

How to Assess Human Development

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Abstract

In the past decades, comprehensive human development has been the core goal in the modernization drive. How to assess human development has become the centerpiece of discussion. This paper briefly looks at and contrasts three ways of assessment, which are GDP per capita, Human Development Index (HDI), and HDI in new version. Their meanings, limitations and significance to policies have been reviewed.

GDP per capita is a single measure to assess human development from the perspective of economic development. The HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. This involves the economic, social and cultural realms. The HDI new version measures human development in five dimensions of a long and healthy life, being knowledgeable, information sharing, environmental friendly and having an affluent life. It involves the economic, social, cultural and environmental realms.

GDP per capita reflects economic development, but not social and cultural progress. The HDI indicates economic, social and cultural development, but not conditions of information sharing, environmental building and knowledge-based economy. It suits to the industrial era. Indices of information sharing, environmental friendly and knowledge-based economy are added to the HDI new version, which is suitable to the knowledge-based era.

The paper finishes assessing 131 countries by means of the HDI new version based on the conditions in 2015 and contrasts the results with that by means of HDI and GDP per capita. There are strong connections in terms of scores and rankings. From the perspective of the scores and rankings, there is no distinct difference among the three ways of measurement. But from the perspective of assessing contents, the differences are huge.

Key words: human development, HDI, HDI in new version and 2015

As people's understanding of human development evolves, researches on assessing it with indices are also improving. From GDP per capita to HDI and HDI new version (HDI_N), the indices reflect our deepening understanding of human development. Human development is not only about

economic growth, but also about social and cultural progress, information sharing and the building of an environmentally friendly society. This paper discusses the differences of each index and their respective significance to policy making.

1. GDP per capita

GDP per capita is a measure of average income per person in a country. GDP stands for Gross Domestic Product.

What is GDP?

In 1937, American economist Simon Kuznets submitted a report to the U.S. Congress, National Income, 1929-1935, in which he proposed to use GDP to measure all economic and production activities of a country. The Bretton Woods conference in 1944 set up an international financial system made up by the World Bank, the International Monetary Fund and other agencies. Since then, GDP has become the main tool for measuring a country's economy.

At present, GDP is a measure of macro economy. It measures the monetary values of final goods and services on official record, excluding the value of their outputs, produced in a country in a given period of time.

GDP is closely related to gross national product (GNP) and gross national income (GNI). GDP is a measure of goods and services produced in a particular country by both nationals and foreign residents. GNP and GNI is a measure of values produced only by nationals. GNP is an estimate of total value turned out in a given period by means of production owned by a country's residents whether in the country or not. It excludes goods and services produced by foreign residents. GNI is the total domestic and foreign output claimed by residents of a country, consisting of domestic incomes and international factor incomes by nationals. Generally, $GNP = GNI = GDP + \text{factor incomes earned by foreign residents}$.

GDP can be determined in three ways. They are the production approach, the income approach or the speculated expenditure approach. The production approach sums the outputs of every class of enterprise to arrive at the total. The calculation formula is: $GDP = \text{gross value added} = \text{gross value of output} - \text{value of intermediate consumption}$.

1.2 Significance of GDP per capita

First, GDP per capita reflects the economic development of a country. Second, the GDP per capita of labor per hour reflects the productivity. Third, the growth rate of GDP per capita reflects changes and fluctuations of the national economy. Fourth, it reflects the size of an economy. Fifth, alongside GDP, it is a widely-used indicator for analysis and international comparison of macro economy.

1.3 Limitations of GDP per capita

First, GDP per capita fails to reflect the costs of resources and environment. Second, it doesn't reflect the quality of economic growth, like the proportion of new technologies and products. Third, GDP per capita doesn't reflect the stock of wealth, nor equality of distributing income. Fourth, it fails to reflect all outputs, such as the non-market economy, underground economy and

non-monetary economy. Fifth, it doesn't take the value of public services into account, but measures the value of public services with its cost. Sixth, GDP per capita doesn't reflect the accruing of wealth. For example, dismantling houses will generate GDP, so will building them.

GDP per capita is an indicator for the macro economy, and reflects some achievements of economic development. But it could not reflect social progress, environmental changes and the improvement of living standards and human development among others.

Criticisms around GDP per capita as a measurement abound. New measurements emerge one after another, such as HDI, Genuine Progress Indicator (GPI), National Happiness Index, EQOLS, OECD's Better Life Index (BLI), FOI and HDI_N.

2. HDI

2.1 What is HDI?

In 1990, the United Nations Development Programme (UNDP) released the first Human Development Report and proposed the Human Development Index. Since then, UNDP has put forth the Human Poverty Index (HPI), the Gender Development Index (GDI), the Inequality-Adjusted Human Development Index (IHDI), the Gender Inequality Index (GII), and the Multidimensional Poverty Index (MPI).

The HDI is a composite measure of human development. It assesses the average achievement of a country in key three dimensions: a long and healthy life, being knowledgeable and having a decent standard of living (See Table 1). The achievement of each dimension is scored from 0 to 1. And the HDI is the geometric mean of normalized indices for each of the three dimensions (See Table 2).

Table 1 Dimensions and indicators of the HDI

Versions	a long and healthy life	being knowledgeable	a decent standard of living
1990	Life expectancy at birth	Adult literacy rate	GDP per capita (PPP)
1991	Life expectancy at birth	Adult literacy rate, mean years of schooling	GDP per capita (PPP)
1994	Life expectancy at birth	Adult literacy rate, enrollment rate	GDP per capita (PPP)
2011	Life expectancy at birth	Mean years of schooling, expected years of schooling	GNI per capita (PPP in 2005)

Note: since 1990, the indicators and ways of the HDI have been adjusted on several occasions.

