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To cite this version:
Ravi Prakash, Pulkit Garg. Comparative assessment of HDI with Composite Development Index (CDI). Insights into Regional Development, 2019, 1 (1), pp.58-76. 10.9770/ird.2019.1.1(5). hal-02115225

HAL Id: hal-02115225
https://hal.archives-ouvertes.fr/hal-02115225
Submitted on 30 Apr 2019

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COMPARATIVE ASSESSMENT OF HDI WITH COMPOSITE DEVELOPMENT INDEX (CDI)

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Received: 10 December 2018; accepted 15 March 2019; published 30 March 2019

Abstract. This paper presents a novel approach to measure the human development, progress and growth of any country. The authors have developed an alternative index to the conventional 'HDI', named as 'Composite Development Index (CDI)' and have also presented an original approach to evaluate it quantitatively. The CDI integrates all the three (social, economic and environmental) aspects of sustainable development, along with peace and happiness. As proposed, the CDI is based on four parameters, i.e. Inequality adjusted HDI (IHDI), Scaled Green Index, Scaled Peace Index and Scaled Happiness Index, evaluated from globally accepted standard databases. Hence, the CDI is much more comprehensive and rational than the conventional HDI or GDP. The CDI values have been evaluated quantitatively for 126 countries of the world. Further, comparative assessment of the CDI has been done with the HDI for all the 126 nations. The results obtained have been startling as no country was even able to have a CDI score of 0.8 on a scale of 0.1 to 1. Switzerland had the highest CDI of 0.767. A country like Norway with the highest HDI of 0.953 had a CDI of only 0.742. On the other hand, countries like Costa Rica, Romania and Uruguay are in the top 20 nations in the CDI Ranking, much ahead of the countries like United Kingdom, France, and USA. The CDI can act as a single point of reference for policy-makers, governments and other development agencies, as it presents a consolidated picture of a country's development. Future course of action on the basis of the concept of CDI are also proposed. It can be concluded that efforts to have a high CDI (in comparison to a high GDP or HDI only) will pave the way forward for sustainable development and holistic progress for all the countries of the world.

Keywords: Human Development Index (HDI); peace; happiness; ecological footprint; Composite Development Index

Reference to this paper should be made as follows: Prakash, R.; Garg, P. 2019. Comparative assessment of HDI with Composite Development Index (CDI), Insights into Regional Development 1(1): 58-76. http://doi.org/10.9770/IRD.2019.1.1(5)

JEL Classifications: 011, 015

Additional disciplines (besides field of economics reflected in JEL classifications): sociology; ecology and environment.

1. Introduction

The adequacy of the GDP and the HDI as a measure of human welfare and development has been questionable for many years now. GDP is an indicator of economic activity of an economy, but it has wrongly been referred to as a very broad measure of human welfare (Costanza et al., 2009, Stiglitz et al., 2010). Nobel Laureate Joseph Stiglitz (2009) has linked the economic recession in 2009 to GDP fetishism of countries. Kuznets (1934), Marcuss and Kane (2007), McCulla and Smith (2007) have mentioned that GDP had never been developed to measure the socio-economic welfare of a nation; still it is the most prevalent parameter in measuring the overall growth and...
performance of any country. Costanza et al (2004) have exemplified a major issue with the GDP with an oil spill, whose occurrence would increase the GDP due to the associated cost of cleanup and remediation, but obviously its occurrence is undesirable from the environmental perspective. One more potential flaw with the GDP is that it does not take into account the distribution of income among individuals, which has a major impact on the social well being of any person (Wilkinson and Pickett, 2009). Kubiszewski et al (2013) have developed the GPI (Genuine Progress Index) because of these drawbacks of the GDP. Costanza et al (2009) have explicitly mentioned the shortcomings associated with the GDP by stating that GDP is a measure of 'economic quantity' and not 'economic quality' and 'human welfare'. They have also stated that due to the 'continued misuse' of the GDP, an immediate change in the indicators is required for the policy makers and the governments to frame policies and evaluate progress.

Due to these pitfalls associated with the GDP, many other indices of human welfare like the Human Development Index (HDI), Index of Sustainable Economic Welfare (ISEW), Sustainable Net benefit Index (SNBI), Index of Economic Well-Being (IEWB), Happy Planet Index (HPI) were developed (Lawn, 2005; Koroneos and Rokos, 2012). Prakash (2011, 2013) has developed the HPI (Holistic Progress Index) that is more comprehensive and based on more factors than the HDI or GDP to reflect peaceful and sustainable development without curtailing human freedom.

The Human Development Index (HDI) was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. 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. It is the geometric mean of normalized indices for each of the three dimensions (HDR: Human Development Reports, UNDP).

But, the widely adopted HDI has also been a subject of much criticism and subsequent modification. Smith (1993) pioneered to bring about and support significant modifications to the HDI. Noorbakhsh (1998) has highlighted various criticisms of the HDI and has also developed four modified indices of the HDI. Taner et al. (2011) have developed an alternative to the HDI considering unemployment. Mazumdar (2003) has developed an alternative method to calculate the HDI using the unadjusted Per Capita Real Gross Domestic Product (PCRGDP). Comim (2016) has tried to enlarge the human development perspective by using the capability approaches of Amartya Sen and Martha Nussbaum. He also investigates alternative measures of human development, including subjective, goals-based, sustainability and other indicators of human development. Jahan (2002) has identified some imperfections in the HDI and has also listed some alternative indices like the HPI (Human Poverty Index), GDI (Gender-related Development Index) and Gender Empowerment Measure (GEM). In 2010, a new index named as Inequality Adjusted HDI was published considering the Gini Coefficient and the relevance of inequalities due to efforts of Paul (1996), Hicks (1997) along with Hirschowitz and Orkin (1997). Ogwang (2000) and Fukuda-Parr (2003) have given suggestions for the addition of gender dimensions to the HDI. Harttgen and Klasen (2010) have advocated the use of a household based HDI. Furthermore, Doessel ve Gounder (1994) has suggested the importance of absolute values over rankings in the estimation of the HDI. Panigrahi and Sivramkrishna (2002), Osberg and Sharpe (2003), Chercyhe, Ooghe and Van Puyenbroeck (2008) have expressed their concerns with the HDI rankings. Harkness (2004) has highlighted reliable data collection as a major obstruction in low-income countries.

