0.507	1.084	0.281	S2
53	Costa Rica	0.940	0.354	0.587	1.023	1.655	S1
54	Ukraine	0.931	0.395	0.536	0.632	0.759	S4
55	Kazakhstan	0.924	0.425	0.499	0.984	2.728	S3
56	Mauritius	0.910	0.413	0.497	1.149	0.349	S2
57	Panama	0.903	0.378	0.525	1.037	2.022	S1
58	Albania	0.901	0.401	0.500	0.691	1.547	S3
59	Tunisia	0.901	0.382	0.518	0.729	1.118	S3
60	Turkey	0.899	0.449	0.451	1.297	2.363	S1
61	Venezuela, RB	0.878	0.411	0.467	1.123	2.902	S1
62	Armenia	0.878	0.399	0.479	0.463	3.909	S3
63	Fiji	0.877	0.411	0.466	0.489	0.197	S4
64	Peru	0.875	0.406	0.469	0.722	1.920	S3
65	Colombia	0.872	0.416	0.456	0.826	1.324	S3
66	Georgia	0.868	0.351	0.517	0.408	2.700	S3
67	Ecuador	0.860	0.385	0.475	0.741	1.688	S3
68	Algeria	0.858	0.464	0.394	0.811	1.434	S3
69	India	0.852	0.565	0.287	0.260	2.621	S3
70	Suriname	0.850	0.381	0.469	0.693	1.467	S3
71	Jamaica	0.846	0.320	0.527	0.795	0.290	S4
72	Dominican Republic	0.843	0.403	0.441	0.722	2.605	S3
73	Moldova	0.824	0.307	0.517	0.267	2.109	S3
74	Namibia	0.823	0.432	0.391	0.589	0.711	S4
75	Jordan	0.816	0.370	0.447	0.244	2.374	S3
76	Vietnam	0.816	0.354	0.463	0.490	2.284	S3
77	Syrian Arab Republic	0.816	0.406	0.410	0.468	1.832	S3
78	Guyana	0.812	0.313	0.500	0.287	-0.550	S4
79	Nicaragua	0.812	0.298	0.514	0.264	1.204	S3
80	Belize	0.804	0.353	0.451	0.707	0.852	S4
81	Egypt, Arab Rep.	0.799	0.402	0.397	0.508	1.258	S3
82	Botswana	0.793	0.401	0.392	1.306	0.462	S2
83	Maldives	0.787	0.348	0.440	0.452	-1.306	S4
84	El Salvador	0.785	0.362	0.423	0.644	0.868	S4
85	Philippines	0.780	0.369	0.410	0.345	1.344	S3
86	Morocco	0.772	0.422	0.351	0.397	0.838	S4
87	Sri Lanka	0.751	0.317	0.434	0.398	1.755	S3
88	Indonesia	0.750	0.391	0.359	0.351	1.601	S3
89	Paraguay	0.747	0.356	0.391	0.441	0.809	S4
90	Bolivia	0.746	0.353	0.394	0.427	1.243	S3
91	Kyrgyz Republic	0.744	0.333	0.411	0.195	-0.049	S4
92	Mongolia	0.729	0.348	0.381	0.324	2.040	S3
93	Cape Verde	0.727	0.372	0.355	1.472	0.850	S2
94	Gabon	0.727	0.396	0.331	0.306	3.343	S4
LOW SOCIAL – ECONOMIC DEVELOPMENT							
95	Honduras	0.676	0.323	0.352	0.371	1.702	S3
96	Guatemala	0.670	0.341	0.328	0.459	0.917	S4
97	Pakistan	0.662	0.360	0.301	0.243	2.156	S3
98	Bangladesh	0.657	0.353	0.303	0.132	1.675	S3
99	Swaziland	0.623	0.382	0.242	0.499	0.621	S4

100	Senegal	0.603	0.370	0.233	0.189	1.582	S3
101	Solomon Islands	0.582	0.335	0.247	0.234	1.524	S3
102	Tanzania	0.576	0.349	0.227	0.120	2.072	S3
103	Cameroon	0.573	0.372	0.201	0.225	0.646	S4
104	Mozambique	0.562	0.332	0.230	0.076	2.359	S3
105	Uganda	0.558	0.319	0.238	0.103	1.781	S3
106	Sudan	0.555	0.354	0.201	0.182	1.779	S3
107	Gambia, The	0.553	0.312	0.241	0.131	-0.248	S4
108	Kenya	0.550	0.337	0.213	0.152	1.661	S3
109	Benin	0.538	0.353	0.184	0.153	0.816	S4
110	Cote d'Ivoire	0.536	0.346	0.190	0.188	0.353	S4
111	Ethiopia	0.523	0.315	0.208	0.072	3.324	S3
112	Burkina Faso	0.519	0.343	0.176	0.114	1.786	S3
113	Togo	0.513	0.311	0.202	0.097	0.332	S4
114	Madagascar	0.513	0.293	0.220	0.098	1.294	S3
115	Burundi	0.499	0.266	0.233	0.039	0.253	S4
116	Mali	0.497	0.333	0.164	0.100	1.710	S3
117	Zambia	0.495	0.288	0.207	0.131	1.502	S3
118	Guinea	0.474	0.270	0.204	0.110	0.843	S4