Table 2 Method of calculating the HDI (2011 and onwards)

Index	Maximum value	Minimum value	Method of calculation
Life expectancy	Actual maximum value	20 years	Life Expectancy Index = (actual value - 20) ÷ (max value - 20)
Mean years of schooling	Actual maximum value	0	Mean Years of Schooling Index = (actual value - 0) ÷ (max value - 0)
Expected years of schooling	Actual maximum value	0	Expected Years of Schooling Index = (actual value - 0) ÷ (max value - 0)
Composite education index	Actual maximum value		Composite Education Index = (expected years of schooling × Expected Years of Schooling Index) ^{1/2}
Education Index	Actual maximum value		Education Index = (actual composite education index - 0) ÷ (max value of composite education value - 0)
GNI per capita	Actual maximum value	100	Income Index = (actual value - ln100) ÷ (ln max value - ln100)
HDI	1	0	HDI = (Life Expectancy Index × Education Index × Income Index) ^{1/3}

Note: GNI per capita is indicated by the natural logarithm at purchasing power parity in US dollar in 2005.

The UNDP believes having a decent standard of living does not necessarily need infinite amount of incomes, so it adjusted the method of calculating income. The GNI per capita is indicated by the natural logarithm.

2.2 Advantages of the HDI

First, HDI reflects the average achievement in three key dimensions of human development: a long and healthy life, being knowledgeable, a decent standard of living, which involve progress in economic, social and cultural fields. Second, the method of calculation is simple and the data are obtainable. Third, international comparison of the HDI is free from the impacts of the size of a country.

2.3 Limitations of the HDI

First, the HDI fails to reflect the features of an information age. People who do not know how to use the Internet are restricted to develop. Second, the HDI doesn't reflect environmental sustainability. The importance of environmental protection and ecological building has been widely recognized by the international community. Third, the HDI fails to reflect the characteristics of knowledge-based economy. Higher education has been made universal, and the knowledge-based economy has outperformed the real economy. Fourth, using the natural logarithm to indicate GNI per capita twists international gap and affects the outcome of assessment.

Current HDI excludes information index and environment index. The knowledge index is not valued, and the higher education index is implicitly contained in two education indices.

3. HDIN

3.1 What is HDI_N?

In 2010, He Chuanqi, researcher with the Chinese Academy of Sciences, analyzed the advantages and limitations of the HDI in China Modernization Report 2010: Overview of Global Modernization. On the basis, he put forth the HDI_N. He noted modernization is a global phenomenon after the 18th century and a frontier change in human civilization. From the 18th to late 21st century, the process of global modernization can be roughly divided into two stages. The first stage is about the shift from agricultural society and economy to industrial society and economy. This stage features industrialization, urbanization and democratization. The second stage is about the shift from industrial society and economy to knowledge-based society and economy, featuring progress driven by knowledge and IT application and ecological civilization (See Table 3). The HDI proposed by the UNDP takes economic, social and knowledge progress into account, but not information and environment indices. Therefore, it is more suitable for assessing human development at the first stage of modernization, which is the industrial era. But it is not suitable for assessing that at the second stage as it cannot reflect all of the characteristics of human development in the era of knowledge-based economy.

Table 3 The frontier process of global modernization

Item	The first modernization	The second modernization
Rough period	1760 - 1970	1970 - 2100
General meaning	Shift from agricultural civilization to modern industrial civilization, including the shift from agricultural economy, society, politics and culture to industrial economy, society, politics and culture	Shift from industrial civilization to ecological civilization, including the shift from industrial economy, society, politics and culture to knowledge-based economy, society and politics and ecological civilization
Main characteristics	Industrialization, urbanization, democratization, rationalization, and the shrinking proportion of agricultural sector in the economy	Knowledge driven, IT application, ecological civilization, globalization, and the shrinking proportion of industrial sector in the economy
2015 level	About 90 countries at the first stage of modernization	About 20 countries at the second stage of modernization

Human Development Index in new version evaluates the average achievement of countries in five dimensions of human development (See Table 4): a long and healthy life, indicated by life expectancy at birth; being knowledgeable, indicated by university enrollment; information sharing, indicated by the penetration of the Internet; environment friendly, indicated by the ratio of domestic wastewater being treated; an affluent standard of living (high-quality life), indicated by GNI per capita at purchasing power parity (PPP) per capita. The achievement of each dimension is scored from 0 to 100 (scored 100 when the actual value is higher than 100), and the HDI_N is the geometric mean of normalized indices for each of the five dimensions (life expectancy, knowledge, information, environment and affluence indices) (See Table 5).

Table 4 indicators of HDI_N and HDI

Dimensions	HDI	HDI_N
Economy	A decent standard of living: PPP per capita	An affluent standard of living: PPP per capita (GNI per capita at PPP per capita)
Society	A long and healthy life: mean life expectancy	A long and healthy life: mean life expectancy
Knowledge	Being knowledgeable: mean years of schooling and expected years of schooling	Being knowledgeable: university enrollment
Information		Information sharing: Internet penetration
Environment		Environment friendly: the ratio of domestic wastewater being treated

Note: many environment indicators feature the shape of inverted-U curve. Being important, they are not suitable as indicators for quantitative assessments.

Table 5 Method of calculating HDI_N (second edition)

indicators	Max value	Mini value	Calculation method
Life expectancy	90	30	Life expectancy index = $100 \times (\text{actual value} - 30) \div (\text{actual max value} - 30)$
University enrollment	100	0%	Knowledge index = $100 \times (\text{actual value} - 0) \div (100 - 0)$
Internet penetration	100	0%	Information index = $100 \times (\text{actual value} - 0) \div (100 - 0)$
Ratio of treated domestic wastewater	100	0%	Environment index = $100 \times (\text{actual value} - 0) \div (100 - 0)$
PPP per capita	80000 (PPP)	200 (PPP)	Affluence index = $100 \times (\text{actual value} - 200) \div (\text{actual max value} - 200)$
HDI_N	100	0	$HDI_N = (\text{life expectancy index} \times \text{knowledge index} \times \text{information index} \times \text{environment index} \times \text{affluence index})^{1/5}$

Note: the maximum value is the predicted mean value of developed countries in 2030 (the mean value of high-income countries predicted based on the annual growth rates from 1990 to 2015 and from 2000 to 2015). The minimum value is roughly the lowest value of 131 sample countries in 1990. The index of a single indicator is less than or equal to 100 (scored 100 when the value is over 100). GNI per capita at PPP per capita is adopted. As the ratio of treated domestic wastewater is hard to get, the calculation adopts the percentage of people using safely managed sanitation services instead. The replacement implies a hypothesis that people using safely managed sanitation services have their wastewater being treated.