Relevant scientific literature on security and sustainability issues around the world can be found; which indicates a variety of approaches adopted for sustainable development. For energy security in the European Union, Melas et al (2017) and Abrhám et al (2018) have pointed out the positive role of renewable energy and distributed 'green energy' systems for self reliance. Bilan et al (2017) and Dudzevičiūtė and Prakapienė (2018) point out inclusive growth in European countries by examining social enterprises and interlinkages between poverty and income
inequality. Ślusarczyk and Kot (2018) have examined plastic free sustainable packaging as a contributor to sustainability in Poland. Smaliukiene (2018) points out a new trend of incorporating sustainability in military activities. Suleimenova et al (2018) examine requirements of environmental protection in food sector in a megalopolis.

Rees (1992); Wackernagel and Rees (1996); Rees (2017); Wackernagel et al. (2002, 2005) have utilized ecological footprint as an indicator of sustainable consumption. Moran et al. (2008) have mentioned that the ecological footprint to biocapacity could act as a useful indicator of environmental sustainability. They have also incorporated ecological footprint as a sustainability indicator along with the HDI so that development is within the regenerative biocapacity of planet Earth (Moran et al., 2008). Hence, the inculcation of the ecological footprint as an indicator of environmental sustainability is gaining much importance. Costanza et al., 2009 have also advocated for development that is within the carrying capacity of our supporting ecosystems.

In view of the deficiencies of important development parameters such as ecological footprint, peace and happiness in the above referred literature; the authors have developed an index of holistic progress and human development, named as the Composite Development Index (CDI). The CDI presents a fresh and comprehensive approach to measure the human development, progress, prosperity, welfare and growth of any country by taking into consideration the following four factors: HDI, ecological footprint, peace and happiness. All these parameters have been given equal weighting factors as the authors consider that all of them carry equal significance. A nation's very high GDP growth with a degraded environment and poor happiness record is not only a facade, but also self-destructing and impoverishing in the long run if the high economic growth is not in harmony with the social and environmental realms. The authors have evaluated the CDI for 126 nations and have ranked them accordingly. Also, a comparative assessment of the countries on the basis of their HDI ranking and their CDI ranking has also been done. The CDI as proposed has the potential to act as a comprehensive and complete index of sustainable development, human welfare and progress and the CDI rankings enlighten the way forward for all the countries of the world (developed or developing) to move in the right direction. The CDI can act as a single point of reference for policy-makers, governments and other development agencies and can pave the way forward for our sustainable future on the planet Earth.

2. Methodology

The HDI is based on merely three parameters (GDP, Literacy and health) and essentially does not represent a complete measure of human progress. It does not include other parameters like environmental impacts of human activities, happiness and peace that are integral to human development and growth of any nation. On the other hand, the Composite Development Index (CDI) incorporates practically all the major dimensions of a country's prosperity and does not rank countries simply on the basis of their high GDP. The following four parameters have been considered as crucial to determining the human development of any country and have been included in the CDI:

1. Inequality adjusted HDI (IHDI)
2. Scaled Happiness Index
3. Scaled Peace Index
4. Scaled Green Index

All these 4 parameters have been taken from widely accepted and reputed indices from their official reports and websites.

The formula used to calculate the CDI of any country is:
CDI = 0.25 X (IHDI + Scaled Green Index + Scaled Happiness Index + Scaled Peace Index)

All the four parameters of the CDI have been given equal weighting factors in the CDI. This is due to the absence any rational basis, which provides relative importance of various parameters linked to human development and growth.

The value of the CDI would vary between 0.1 to 1 for any country.

2.1 Inequality adjusted HDI (IHDI)

It cannot be denied that the HDI is an apt measure of a country's economic prosperity, education and health of its population. The IHDI goes a step further to show how the achievements in HDI are distributed among a nation's residents. The IHDI connotes the level of human development when inequality is accounted for. The relative difference between IHDI and HDI values is the loss due to inequality in distribution of the HDI within the country.

The absolute values of the IHDI have been accessed from the UNDP's website (HDII, 2018).
Hence, the absolute IHDI values have been used for the evaluation of CDI as the IHDI is an improvement over the conventional HDI. Further, the IHDI values as available from the cited reference vary between 0.25 to 0.88.

2.2 Scaled Green Index

The environmental impacts due to human activities have taken a toll on the Earth. The ecological footprint per capita (EF/capita) helps in the quantitative assessment of the impacts of human activities on earth. It can be used to examine various measures such as the feasibility of resource consumption, distribution of the world’s natural resources, waste assimilation and the overall sustainability of a country. The purpose of including the scaled green index in the CDI is to ensure that high human development does not occur at the cost of detrimental impacts to the environment and high material and resource consumption. The sustainability of a nation has been given equal importance as its GDP or IHDI.

The relative ranks of various countries based on their ecological footprint/capita have been taken from the 'Global Footprint Network' website (GFN, 2018).