Note: Hierarchical cluster analysis is based upon median. Ward's clustering method provides the same classification.

a value of 0.484 on the economic development index, but attains a value of 0.699 in regards to social development. Lithuania, Argentina, Barbados, Bulgaria, Belarus and Chile are further examples of this scenario.

The fourth scenario: Countries attain a level of economic and social development lower than the average of countries examined in the present study (0.5). For example, Guinea attains a value of 0.27 on the economic development index and a value of 0.204 in regards to social development, both of which are below average. Mali, Ethiopia and Kenya are further examples of this scenario.

Additionally, the DSM results indicate the following classification of countries according to level of development:

1. The first group consist of countries with considerable economic activities, where the GDP per capita/the world GDP per capita >1; and the growth rate of GDP per capita/the growth rate of the world GDP per capita >1, such as the Republic of Korea, Spain, Luxembourg, Iceland, Ireland, Slovenia, Czech Republic, Turkey and Malaysia.
2. The second group are countries that could confront economic problems in the future, where the GDP per capita/the world GDP per capita >1; and the growth rate of GDP per capita/the growth rate of the world GDP per capita <1, such as the United States, Germany, Japan, Canada, the United Kingdom,

France, Australia, Sweden, Norway, Belgium and Switzerland.

3. The third group are countries which require procedures to stimulate development, where the GDP per capita/ the world GDP per capita <1; and the growth rate of GDP per capita/the growth rate of the world GDP per capita >1, such as China, India, Pakistan, Indonesia and Egypt.
4. The fourth group are countries which future development potentials are not clear, where the GDP per capita/the world GDP per capita <1; and the growth rate of GDP per capita/the growth rate of the world GDP per capita <1, such as Guinea, Burundi, Togo, Burkina Faso, Cameroon, Mozambique, Uganda, Sudan, Gambia, Kenya, Benin, and Cote d'Ivoire.

## DISCUSSION AND CONCLUDING REMARKS

The main contribution of this paper lies in the utilization of a combination of indicators (economic and social) to measure development. The result is the creation of the Social-Economic Development Index (SEDI) and the Development Status Matrix (DSM) as a means to measure the level of development in countries. The SEDI is a good representative measure of development because provides a better indication of the general level of development in a specific country at a certain period of time. The measurement detects more differentiation between developed and underdeveloped countries. Furthermore, the DSM provides more information about the level of social and economic development in different countries. Additionally, the DSM is a quantitative tool for the evaluation of the development capacity of countries

that aids in the classification of countries into groups, specifically focusing on the dynamic characteristics of underdeveloped countries. Finally, the combination of the SEDI and the DSM is designed to be applied to both developed and underdeveloped countries, as well as their potential application to counties or governorates within a given country.

The proposed index introduces the SEDI and the DSM as an alternative or a companion to the HDI. The SEDI takes into account the level of economic development (expressed as the Economic Development Index) and the level of social development (expressed as the Social Development Index) when measuring the level of development of a country. The sub-indices are then combined into a composite index to provide a ranking of the level of development in the country. The SEDI is based on twelve indicators representing the economic development index and twelve indicators representing the social development index, whereas the HDI simply assesses the development based upon three equally weighted indicators. When the SEDI indicators are combined, they form a composite index that measures the average achievements of development in a country. Furthermore, normal distribution values are used for scaling in this method, leading to the reduction of issues faced by HDI measurements, including the effects of extreme values among the limited number of indices/indicators on country ranking; the use of reference minimums and maximums for purposes of scaling; the inaccuracy of the underlying statistics; the reliance upon a small pool of variables for the measurement of the level of development; and the high correlation between GDP and certain background variables that primarily serves the interests of developed countries. The results of the SEDI and the DSM are manageable and easily understood, while addressing the inherent issues associated with the HDI that has led to significant criticism of the measure.

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