3.2 Advantages of HDI_N

First, HDI_N reflects the average achievement of countries in five dimensions of human development: a long and healthy life, being knowledgeable, information sharing, environment friendly, and an affluent standard of living. It involves progress in the economic, social, cultural and ecological fields. Second, HDI_N features simple methods of calculation.

3.3 Limitations of HDI_N

First, some indicators for the HDI_N, such as the university enrollment, cannot be calculated based on complete statistical data, affecting the results of assessment. Second, in calculating the environment index, the ratio of treated domestic wastewater adopts a replacement, and the statistical data are also incomplete. These may lead to some errors.

4. HDIN and international comparison

4.1 Top 10 with the highest indices in 2015

In 2015, the top 10 countries with the highest GDP per capita, HDI and HDI_N indices are shown in the following Table 6. Among them, seven countries had their three indices all ranked among the top 10. They are Switzerland, Norway, Australia, the United States, Singapore, Denmark, and the Netherlands. Ireland has two indices, GDP per capita and HDI, ranked among the top 10. Another seven countries had one index ranked among top 10 in the world. They are Sweden, the UK, Germany, Canada, Austria, Finland and South Korea.

Table 6 Top 10 with the highest GDP per capita, HDI and HDI_N indices in 2015

GDP per capita (in US\$) and the ranking			HDI and the ranking			HDI _N and the ranking		
Switzerland	82016	1	Norway	0.949	1	Singapore	90.6	1
Norway	74498	2	Australia	0.939	2	Norway	83.8	2
Ireland	61808	3	Switzerland	0.939	3	Denmark	82.9	3
Australia	56561	4	Germany	0.926	4	The Netherlands	82.4	4
The U.S.	56444	5	Denmark	0.925	5	Switzerland	81.4	5
Singapore	54941	6	Singapore	0.925	6	The U.S.	81.0	6
Denmark	53013	7	The Netherlands	0.924	7	Austria	80.8	7
Sweden	50812	8	Ireland	0.923	8	Finland	79.4	8
The Netherlands	44746	9	Canada	0.92	9	South Korea	79.4	9
The UK	44306	10	The U.S.	0.92	10	Australia	79.1	10

Note: the ranking refers to that of 131 sample countries (with complete statistical data and a population over 1 million).

4.2 Relevance between three indices and the rankings in 2015

The statistical data of the 128 countries out of 131 sample countries in 2015 are complete. There is obvious relevance among the three indices of GDP per capita, HDI and HDI_N, so is between the indices and the rankings (See Table 7). This manifests that there is no significant distinction among the three methods of calculation seeing from the results of assessment and ranking. But the distinction is obvious seeing from the contents of assessment (See Table 8).

Table 7 Relevance between three indices and the ranking in 2015

Item	GDP per capita and HDI	HDI and HDIN	GDP per capita and HDI _N
Relevance of coefficients regarding different values	0.735 ***	0.954 ***	0.831 ***
Relevance of coefficients regarding rankings	0.961 ***	0.981 ***	0.966 ***

Note: *** represents significant relevance.

Table 8 Comparison of GDP per capita, HDI and HDI_N

Item	GDP per capita	HDI	HDI _N
Meaning	Achievement of human development in one dimension	The average achievement in three dimensions of human development	The average achievement in five dimensions of human development
Indicator	GDP per capita involves indicators regarding the sizes of the economy and population	Indicators regarding life expectancy, knowledge, and a decent standard of living	Indicators regarding life expectancy, knowledge, information, environment and affluence.

4.3 International comparison among some countries in 2015

In 2015, among the 18 countries (12 of which were members of the academic board of the International Modernization Forum and the other six of which attended the International Modernization Forum, six countries had their rankings of GDP per capita higher than that of the HDI, and 12 countries lower than the HDI. Five countries had their rankings of GDP per capita higher than that of HDI_N, and nine one lower. Nine countries had their rankings of HDI higher than that of HDI_N, and another eight countries lower (See Table 9).

Table 9 Three indices and the rankings in 2015

Country	GDP per capita and the ranking		HDI and the ranking		HDI _N and the ranking		(1)-(2)	(2)-(3)	(1)-(3)
The U.S.	56444	5	0.92	10	81.0	6	-5	4	-1
The Netherlands	44746	9	0.924	7	82.4	4	2	3	5
The UK	44306	10	0.909	13	74.0	17	-3	-4	-7
Finland	42424	13	0.895	19	79.4	8	-6	11	5
Germany	41324	14	0.926	4	77.8	12	10	-8	2
Italy	30180	20	0.887	22	67.4	26	-2	-4	-6
South Korea	27105	22	0.901	15	79.4	9	7	6	13
Czech Republic	17716	28	0.878	24	66.1	28	4	-4	0
Poland	12566	37	0.855	27	61.5	32	10	-5	5
Russia	9347	44	0.804	37	58.3	36	7	1	8
Romania	8978	46	0.802	38	49.4	46	8	-8	0
China	8069	49	0.738	65	45.1	50	-16	15	-1
Denmark	53013	7	0.925	5	82.9	3	2	2	4
Sweden	50812	8	0.913	12	77.2	13	-4	-1	-5
Japan	34568	19	0.903	14	77.1	14	5	0	5
Hungary	12484	38	0.836	33	57.5	38	5	-5	0
Georgia	3765	73	0.769	48	36.6	67	25	-19	6
India	1606	92	0.624	90	23.9	87	2	3	5
High-income country	39137		0.892*		74.5				
Medium-income country	4792		0.631*		33.1				
Low-income country	762		0.497*		10.6				
world average	10172		0.717*		38.4				

Note: the ranking refers to that of 131 sample countries. GDP per capita is indicated in US\$. * represents the highest human development level, medium human development level, low human development level and world average human development level respectively. (1) - (2) refers to the ranking of GDP per capita minus the ranking of HDI. (2) - (3) refers to the ranking of HDI minus the ranking of HDI_N. (1) - (3) refers to the ranking of GDP per capita minus the ranking of HDI_N.