Scaled Green Index = (0.1 + 0.9 * (X_g/X_t))

X_t = Total number of countries considered for the scaled green index calculation
X_g = EF/capita rank of a country (The country with the highest EF/capita will have the X_g value of 1 and that with the lowest EF/capita; X_g = X_t)

Hence, the quantitative value of the scaled green index would vary between 0.1 and 1.

2.3 Scaled Happiness Index

The Happiness Index has been based on the comprehensive ‘World Happiness Report’, 2018 (WHR, 2018). The Happiness Index incorporates the following factors and ranks countries on the basis of their happiness level.

- GDP per capita
- Social support
- Healthy life expectancy
- Freedom to make life choices
- Generosity
- Perceptions of corruption
- Dystopia and residual factors

The scaled happiness index has been included in the evaluation of the CDI because the happiness level of the people of any nation is equally important as its GDP or HDI growth. If a country has a majority of population that is stressed and morose, it will eventually lead to unsustainable growth and internal conflicts, thereby reducing its peace index.

Scaled Happiness Index = (0.1 + 0.9 * (X_t - X_h) /X_t)

X_t = Total number of countries considered for Scaled Happiness Index calculation
X_h = Relative rank of a country based on Happiness Index (The country with the highest happiness index will have the X_h value of 1 and that with the lowest happiness index; X_h = X_t)

Hence, the quantitative value of the scaled happiness index would vary between 0.1 and 1.

2.4 Scaled Peace Index

The scaled peace index is based on the 'Global Peace Index' report, 2018 (GPI, 2018). The Peace Index considers the following factors and ranks countries on the basis of their peace:

1. Safety and Security
2. Militarization
3. Ongoing Conflicts

The scaled peace index has been incorporated in the CDI because merely a high HDI or IHDI with great internal dissent and unrest does not hold much water. Also, the Global Peace Index of any country shows the amount of money spent for military expenditure (more than 5% of the GDP for some countries) that could be invested for developmental purposes.

Scaled Peace Index = (0.1 + 0.9 * (X_t - X_p /X_t))

X_t = Total number of countries considered for the evaluation of scaled peace index.
X_p = Relative rank of a country based on its 'Global Peace Index' (The country with the highest peace index will have the X_p value of 1 and that with the lowest happiness index; X_p = X_t)

Hence, the quantitative value of the scaled peace index would vary between 0.1 and 1.

3. Results

The CDI has been calculated for 126 nations by calculating the values for all the 4 parameters (i.e. IHDI, scaled green index, scaled happiness index, scaled peace index). Then, the values of all the 4 parameters have been summed up and multiplied by 0.25 so as to get the final value of CDI between 0.1 and 1.
3.1 Inequality adjusted HDI (IHDI)

The absolute values of the IHDI have been used for the computation of the CDI and they have been mentioned in Column (a) of Table 1.

3.2 Scaled Green Index

The scaled green index has been calculated using the formula given in section 2.2. The values of the scaled green index for 126 nations are mentioned in Column (b) of Table 1. Countries like USA and Canada that have a very high EF/capita have a very low scaled green index (very close to the minimum value 0.1). On the other hand, countries with a low EF/capita like India and Zambia have a very high scaled green index (close to 1).

3.3 Scaled Happiness Index

The scaled happiness index has been calculated using the formula given in section 2.3. The values of the scaled happiness index for 126 nations are mentioned in Column (c) of Table 1. Countries like Sweden and Netherlands rank very high on the scaled happiness index (close to the maximum value 1). On the other hand, countries like Angola, Togo and Sudan rank very low on the scaled happiness index (close to 0.1).

3.4 Scaled Peace Index

The scaled peace index has been calculated using the formula given in section 2.4. The values of the scaled peace index for 126 nations are mentioned in Column (d) of Table 1. Countries like Pakistan and Sudan that have a high degree of militarization and ongoing conflicts have a very low scaled peace index (very close to the minimum value 0.1). On the other hand, peaceful countries like Ireland and Canada score very high on the scaled peace index (close to 1).

Discussion

After substituting the values of all the 4 parameters in the formula of CDI, the values and ranks of CDI of all the 126 nations was computed. Switzerland emerged as the nation with the highest CDI (0.767), followed by Ireland (0.757), Norway (0.742) and Finland (0.741).

Further, the CDI and HDI ranks and values of all 126 nations were compared, and the complete comparative assessment is given in Table 2. The top 15 countries on the basis of their CDI and HDI are represented in Fig. 1 and Fig. 2 respectively.

Norway, which has the highest HDI (0.953), has a CDI of 0.742. This is due to its high ecological footprint per capita leading to a very low scaled green index (0.19). Similarly, countries like UK and France rank 24 and 31 as per the CDI ranking due to their scaled green index and scaled peace index.

Surprisingly, countries like Romania, Uruguay and Costa Rica that rank 52nd, 55th and 63rd in the HDI ranking, fare pretty well in the CDI ranking and secure the 13th, 14th and 8th spot respectively out of 126 countries, surpassing even very high HDI countries like Singapore, USA, France and UK. This contrast is explained by the higher scaled green index, scaled happiness index and scaled peace index of Romania, Uruguay and Costa Rica as compared to Singapore, USA, France and UK.
USA was able to secure the 70th rank in the CDI ranking, with a CDI of 0.538. On the other hand, it has a pretty high HDI of 0.924 and ranks 13th as per the HDI ranking. The culprit is the high EF/capita of USA leading to a poor scaled green index of 0.13 and the high degree of militarization leading to a low peace index of 0.33. Even countries like Switzerland, Ireland and Norway that have bagged the top spots in the CDI ranking have a lot of scope to improve their CDI values. They need to reduce their ecological footprint/capita so that their scaled green index increase, thereby improving their CDI values.

Table 1. CDI Calculations for 126 nations

| COUNTRY | IHDI (a) | Scaled Green Index (b) | Scaled Happiness Index (c) | Scaled Peace Index (d) | CDI (e) |
|---------|---------|------------------------|---------------------------|-----------------------|---------|
| India   | 0.468   | 0.880319149            | 0.232692308               | 0.249079755           | 0.458   |
| China   | 0.643   | 0.411170213            | 0.503846154               | 0.381595092           | 0.485   |
| Japan   | 0.876   | 0.305851064            | 0.688461538               | 0.950306748           | 0.705   |
| Thailand| 0.636   | 0.588297872            | 0.734615385               | 0.37607362            | 0.584   |
| Russia  | 0.738   | 0.253191489            | 0.659615385               | 0.149693252           | 0.450   |
| Australia| 0.861  | 0.152659574            | 0.942307692               | 0.928220859           | 0.721   |
| UK      | 0.835   | 0.30106383             | 0.890384615               | 0.685276074           | 0.678   |
| France  | 0.808   | 0.315425532            | 0.867307692               | 0.96134969            | 0.741   |
| Germany | 0.861   | 0.281914894            | 0.913461538               | 0.33190184            | 0.538   |
| Sweden  | 0.864   | 0.171808511            | 0.948076923               | 0.92699387           | 0.727   |
| Netherlands | 0.857  | 0.205319149            | 0.965384615               | 0.873006135           | 0.725   |
| Italy   | 0.771   | 0.368085106            | 0.728846158               | 0.790184049           | 0.665   |
| Greece  | 0.753   | 0.363297872            | 0.544230769               | 0.563803681           | 0.556   |
| USA     | 0.797   | 0.128723404            | 0.913461538               | 0.33190184            | 0.538   |
| Canada  | 0.852   | 0.133510638            | 0.959615385               | 0.96871166            | 0.728   |
| Mexico  | 0.609   | 0.569148936            | 0.861538462               | 0.226993865           | 0.567   |
| Brazil  | 0.578   | 0.511702128            | 0.838461538               | 0.414723926           | 0.586   |
| Argentina| 0.707  | 0.415957447            | 0.832692308               | 0.635582822           | 0.648   |
| Egypt   | 0.493   | 0.674468085            | 0.296153846               | 0.215950923           | 0.420   |
| Ethiopia| 0.331   | 0.904255319            | 0.267307692               | 0.23251337            | 0.434   |
| Norway  | 0.876   | 0.190957447            | 0.988461538               | 0.911656442           | 0.742   |
| Switzerland | 0.871  | 0.291489362            | 0.971153846               | 0.933742331           | 0.767   |
| South Korea | 0.773 | 0.224468085            | 0.671153846               | 0.729447853           | 0.600   |
| Ireland | 0.854   | 0.310638298            | 0.919230769               | 0.944785276           | 0.757   |
| Singapore| 0.816  | 0.214893617            | 0.803846154               | 0.955828221           | 0.698   |
| Denmark | 0.86    | 0.143085106            | 0.982692308               | 0.972392638           | 0.740   |
| Finland | 0.868   | 0.186170213            | 0.994230769               | 0.917177914           | 0.741   |
| Belgium | 0.836   | 0.162234043            | 0.907692308               | 0.88404908            | 0.697   |
| Austria | 0.835   | 0.210106383            | 0.930769231               | 0.983435583           | 0.740   |
| Israel  | 0.787   | 0.325                  | 0.93638462                | 0.193865031           | 0.561   |
| Slovenia| 0.846   | 0.329787234            | 0.705769231               | 0.939263804           | 0.705   |
| Country                          | 2019  | 2018  | 2017  | 2016  | 2015  | 2014  |
|---------------------------------|-------|-------|-------|-------|-------|-------|
| Spain                           | 0.754 | 0.401595745 | 0.671153846 | 0.834355828 | 0.665 |
| Cyprus                          | 0.769 | 0.473404255 | 0.648076923 | 0.657668712 | 0.637 |
| Poland                          | 0.787 | 0.34893617 | 0.757692308 | 0.823312883 | 0.679 |
| Lithuania                       | 0.757 | 0.234042553 | 0.711538462 | 0.801226994 | 0.626 |
| Slovakia                        | 0.797 | 0.37287234 | 0.775 | 0.878527607 | 0.706 |
| Latvia                          | 0.759 | 0.243617021 | 0.694230769 | 0.828834356 | 0.631 |
| Portugal                        | 0.732 | 0.420744681 | 0.555769231 | 0.97971411 | 0.672 |
| Chile                           | 0.71  | 0.392021277 | 0.855769231 | 0.845398773 | 0.701 |
| Hungary                         | 0.772 | 0.439893617 | 0.601923077 | 0.906134969 | 0.680 |
| Croatia                         | 0.756 | 0.435106383 | 0.526923077 | 0.850920245 | 0.642 |
| Montenegro                      | 0.741 | 0.454255319 | 0.532692308 | 0.679754601 | 0.602 |
| Bulgaria                        | 0.71  | 0.497340426 | 0.423076923 | 0.850920245 | 0.620 |
| Romania                         | 0.717 | 0.554787234 | 0.7 | 0.867484663 | 0.710 |
| Belarus                         | 0.755 | 0.320212766 | 0.578846154 | 0.442331288 | 0.524 |
| Uruguay                         | 0.689 | 0.52606383 | 0.821153846 | 0.795705521 | 0.708 |
| Kazakhstan                      | 0.737 | 0.229255319 | 0.653846154 | 0.613496933 | 0.558 |
| Iran                            | 0.707 | 0.463829787 | 0.388461538 | 0.276687117 | 0.459 |
| Costa Rica                      | 0.651 | 0.583510638 | 0.925 | 0.779141104 | 0.735 |
| Turkey                          | 0.669 | 0.492553191 | 0.573076923 | 0.177300613 | 0.478 |
| Mauritius                       | 0.683 | 0.449468085 | 0.682692308 | 0.889570552 | 0.676 |
| Panama                          | 0.623 | 0.607446809 | 0.844230769 | 0.72392638 | 0.700 |
| Serbia                          | 0.667 | 0.540425532 | 0.55 | 0.701840491 | 0.615 |
| Albania                         | 0.706 | 0.636170213 | 0.353846154 | 0.712883436 | 0.602 |
| Georgia                         | 0.682 | 0.698404255 | 0.873076923 | 0.436809816 | 0.673 |
| Sri Lanka                       | 0.664 | 0.789361702 | 0.261538462 | 0.63006135 | 0.586 |
| Bosnia and Herzegovina          | 0.649 | 0.482978723 | 0.330769231 | 0.508588957 | 0.493 |
| Venezuela                       | 0.636 | 0.487765957 | 0.463461538 | 0.210429448 | 0.449 |
| Azerbaijan                      | 0.681 | 0.631382979 | 0.411538462 | 0.271165644 | 0.499 |
| The former Yugoslav Republic of Macedonia | 0.661 | 0.506914894 | 0.486538462 | 0.519631902 | 0.544 |
| Armenia                         | 0.68  | 0.664893617 | 0.255769231 | 0.337423313 | 0.485 |
| Algeria                         | 0.598 | 0.593085106 | 0.515384615 | 0.398159509 | 0.526 |
| Ecuador                         | 0.603 | 0.660106383 | 0.723076923 | 0.585889571 | 0.643 |
| Ukraine                         | 0.701 | 0.530851064 | 0.203846154 | 0.160736196 | 0.399 |
| Peru                            | 0.606 | 0.617021277 | 0.625 | 0.591411043 | 0.610 |
| Colombia                        | 0.571 | 0.688829787 | 0.786538462 | 0.199386503 | 0.561 |
| Mongolia                        | 0.639 | 0.119148936 | 0.457692308 | 0.74601227 | 0.490 |
| Jordan                          | 0.617 | 0.640957447 | 0.480769231 | 0.458895706 | 0.549 |
| Tunisia                         | 0.573 | 0.621808511 | 0.359615385 | 0.569325153 | 0.531 |
| Jamaica                         | 0.608 | 0.722340426 | 0.676923077 | 0.503067485 | 0.628 |
| Turkmenistan                    | 0.575 | 0.257978723 | 0.607692308 | 0.342944785 | 0.446 |
| Gabon                           | 0.545 | 0.559574468 | 0.405769231 | 0.475460123 | 0.496 |