5. Relating policy agendas

With different meanings and indicators, GDP per capita, HDI and HDI_N has different

implications to public policies.

5.1 Relating policies of GDP per capita

GDP per capita is a core indicator to measure economic development. It implicates many policy agendas. The following explains it with examples.

The first is to maintain economic growth and improve the growth rate of GDP per capita. The second is to restructure the economy by improving the proportion of industrial and service sectors while reducing the proportion of agricultural sectors. The third is to adjust the structure of income, optimize the proportion of labor payment and asset income, and improve the taxation system. The fourth is to adjust expenditure structure, optimize the proportion of consumption and investment, and expand net export. The fifth is to highlight the environmental cost of growth in GDP per capita to boost green GDP growth. The sixth is to highlight new technology and innovation to improve the quality of economic development.

5.2 Relating policies of HDI

The UNPD notes that human development should be achieved by and for the people. It is a process as well as a goal. Human development is about progress in four dimensions of democratic participation, economic equity, health and education, peace and personal safety. Across the four dimensions, three basic ones are about a long and healthy life, being knowledgeable and a decent standard of living.

The first is about human health and the improvement of life quality. The second is about developing education at all levels to improve the quality of the nationals. The third is about raising the income level and promoting economic equity. The fourth is about safeguarding human peace and personal safety. The fifth is about giving people more choices and increasing autonomy of the people. The sixth is about promoting international exchanges and defending citizen rights.

5.3 Relating policies of HDI_N

China Modernization Report 2010: Overview of Global Modernization notes that the emerging of information revolution, ecological revolution and knowledge-based economy since the 1970s has changed and will continue to change people's lifestyle and basic ideas. At present, all development countries have entered the second stage of modernization, but the vast majority of developing countries remain at the first stage. The second stage represents the frontier and direction of human development, and people's overall development and improvement of living standards have been on the center of agendas during the second stage of modernization.

The relating policies first are about extending life expectancy and improving the quality of life. Second, it is about pacing up the popularization of knowledge and narrowing knowledge gap to build a knowledge-based society. Third, it is about information sharing and narrowing the digital gap to build a society with wide IT application. Fourth, it is about green development and win-win approach to economic and ecological development to build ecological civilization. Fifth, it is about raising the purchasing power and narrowing the gap between the wealth and the poor to build a harmonious society. Sixth, it is about improving the capability of innovation and accelerating the

upgrading of knowledge to build an innovation-driven society.

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Appendixes

Appendix 1 HDI_N of 131 countries in 2015

Appendix 2 international comparison of the three indices in 2015

Appendix 1 HDIN of 131 countries in 2015

Country	Life expectancy	University enrollment	Internet penetration	Ratio of treated domestic wastewater*	Purchasing power per capita	Health index	Knowledge index	Information index	Environment index	Affluence index	HDI _N	Ranking
Singapore	82.7	83.9	79.0	100.0	83760	87.9	83.9	79.0	100.0	104.7	90.6	1
Norway	82.3	78.0	96.8	78.4	64280	87.2	78.0	96.8	78.4	80.3	83.8	2
Denmark	80.7	82.1	96.3	93.2	50190	84.5	82.1	96.3	93.2	62.6	82.9	3
The Netherlands	81.5	80.6	91.7	97.5	49250	85.8	80.6	91.7	97.5	61.5	82.4	4
Switzerland	82.9	57.5	87.5	99.0	65210	88.2	57.5	87.5	99.0	81.5	81.4	5
The U.S.	78.7	88.9	74.6	89.5	57880	81.2	88.9	74.6	89.5	72.3	81.0	6
Austria	81.2	80.6	83.9	96.8	49520	85.3	80.6	83.9	96.8	61.8	80.8	7
Finland	81.5	87.7	86.4	91.6	42450	85.8	87.7	86.4	91.6	52.9	79.4	8
South Korea	82.0	93.3	89.9	98.5	35300	86.7	93.3	89.9	98.5	44.0	79.4	9
Australia	82.4	119.7	84.6	74.2	45270	87.3	100	84.6	74.2	56.5	79.1	10
Belgium	81.0	74.6	85.1	97.1	45330	85.0	74.6	85.1	97.1	56.6	78.4	11
Germany	80.6	66.3	87.6	95.5	48690	84.4	66.3	87.6	95.5	60.8	77.8	12
Sweden	82.2	62.3	90.6	92.3	48510	87.0	62.3	90.6	92.3	60.5	77.2	13
Japan	83.8	63.2	91.1	99.8	42270	89.7	63.2	91.1	99.8	52.7	77.1	14
Ireland	81.5	77.2	83.5	70.3	54230	85.8	77.2	83.5	70.3	67.7	76.6	15
Spain	82.8	89.5	78.7	97.5	34740	88.1	89.5	78.7	97.5	43.3	76.5	16
The UK	81.0	57.3	92.0	97.6	40660	84.9	57.3	92.0	97.6	50.7	74.0	17
Canada	82.1	65.3	88.5	76.8	43960	86.9	65.3	88.5	76.8	54.8	73.3	18
New Zealand	81.5	80.6	88.2	75.9	36090	85.8	80.6	88.2	75.9	45.0	73.1	19
France	82.3	62.8	78.0	92.1	41100	87.1	62.8	78.0	92.1	51.3	72.6	20
Saudi Arab	74.4	60.6	69.6	84.5	55580	74.0	60.6	69.6	84.5	69.4	71.2	21
Israel	82.1	64.7	77.4	93.3	35580	86.8	64.7	77.4	93.3	44.3	70.9	22
Estonia	77.6	72.0	88.4	92.9	28090	79.3	72.0	88.4	92.9	34.9	69.7	23
Greece	81.0	126.4	66.8	75.2	26820	85.1	100	66.8	75.2	33.4	67.7	24
Slovenia	80.8	80.0	73.1	75.7	30520	84.6	80.0	73.1	75.7	38.0	67.7	25
Italy	82.5	62.9	58.1	95.4	36440	87.6	62.9	58.1	95.4	45.4	67.4	26
Chile	79.3	88.3	76.6	85.5	22120	82.2	88.3	76.6	85.5	27.5	66.6	27
Czech Republic	78.6	64.5	75.7	81.9	31210	81.0	64.5	75.7	81.9	38.9	66.1	28
Kuwait	74.6	21.1	77.5	100.0	81000	74.3	21.1	77.5	100.0	101.3	65.7	29
Latvia	74.5	74.3	79.2	78.4	24620	74.1	74.3	79.2	78.4	30.6	63.7	30