INSIGHTS INTO REGIONAL DEVELOPMENT
ISSN 2669-0195 (online) [http://ssidoi.org/jesi/]
2019 Volume I Number 1 (March) [http://doi.org/10.9770/IRD.2019.1.1(5)]
| Country                               | 2019 | 2020 | 2021 | 2022 | 2023 |
|---------------------------------------|------|------|------|------|------|
| Paraguay                              | 0.522| 0.425531915| 0.630769231| 0.574846626| 0.538 |
| Philippines                           | 0.574| 0.899468085| 0.590384615| 0.243558282| 0.577 |
| South Africa                          | 0.467| 0.459042553| 0.394230769| 0.309815951| 0.408 |
| Indonesia                             | 0.563| 0.760638298| 0.446153846| 0.696319018| 0.617 |
| Viet Nam                              | 0.574| 0.741489362| 0.451923077| 0.668711656| 0.609 |
| Bolivia (Plurinational State of)      | 0.514| 0.516489362| 0.624307692| 0.243558282| 0.479 |
| Iraq                                  | 0.546| 0.650531915| 0.325 | 0.480981595| 0.501 |
| El Salvador                           | 0.524| 0.669680851| 0.769230769| 0.116546147| 0.520 |
| Kyrgyzstan                           | 0.606| 0.731914894| 0.469230769| 0.359509202| 0.542 |
| Nicaragua                             | 0.507| 0.794148936| 0.763461538| 0.624539877| 0.672 |
| Guatemala                             | 0.467| 0.707978723| 0.826923077| 0.387116564| 0.597 |
| Tajikistan                            | 0.562| 0.932978723| 0.538461538| 0.370521479| 0.601 |
| Namibia                               | 0.422| 0.645744681| 0.313461538| 0.762576687| 0.536 |
| Honduras                              | 0.459| 0.746276596| 0.584615385| 0.348466258| 0.535 |
| Bhutan                                | 0.446| 0.334574468| 0.440384615| 0.895092025| 0.529 |
| Bangladesh                            | 0.462| 0.961702128| 0.336538462| 0.46503067| 0.562 |
| Congo (Republic)                      | 0.469| 0.856382979| 0.342307692| 0.30494479| 0.493 |
| Lao People's Democratic Republic      | 0.445| 0.717553191| 0.365384615| 0.74601227| 0.568 |
| Ghana                                 | 0.42 | 0.679255319| 0.376923077| 0.773619632| 0.562 |
| Kenya                                 | 0.434| 0.913829787| 0.284615385| 0.320858896| 0.488 |
| Zambia                                | 0.388| 0.942553191| 0.278846154| 0.734969325| 0.586 |
| Cambodia                              | 0.469| 0.822872324| 0.307692308| 0.46993865| 0.517 |
| Angola                                | 0.393| 0.770212766| 0.180769231| 0.54177791| 0.471 |
| Myanmar                               | 0.466| 0.775 | 0.25 | 0.326380368| 0.454 |
| Nepal                                 | 0.427| 0.918617021| 0.417307692| 0.536196319| 0.575 |
| Pakistan                              | 0.387| 0.966489362| 0.567307692| 0.166257669| 0.522 |
| Cameroon                              | 0.366| 0.842021277| 0.428846154| 0.265644172| 0.476 |
| Tanzania (United Republic of)         | 0.404| 0.79893617| 0.117307692| 0.718409408| 0.510 |
| Nigeria                               | 0.347| 0.885106383| 0.475 | 0.182822086| 0.472 |
| Rwanda                                | 0.367| 0.971276596| 0.128846154| 0.431288344| 0.475 |
| Lesotho                               | 0.359| 0.808510638| 0.186538462| 0.425766871| 0.445 |
| Mauritania                            | 0.348| 0.612234043| 0.273076923| 0.298773006| 0.383 |
| Madagascar                            | 0.385| 0.928191489| 0.175 | 0.790184049| 0.570 |
| Uganda                                | 0.37 | 0.870744681| 0.221153846| 0.409202454| 0.468 |
| Benin                                 | 0.326| 0.81805106 | 0.215384615| 0.619018405| 0.495 |
| Senegal                               | 0.34 | 0.889893617| 0.371153846| 0.712883436| 0.578 |
| Togo                                  | 0.344| 0.894680851| 0.198076923| 0.458957066| 0.474 |
| Sudan                                 | 0.328| 0.851597545| 0.209615385| 0.155214724| 0.386 |
| Afghanistan                           | 0.35 | 0.976063833| 0.163461538| 0.105521472| 0.399 |
| Haiti                                 | 0.304| 0.985638298| 0.146153846| 0.514110429| 0.487 |
| Malawi                                | 0.332| 0.956914894| 0.151923077| 0.757055215| 0.549 |
### Table 2. HDI vs CDI Rankings of 126 countries

| COUNTRY                              | CDI   | RANK(CDI) | HDI   | RANK(HDI) | Difference |
|--------------------------------------|-------|-----------|-------|-----------|------------|
| Switzerland                         | 0.767 | 1         | 0.944 | 2         | 1          |
| Ireland                             | 0.757 | 2         | 0.938 | 4         | 2          |
| Norway                              | 0.742 | 3         | 0.953 | 1         | 2          |
| Finland                             | 0.741 | 4         | 0.92  | 15        | 11         |
| Germany                             | 0.741 | 5         | 0.936 | 5         | 0          |
| Austria                             | 0.740 | 6         | 0.908 | 20        | 14         |
| Denmark                             | 0.740 | 7         | 0.929 | 11        | 4          |
| Costa Rica                          | 0.735 | 8         | 0.794 | 63        | 55         |
| Canada                              | 0.728 | 9         | 0.926 | 12        | 3          |
| Sweden                              | 0.727 | 10        | 0.933 | 7         | 3          |
| Netherlands                         | 0.725 | 11        | 0.931 | 10        | 1          |
| Australia                           | 0.721 | 12        | 0.939 | 3         | 9          |
| Romania                             | 0.710 | 13        | 0.811 | 52        | 39         |
| Uruguay                             | 0.708 | 14        | 0.804 | 55        | 41         |
| Slovakia                            | 0.706 | 15        | 0.855 | 38        | 23         |
| Slovenia                            | 0.705 | 16        | 0.896 | 25        | 9          |
| Japan                               | 0.705 | 17        | 0.909 | 19        | 2          |
| Chile                               | 0.701 | 18        | 0.843 | 44        | 26         |
| Panama                              | 0.700 | 19        | 0.789 | 66        | 47         |
| Singapore                           | 0.698 | 20        | 0.932 | 9         | 11         |
| Belgium                             | 0.697 | 21        | 0.916 | 17        | 4          |
| Hungary                             | 0.680 | 22        | 0.838 | 45        | 23         |
| Poland    | 0.679 | 23 | 0.865 | 33 | 10 |
|----------|-------|----|-------|----|----|
| UK       | 0.678 | 24 | 0.922 | 14 | 10 |
| Mauritius| 0.676 | 25 | 0.79  | 65 | 40 |
| Georgia  | 0.673 | 26 | 0.78  | 70 | 44 |
| Nicaragua| 0.672 | 27 | 0.658 | 124| 97 |
| Portugal | 0.672 | 28 | 0.847 | 41 | 13 |
| Spain    | 0.665 | 29 | 0.891 | 26 | 3 |
| Italy    | 0.665 | 30 | 0.88  | 28 | 2 |
| France   | 0.663 | 31 | 0.901 | 24 | 7 |
| Argentina| 0.648 | 32 | 0.825 | 47 | 15 |
| Ecuador  | 0.643 | 33 | 0.752 | 86 | 53 |
| Croatia  | 0.642 | 34 | 0.831 | 46 | 12 |
| Cyprus   | 0.637 | 35 | 0.869 | 32 | 3 |
| Latvia   | 0.631 | 36 | 0.847 | 41 | 5 |
| Jamaica  | 0.628 | 37 | 0.732 | 97 | 60 |
| Lithuania| 0.626 | 38 | 0.858 | 35 | 3 |
| Bulgaria | 0.620 | 39 | 0.813 | 51 | 12 |
| Indonesia| 0.617 | 40 | 0.694 | 116| 76 |
| Serbia   | 0.615 | 41 | 0.787 | 67 | 26 |
| Peru     | 0.610 | 42 | 0.75  | 89 | 47 |
| Viet Nam | 0.609 | 43 | 0.694 | 116| 73 |
| Albania  | 0.602 | 44 | 0.785 | 68 | 24 |
| Montenegro| 0.602| 45 | 0.814 | 50 | 5 |
| Tajikistan| 0.601| 46 | 0.65  | 127| 81 |
| South Korea| 0.600| 47 | 0.903 | 22 | 25 |
| Guatemala| 0.597 | 48 | 0.65  | 127| 79 |
| Sri Lanka| 0.586 | 49 | 0.77  | 76 | 27 |
| Zambia   | 0.586 | 50 | 0.588 | 144| 94 |
| Brazil   | 0.586 | 51 | 0.759 | 79 | 28 |
| Thailand | 0.584 | 52 | 0.755 | 83 | 31 |
| Senegal  | 0.578 | 53 | 0.505 | 164| 111|
| Philippines| 0.577| 54 | 0.699 | 113| 59 |
| Nepal    | 0.575 | 55 | 0.574 | 149| 94 |
| Madagascar| 0.570| 56 | 0.519 | 161| 105|
| Lao People's Democratic Republic| 0.568| 57 | 0.601 | 139| 82 |
| Sierra Leone| 0.567| 58 | 0.419 | 184| 126|
| Mexico   | 0.567 | 59 | 0.774 | 74 | 15 |
| Ghana    | 0.562 | 60 | 0.592 | 140| 80 |
| Bangladesh| 0.562| 61 | 0.608 | 136| 75 |
| Country                                      | Score | Rank | Value 1 | Rank 1 | Value 2 | Rank 2 |
|----------------------------------------------|-------|------|---------|--------|---------|--------|
| Colombia                                     | 0.561 | 62   | 0.747   | 90     | 28      |
| Israel                                       | 0.561 | 63   | 0.903   | 22     | 41      |
| Kazakhstan                                   | 0.558 | 64   | 0.58    | 0.8    | 63.2    |
| Greece                                       | 0.556 | 65   | 0.87    | 31     | 34      |
| Malawi                                       | 0.549 | 66   | 0.477   | 171    | 105     |
| Jordan                                       | 0.549 | 67   | 0.735   | 95     | 28      |
| The former Yugoslav Republic of Macedonia    | 0.544 | 68   | 0.757   | 80     | 12      |
| Kyrgyzstan                                   | 0.542 | 69   | 0.672   | 122    | 53      |