Slovakia	76.6	50.7	77.6	81.7	28990	77.6	50.7	77.6	81.7	36.1	61.8	31
Poland	77.5	66.7	68.0	77.1	25670	79.1	66.7	68.0	77.1	31.9	61.5	32
Portugal	81.1	61.4	68.6	61.7	28720	85.2	61.4	68.6	61.7	35.7	60.2	33
Lithuania	74.3	69.7	71.4	61.2	27730	73.9	69.7	71.4	61.2	34.5	60.0	34
Belarus	73.6	88.2	67.3	76.2	17540	72.7	88.2	67.3	76.2	21.7	59.0	35
Russia	71.2	80.5	70.1	-	24060	68.6	80.5	70.1	-	29.9	58.3	36
Croatia	77.3	67.0	69.8	60.1	22860	78.8	67.0	69.8	60.1	28.4	57.5	37
Hungary	75.6	48.9	72.8	75.6	24680	75.9	48.9	72.8	75.6	30.7	57.5	38
Malaysia	75.1	42.4	71.1	81.9	25900	75.2	42.4	71.1	81.9	32.2	56.9	39
Turkey	75.5	95.4	53.7	44.3	24570	75.8	95.4	53.7	44.3	30.5	55.5	40
Uruguay	77.3	55.6	64.6	63.6	20530	78.9	55.6	64.6	63.6	25.5	54.0	41
Kazakhstan	72.0	45.8	70.8	-	23550	70.0	45.8	70.8	-	29.3	50.8	42
Bulgaria	74.6	70.3	56.7	48.9	17820	74.4	70.3	56.7	48.9	22.1	50.2	43
Albania	78.2	66.4	63.3	64.8	11800	80.3	66.4	63.3	64.8	14.5	50.2	44
Argentina	76.4	86.0	68.0	26.5	19980	77.4	86.0	68.0	26.5	24.8	49.5	45
Romania	75.0	46.8	55.8	57.1	21130	75.0	46.8	55.8	57.1	26.2	49.4	46
Iran	75.7	68.8	45.3	-	17620	76.2	68.8	45.3	-	21.8	47.7	47
Costa Rica	79.6	53.6	59.8	-	15000	82.7	53.6	59.8	-	18.5	47.1	48
Panama	77.8	47.3	51.2	-	19980	79.7	47.3	51.2	-	24.8	46.8	49
China	76.1	45.4	50.3	59.7	14400	76.8	45.4	50.3	59.7	17.8	45.1	50
Syria	69.9	43.7	30.0	-	-	66.5	43.7	30.0	-	-	44.3	51
Brazil	75.3	51.1	58.3	38.6	15320	75.5	51.1	58.3	38.6	18.9	44.0	52
Macedonia	75.5	41.1	70.4	-	13400	75.9	41.1	70.4	-	16.5	43.7	53
Dominica	73.7	50.1	54.2	-	13660	72.8	50.1	54.2	-	16.9	42.7	54
Jordan	74.2	37.4	60.1	77.3	8940	73.6	37.4	60.1	77.3	11.0	42.6	55
Mexico	76.9	30.8	57.4	45.2	16830	78.2	30.8	57.4	45.2	20.8	42.0	56
Tunisia	75.5	34.7	46.5	73.5	11110	75.9	34.7	46.5	73.5	13.7	41.5	57
Azerbaijan	71.9	25.5	77.0	-	17100	69.9	25.5	77.0	-	21.2	41.3	58
Thailand	75.1	49.3	39.3	-	15400	75.2	49.3	39.3	-	19.0	40.8	59
Ukraine	71.2		48.9	-	7850	68.6	80.1	48.9	-	9.6	40.1	60
Ecuador	76.1	45.5	48.9	42.4	11250	76.8	45.5	48.9	42.4	13.8	39.8	61
Peru	74.7	69.6	40.9	30.3	12100	74.6	69.6	40.9	30.3	14.9	39.5	62
Armenia	74.4	46.5	59.1	-	9090	74.1	46.5	59.1	-	11.1	38.8	63
Lebanon	79.4	38.5	74.0	20.1	13990	82.3	38.5	74.0	20.1	17.3	38.2	64
Colombia	74.2	55.7	55.9	19.6	13490	73.7	55.7	55.9	19.6	16.7	37.6	65
Egypt	71.3	35.1	37.8	60.6	10570	68.8	35.1	37.8	60.6	13.0	37.3	66
Georgia	73.1	45.6	47.6	-	9350	71.8	45.6	47.6	-	11.5	36.6	67
Paraguay	73.0	35.1	49.7	-	11430	71.7	35.1	49.7	-	14.1	36.4	68
Venezuela	74.4		61.9	19.1	16010	73.9	28.5	61.9	19.1	19.8	34.6	69
Mongolia	69.1	68.6	22.5	-	11160	65.1	68.6	22.5	-	13.7	34.3	70
Monaca	75.6	28.4	57.1	38.1	7670	76.0	28.4	57.1	38.1	9.4	33.8	71
Moldova	71.5	41.2	69.0	-	5410	69.1	41.2	69.0	-	6.5	33.7	72
Botswana	65.8	28.2	37.3	-	15770	59.7	28.2	37.3	-	19.5	33.3	73
The Philippines	69.0	29.6	53.7	-	8850	64.9	29.6	53.7	-	10.8	32.5	74
Algeria	75.9	36.8	38.2	19.1	14220	76.4	36.8	38.2	19.1	17.6	32.5	75
South Africa	62.0	20.5	51.9	-	12850	53.3	20.5	51.9	-	15.9	30.8	76
Jamaica	75.8	26.9	42.2	-	8310	76.4	26.9	42.2	-	10.2	30.6	77
Vietnam	76.1	28.8	43.5	-	5610	76.8	28.8	43.5	-	6.8	28.4	78
Sri Lanka	75.1	19.8	30.0	-	11500	75.1	19.8	30.0	-	14.2	28.2	79
El Salvador	73.3	28.1	26.8	-	7120	72.1	28.1	26.8	-	8.7	26.2	80
Turkmenistan	67.7	-	15.0	-	15030	62.8	-	15.0	-	18.6	26.0	81
Indonesia	69.0	23.0	22.0	-	10670	65.0	23.0	22.0	-	13.1	25.6	82
Guatemala	73.2	21.3	28.8	-	7600	71.9	21.3	28.8	-	9.3	25.3	83
Kirghizia	70.7	47.3	30.2	-	3310	67.8	47.3	30.2	-	3.9	24.8	84
Namibia	63.8	19.3	25.7	-	10570	56.3	19.3	25.7	-	13.0	24.5	85
Bolivia	68.8	-	35.6	19.0	6720	64.6	-	35.6	19.0	8.2	24.4	86
India	68.3	26.9	26.0	-	6060	63.8	26.9	26.0	-	7.3	23.9	87