| USA                                          | 0.538 | 70   | 0.924   | 13     | 57      |
| Paraguay                                     | 0.538 | 71   | 0.702   | 110    | 39      |
| Namibia                                      | 0.536 | 72   | 0.647   | 129    | 57      |
| Honduras                                     | 0.535 | 73   | 0.617   | 133    | 60      |
| Tunisia                                      | 0.531 | 74   | 0.735   | 95     | 21      |
| Bhutan                                       | 0.529 | 75   | 0.612   | 134    | 59      |
| Algeria                                      | 0.526 | 76   | 0.754   | 85     | 9       |
| Belarus                                      | 0.524 | 77   | 0.808   | 53     | 24      |
| Pakistan                                     | 0.522 | 78   | 0.562   | 150    | 72      |
| El Salvador                                  | 0.520 | 79   | 0.674   | 121    | 42      |
| Cambodia                                     | 0.517 | 80   | 0.582   | 146    | 66      |
| Mozambique                                   | 0.514 | 81   | 0.437   | 180    | 99      |
| Tanzania (United Republic of)                | 0.510 | 82   | 0.538   | 154    | 72      |
| Iraq                                         | 0.501 | 83   | 0.685   | 120    | 37      |
| Azerbaijan                                   | 0.499 | 84   | 0.757   | 80     | 4       |
| Gabon                                        | 0.496 | 85   | 0.702   | 110    | 25      |
| Benin                                        | 0.495 | 86   | 0.515   | 163    | 77      |
| Burkina Faso                                 | 0.494 | 87   | 0.423   | 183    | 96      |
| Congo (Republic)                             | 0.493 | 88   | 0.457   | 176    | 88      |
| Bosnia and Herzegovina                       | 0.493 | 89   | 0.768   | 77     | 12      |
| Mongolia                                     | 0.490 | 90   | 0.741   | 92     | 2       |
| Liberia                                      | 0.489 | 91   | 0.435   | 181    | 90      |
| Kenya                                        | 0.488 | 92   | 0.59    | 142    | 50      |
| Haiti                                        | 0.487 | 93   | 0.498   | 168    | 75      |
| China                                        | 0.485 | 94   | 0.752   | 86     | 8       |
| Armenia                                      | 0.485 | 95   | 0.755   | 83     | 12      |
| Bolivia (Plurinational State of)             | 0.479 | 96   | 0.693   | 118    | 22      |
| Turkey                                       | 0.478 | 97   | 0.791   | 64     | 33      |
| Cameroon                                     | 0.476 | 98   | 0.556   | 151    | 53      |
| Rwanda                                       | 0.475 | 99   | 0.524   | 158    | 59      |
| Togo                                         | 0.474 | 100  | 0.503   | 165    | 65      |
| Country                   | Index | Rank | Score   | Rank | Score   |
|---------------------------|-------|------|---------|------|---------|
| Nigeria                   | 0.472 | 101  | 0.532   | 157  | 56      |
| Angola                    | 0.471 | 102  | 0.581   | 147  | 45      |
| Uganda                    | 0.468 | 103  | 0.516   | 162  | 59      |
| Iran                      | 0.459 | 104  | 0.798   | 60   | 44      |
| India                     | 0.458 | 105  | 0.64    | 130  | 25      |
| Myanmar                   | 0.454 | 106  | 0.578   | 148  | 42      |
| Russia                    | 0.450 | 107  | 0.816   | 49   | 58      |
| Venezuela                 | 0.449 | 108  | 0.761   | 78   | 30      |
| Turkmenistan              | 0.446 | 109  | 0.706   | 108  | 1       |
| Lesotho                   | 0.445 | 110  | 0.52    | 159  | 49      |
| Guinea                    | 0.443 | 111  | 0.459   | 175  | 64      |
| Ethiopia                  | 0.434 | 112  | 0.463   | 173  | 61      |
| Egypt                     | 0.420 | 113  | 0.696   | 115  | 2       |
| Congo (Democratic Republic of the) | 0.419 | 114  | 0.457   | 176  | 62      |
| South Africa              | 0.408 | 115  | 0.699   | 113  | 2       |
| Burundi                   | 0.407 | 116  | 0.417   | 185  | 69      |
| Ukraine                   | 0.399 | 117  | 0.751   | 88   | 29      |
| Afghanistan               | 0.399 | 118  | 0.498   | 168  | 50      |
| Mali                      | 0.398 | 119  | 0.427   | 182  | 63      |
| Sudan                     | 0.386 | 120  | 0.502   | 167  | 47      |
| Mauritania                | 0.383 | 121  | 0.52    | 159  | 38      |
| Chad                      | 0.375 | 122  | 0.404   | 186  | 64      |
| Niger                     | 0.374 | 123  | 0.354   | 189  | 66      |
| Yemen                     | 0.371 | 124  | 0.452   | 178  | 54      |
| Central African Republic  | 0.334 | 125  | 0.367   | 188  | 63      |
| South Sudan               | 0.312 | 126  | 0.388   | 187  | 61      |
Fig. 1. Top 15 nations in the CDI Ranking

Fig. 2. Top 15 nations in the HDI Ranking
4 The Way Forward

The CDI, as presented above, is a much more comprehensive and rational measure of human development and progress as compared to the conventional HDI and GDP. The following actions are proposed in order to leverage the CDI:

A. Governments and policy makers across the globe need to be persuaded to adopt the proposed CDI as an indicator of holistic development of their country, in place of the GDP or HDI.

B. The countries need to analyze the reasons for their current CDI ranking so as to identify the scope of improvement in their CDI. The rankings reveal that even the developed superpowers cannot be indifferent and ignorant towards the CDI ranking because of their current low CDI.

C. In order to improve the CDI, all countries need to frame policies so as to improve all the four development parameters associated with the CDI, i.e., HDI, peace, happiness, and environmental sustainability. Policies need to be focused on demilitarization, self-reliance, communal harmony, job satisfaction, job creation, more efficient resource utilization, reducing ecological footprint, etc. so as to ensure a high CDI rank.

D. The academic institutions, NGOs, and the private sector need to act as agents of change and catalysts in the process of sustainability, peace and happiness at the grass root level so as to help achieve the goal of a high CDI.

5 Conclusions

It has been established that GDP should not be treated as an indicator of human welfare and attainment of a high GDP must not entirely influence a country's national policies and goals (Costanza et al, 2009; Stiglitz et al, 2010). This paper presents a new indicator of human development that measures the holistic progress of any country named as CDI. The CDI is not a perfect measure of human development and progress, but it is more rational and comprehensive than the HDI or GDP. An ambiguity-free and simple methodology to quantitatively evaluate the CDI has also been discussed. The CDI is based on four well established and widely accepted factors: IHDI, Peace Index, Happiness Index and Ecological Footprint, that have been named as the IHDI, scaled peace index, scaled happiness index and scaled green index respectively. At the same time, the CDI values of 126 nations have been evaluated. On the basis of the CDI and HDI values, a comparative assessment and relative ranking of all the 126 countries has been done.

The trends in the CDI values and ranks are unexpected and astonishing. Switzerland emerged as the country with the highest CDI with a CDI of 0.767. A country like USA with an HDI rank of 13 and HDI of 0.924 has a CDI ranking of 70 and a CDI value of 0.538, ranking much behind the countries like Zambia, Sierra Leone, Senegal and Nepal which have an HDI score below 0.60. The top 15 countries on the basis of the HDI and CDI have also been presented graphically. Thus, it can be concluded that a high HDI does not ensure a high CDI value as the CDI is much more comprehensive. Further, an obsession with a high HDI or GDP growth would divert attention from other critical developmental issues like environmental sustainability, peace and happiness.

The CDI provides an architecture to build a positive relationship between all the countries of the world and harmony across peoples all around the world. Worldwide efforts to improve the CDI are the need of the hour so as to ensure our sustainable and peaceful future on the planet Earth. Let the era of the CDI begin!!

6 Scope of Future Work
In the future, this work can be expanded for all the remaining countries of the world, as and when the data for all the four parameters is available. Inclusion of more factors in the CDI may also be considered as its implementation begins in countries around the world. As pointed out in the methodology, equal weighting factors were used for different parameters for CDI evaluation. If future research in social sciences provides relative importance of various developmental parameters, suitable weighting factors may be applied accordingly in the CDI evaluation. Policy instruments need to be developed that are aimed for CDI improvement so that the overall well-being of any country increases.

**Abbreviations:**

CDI: Composite Development Index  
GDP: Gross Domestic Product  
HDI: Human Development Index  
HPI: Holistic Progress Index  
IHDI: Inequality adjusted Human Development Index  
NGOs: Non-Governmental Organizations  
UN: United Nations

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