Honduras	73.4	20.8	27.6	-	4280	72.3	20.8	27.6	-	5.1	21.5	88
Uzbekistan	71.2	8.2	42.8	-	6200	68.7	8.2	42.8	-	7.5	20.6	89
Laos	66.3	18.1	18.2	-	5860	60.6	18.1	18.2	-	7.1	19.4	90
Tajikistan	70.9	26.3	19.0	-	3360	68.1	26.3	19.0	-	4.0	19.2	91
Ghana	62.4	15.8	31.4	-	3980	54.1	15.8	31.4	-	4.7	18.9	92
Nicaragua	75.1	10.8	19.7	-	5130	75.2	10.8	19.7	-	6.2	17.7	93
Zambia	61.4	-	21.0	-	3800	52.3	-	21.0	-	4.5	17.1	94
Bangladesh	72.2	17.3	14.4	-	3550	70.3	17.3	14.4	-	4.2	16.5	95
Cambodia	68.6	13.1	22.3	-	3290	64.4	13.1	22.3	-	3.9	16.4	96
Senegal	66.8	10.4	21.7	24.1	3040	61.3	10.4	21.7	24.1	3.6	16.4	97
Cameroon	57.6	17.4	20.7	-	3450	46.0	17.4	20.7	-	4.1	16.1	98
Nigeria	53.0	9.6	24.5	-	5890	38.3	9.6	24.5	-	7.1	15.9	99
Republic of Yemen	64.7	10.5	24.1	-	3160	57.9	10.5	24.1	-	3.7	15.3	100
Pakistan	66.3	9.9	14.0	-	5310	60.5	9.9	14.0	-	6.4	15.2	101
Cote d'Ivoire	53.1	9.0	38.4	-	3350	38.4	9.0	38.4	-	3.9	15.1	102
Nepal	69.9	14.9	17.6	-	2500	66.5	14.9	17.6	-	2.9	15.0	103
Angola	61.2	8.5	12.4	-	6720	52.1	8.5	12.4	-	8.2	14.6	104
Myanmar	66.5	5.4	21.7	-	5220	60.8	5.4	21.7	-	6.3	14.6	105
The Republic of Congo	64.1	-	7.6	-	5840	56.9	-	7.6	-	7.1	14.5	106
Lesotho	53.7	9.1	25.0	-	3210	39.6	9.1	25.0	-	3.8	13.6	107
Kenya	66.7	9.4	16.6	-	2990	61.2	9.4	16.6	-	3.5	13.5	108
Papua New Guinea	65.4	-	7.9	-	3890	59.0	-	7.9	-	4.6	12.9	109
Zimbabwe	60.4	8.5	22.7	-	2110	50.7	8.5	22.7	-	2.4	12.4	110
Mauritania	63.1	5.5	15.2	-	3690	55.1	5.5	15.2	-	4.4	11.9	111
Benin	60.6	13.6	11.3	-	2100	51.1	13.6	11.3	-	2.4	11.7	112
Rwanda	66.7	7.9	18.0	-	1800	61.2	7.9	18.0	-	2.0	11.5	113
Haiti	63.1	-	12.2	-	1770	55.1	-	12.2	-	2.0	11.0	114
Ethiopia	65.0	7.3	13.9	-	1630	58.4	7.3	13.9	-	1.8	10.1	115
Guinea	59.4	10.4	8.2	-	1820	49.0	10.4	8.2	-	2.0	9.6	116
Tanzania	65.0	3.9	10.0	-	2610	58.3	3.9	10.0	-	3.0	9.1	117
Uganda	59.6	3.9	17.8	-	1740	49.3	3.9	17.8	-	1.9	9.0	118
Togo	59.9	10.7	7.1	-	1590	49.9	10.7	7.1	-	1.7	9.0	119
Mozambique	57.7	6.5	16.9	-	1170	46.2	6.5	16.9	-	1.2	8.9	120
Mali	57.5	5.5	10.3	-	2000	45.8	5.5	10.3	-	2.3	8.7	121
Burkina Faso	59.9	5.1	11.4	-	1640	49.9	5.1	11.4	-	1.8	8.5	122
Sierra Leone	51.4	-	6.3	-	1380	35.7	-	6.3	-	1.5	6.9	123
Madagascar	65.5	4.8	4.2	-	1410	59.2	4.8	4.2	-	1.5	6.5	124
Burundi	57.1	6.0	4.9	-	760	45.2	6.0	4.9	-	0.7	5.5	125
Democratic Republic of Congo	59.2	6.6	3.8	-	800	48.7	6.6	3.8	-	0.8	5.5	126
Niger	59.7	3.5	2.5	8.5	950	49.4	3.5	2.5	8.5	0.9	5.1	127
Chad	52.6	2.1	3.5	-	2130	37.6	2.1	3.5	-	2.4	5.1	128
Malawi	62.7	0.7	9.3	-	1120	54.4	0.7	9.3	-	1.2	4.5	129
Eritrea	64.6	2.5	1.1	-	1370	57.7	2.5	1.1	-	1.5	3.9	130
Central Africa	51.4	2.6	3.8	-	660	35.7	2.6	3.8	-	0.6	3.8	131
High-income country	80.3	76.1	79.4	80.5	45129	83.9	76.1	79.4	80.5	56.3	74.5	
Medium-income country	71.1	34.1	38.6	-	10793	68.5	34.1	38.6	-	13.3	33.1	
Low-income country	62.5	8.9	11.7	-	2000	54.2	8.9	11.7	-	2.3	10.6	
World average	71.9	36.7	43.0	39.3	15696	69.8	36.7	43.0	39.3	19.4	38.4	

Note: * refers to replacing it with the percent of people using safely managed sanitation services. “-” represents data

are not available.

Appendix 2 international comparison of the three indices in 2015

Country	GDP per capita and ranking		HDI and ranking		HDI _N and ranking		(1)-(2)	(2)-(3)	(1)-(3)
Switzerland	82016	1	0.939	3	81.4	5	-2	-2	-4
Norway	74498	2	0.949	1	83.8	2	1	-1	0
Ireland	61808	3	0.923	8	76.6	15	-5	-7	-12
Australia	56561	4	0.939	2	79.1	10	2	-8	-6
The U.S.	56444	5	0.920	10	81.0	6	-5	4	-1
Singapore	54941	6	0.925	6	90.6	1	0	5	5
Denmark	53013	7	0.925	5	82.9	3	2	2	4
Sweden	50812	8	0.913	12	77.2	13	-4	-1	-5
The Netherlands	44746	9	0.924	7	82.4	4	2	3	5
The UK	44306	10	0.909	13	74.0	17	-3	-4	-7
Austria	44207	11	0.893	20	80.8	7	-9	13	4
Canada	43525	12	0.920	9	73.3	18	3	-9	-6
Finland	42424	13	0.895	19	79.4	8	-6	11	5
Germany	41324	14	0.926	4	77.8	12	10	-8	2
Belgium	40361	15	0.896	18	78.4	11	-3	7	4
New Zealand	38649	16	0.915	11	73.1	19	5	-8	-3
France	36613	17	0.897	17	72.6	20	0	-3	-3
Israel	35691	18	0.899	16	70.9	22	2	-6	-4
Japan	34568	19	0.903	14	77.1	14	5	0	5
Italy	30180	20	0.887	22	67.4	26	-2	-4	-6
Kuwait	29109	21	0.800	39	65.7	29	-18	10	-8
South Korea	27105	22	0.901	15	79.4	9	7	6	13
Spain	25790	23	0.884	23	76.5	16	0	7	7
Slovenia	20873	24	0.89	21	67.7	25	3	-4	-1
Saudi Arab	20733	25	0.847	30	71.2	21	-5	9	4
Portugal	19253	26	0.843	32	60.2	33	-6	-1	-7
Greece	18071	27	0.866	25	67.7	24	2	1	3
Czech Republic	17716	28	0.878	24	66.1	28	4	-4	0
Estonia	17156	29	0.865	26	69.7	23	3	3	6
Slovakia	16133	30	0.845	31	61.8	31	-1	0	-1
Uruguay	15525	31	0.795	41	54.0	41	-10	0	-10
Lithuania	14289	32	0.848	28	60.0	34	4	-6	-2
Chile	13737	33	0.847	29	66.6	27	4	2	6
Argentina	13698	34	0.827	35	49.5	45	-1	-10	-11
Panama	13684	35	0.788	45	46.8	49	-10	-4	-14
Latvia	13640	36	0.83	34	63.7	30	2	4	6
Poland	12566	37	0.855	27	61.5	32	10	-5	5
Hungary	12484	38	0.836	33	57.5	38	5	-5	0
Croatia	11758	39	0.827	36	57.5	37	3	-1	2
Costa Rica	11393	40	0.776	46	47.1	48	-6	-2	-8
Turkey	10985	41	0.767	49	55.5	40	-8	9	1
Kazakhstan	10511	42	0.794	43	50.8	42	-1	1	0
Malaysia	9649	43	0.789	44	56.9	39	-1	5	4
Russia	9347	44	0.804	37	58.3	36	7	1	8
Mexico	9291	45	0.762	54	42.0	56	-9	-2	-11
Romania	8978	46	0.802	38	49.4	46	8	-8	0
Brazil	8750	47	0.754	56	44.0	52	-9	4	-5
Lebanon	8452	48	0.763	53	38.2	64	-5	-11	-16
China	8069	49	0.738	65	45.1	50	-16	15	-1
Bulgaria	6993	50	0.794	42	50.2	43	8	-1	7
Dominica	6535	51	0.722	70	42.7	54	-19	16	-3
Botswana	6528	52	0.698	73	33.3	73	-21	0	-21
Turkmenistan	6433	53	0.691	76	26.0	81	-23	-5	-28

Ecuador	6150	54	0.739	64	39.8	61	-10	3	-7
Peru	6053	55	0.74	62	39.5	62	-7	0	-7
Colombia	6045	56	0.727	68	37.6	65	-12	3	-9
Belarus	5949	57	0.796	40	59.0	35	17	5	22
Thailand	5846	58	0.74	63	40.8	59	-5	4	-1
South Africa	5747	59	0.666	82	30.8	76	-23	6	-17
Azerbaijan	5500	60	0.759	55	41.3	58	5	-3	2
Jamaica	4940	61	0.73	67	30.6	77	-6	-10	-16
Iran	4862	62	0.774	47	47.7	47	15	0	15
Namibia	4852	63	0.64	87	24.5	85	-24	2	-22
Macedonia	4834	64	0.748	57	43.7	53	7	4	11
Algeria	4160	65	0.745	58	32.5	75	7	-17	-10
Paraguay	4109	66	0.693	74	36.4	68	-8	6	-2
Jordan	4096	67	0.741	61	42.6	55	6	6	12
Albania	3953	68	0.764	52	50.2	44	16	8	24
Mongolia	3947	69	0.735	66	34.3	70	3	-4	-1
Guatemala	3924	70	0.64	86	25.3	83	-16	3	-13
Sri Lanka	3842	71	0.766	51	28.2	79	20	-28	-8
Tunisia	3828	72	0.725	69	41.5	57	3	12	15
Georgia	3765	73	0.769	48	36.6	67	25	-19	6
Angola	3684	74	0.533	102	14.6	104	-28	-2	-30
El Salvador	3670	75	0.68	80	26.2	80	-5	0	-5
Armenia	3618	76	0.743	59	38.8	63	17	-4	13
Egypt	3548	77	0.691	75	37.3	66	2	9	11
Indonesia	3335	78	0.689	77	25.6	82	1	-5	-4
Bolivia	3077	79	0.674	81	24.4	86	-2	-5	-7
The Philippines	2878	80	0.682	79	32.5	74	1	5	6
Monaco	2864	81	0.647	84	33.8	71	-3	13	10
Nigeria	2655	82	0.527	104	15.9	99	-22	5	-17
Papua New Guinea	2606	83	0.516	106	12.9	109	-23	-3	-26
Honduras	2341	84	0.625	89	21.5	88	-5	1	-4
Laos	2159	85	0.586	92	19.4	90	-7	2	-5
Uzbekistan	2138	86	0.701	71	20.6	89	15	-18	-3
Ukraine	2125	87	0.743	60	40.1	60	27	0	27
Nicaragua	2073	88	0.645	85	17.7	93	3	-8	-5
Vietnam	2065	89	0.683	78	28.4	78	11	0	11
Moldova	1832	90	0.699	72	33.7	72	18	0	18
The Republic of Congo	1712	91	0.592	91	14.5	106	0	-15	-15
India	1606	92	0.624	90	23.9	87	2	3	5
Cote d'Ivoire	1434	93	0.474	119	15.1	102	-26	17	-9
Pakistan	1429	94	0.55	100	15.2	101	-6	-1	-7
Kenya	1355	95	0.555	99	13.5	108	-4	-9	-13
Cameroon	1354	96	0.518	105	16.1	98	-9	7	-2
Ghana	1354	97	0.579	94	18.9	92	3	2	5
Zambia	1314	98	0.579	95	17.1	94	3	1	4
Republic of Yemen	1286	99	0.482	117	15.3	100	-18	17	-1
Bangladesh	1210	100	0.579	93	16.5	95	7	-2	5
Cambodia	1163	101	0.563	96	16.4	96	5	0	5
Mauritania	1158	102	0.513	108	11.9	111	-6	-3	-9
Lesotho	1152	103	0.497	111	13.6	107	-8	4	-4
Myanmar	1139	104	0.556	98	14.6	105	6	-7	-1
Kirghizia	1121	105	0.664	83	24.8	84	22	-1	21
Zimbabwe	1033	106	0.516	107	12.4	110	-1	-3	-4
Tajikistan	919	107	0.627	88	19.2	91	19	-3	16
Senegal	911	108	0.494	112	16.4	97	-4	15	11
Tanzania	872	109	0.531	103	9.1	117	6	-14	-8
Haiti	815	110	0.493	113	11.0	114	-3	-1	-4
Chad	784	111	0.396	129	5.1	128	-18	1	-17

Benin	784	112	0.485	116	11.7	112	-4	4	0
Mali	750	113	0.442	121	8.7	121	-8	0	-8
Nepal	747	114	0.558	97	15.0	103	17	-6	11
Guinea	733	115	0.414	126	9.6	116	-11	10	-1
Rwanda	712	116	0.498	110	11.5	113	6	-3	3
Uganda	675	117	0.493	114	9.0	118	3	-4	-1
Ethiopia	645	118	0.448	120	10.1	115	-2	5	3
Sierra Leone	583	119	0.42	124	6.9	123	-5	1	-4
Burkina Faso	575	120	0.402	128	8.5	122	-8	6	-2
Togo	551	121	0.487	115	9.0	119	6	-4	2
Mozambique	528	122	0.418	125	8.9	120	-3	5	2
Democratic Republic of Congo	498	123	0.435	122	5.5	126	1	-4	-3
Madagascar	402	124	0.512	109	6.5	124	15	-15	0
Niger	364	125	0.353	130	5.1	127	-5	3	-2
Malawi	363	126	0.476	118	4.5	129	8	-11	-3
Central Africa	348	127	0.352	131	3.8	131	-4	0	-4
Burundi	301	128	0.404	127	5.5	125	1	2	3
Venezuela	-		0.767	50	34.6	69	-50	-19	
Syria	-		0.536	101	44.3	51		50	
Eritrea	-		0.42	123	3.9	130		-7	
High-income country	39137		0.892*		74.5				
Medium-income country	4792		0.631*		33.1				
Low-income country	762		0.497*		10.6				
World average	10172		0.717*		38.4				

Note: the ranking refers to that of 131 sample countries. * represents the highest human development level, medium human development level, low human development level and world average human development level respectively. (1) - (2) refers to the ranking of GDP per capita minus the ranking of HDI. (2) - (3) refers to the ranking of HDI minus the ranking of HDI_N. (1) - (3) refers to the ranking of GDP per capita minus the ranking of HDI_N.