# Cracking the HDI

## Human Development Indexing Exercise

**APRI**

**Asia Pacific Regional HDR Initiative**

**UNDP Regional Centre in Colombo**

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# Contents

# Preface

This indexing exercise aims to demystify the principles and calculations in indexing, taking up the case of the human development index. It demonstrates that indexing is a simple idea and the actual steps can be mastered by anyone with basic high school mathematics. The document is in three sections. Section one is about measuring human development, and in particular, covers the idea of indexing, its strengths and limitations, principles of calculating an index and actual steps in the calculations. It shows how the HDI is used to represent, very simply, three dimensions of the aggregate human condition of a particular geographic area. Section two contains an exercise based on data for three imaginary countries – Masalabad, Guinea Town and Messifeng. The exercise requires the calculation of the HDI for each and finally comparing the three values to draw conclusions on ranking to help compare the three imaginary countries. The repetition in calculations – repeating the steps three times for the three countries is expected to help in firmer understanding and learning. Section three provides the solutions.

Happy indexing!!

Anuradha Rajivan
September 2005

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[1]Part of the UNDP Regional Centre in Colombo. For more information see http://rcc.undp.sk

# Measuring Human Development

## I. The Concept

The human development concept brings together observations and experiences from around the world placing human beings at the centre of development concerns, in contrast with the primary pursuit of economic ends. The importance of people has been recognised from as far back as Aristotle, going on to Adam Smith, and even Arthur Lewis, to the extent that he emphasised the importance of economic growth because it expanded choices. This was lost sight of in development writing in the 1960s and 1970s, but revived by Amartya Sen in the 1980s. Today human development is commonly understood as enlarging people's choices to have a meaningful and creative life with human dignity. Human development is multi-disciplinary rather than just economic, focuses on people, not markets and incomes. Incomes, while no doubt important, are treated as the means to a better human condition rather than ends in themselves.

## II. Concept to Measurement: the Human Development Index

The concept of human development is clearly much broader than the various measures that capture numerically some of its important aspects. The most well known aggregate measure is the Human Development Index (HDI)[2]. The concept and the HDI are quite distinct - the two should not be confused. The HDI was developed as an alternative to the gross domestic product (GDP), to monitor the overall status and progress of nations. The GDP aims to present an aggregate picture of the economic status of a nation for a year, while the HDI aims to represent an aggregate picture of the broader human condition. Measuring human development involves using specifically selected variables or indicators and aggregating them to create summary indices. The HDI has become a flagship summary measure to represent human development achievements of a particular geographic area[3], for a year. It captures three dimensions –

a) a long and healthy life
b) knowledge
c) a decent standard of living.

A good question to ask is why go beyond the GDP in measuring progress of nations? The limitation of income as an exclusive measure of development becomes evident as we rec-

[2] Other commonly used indices are the Gender Development Index (GDI), the Gender Empowerment Measure (GEM) and the Human Poverty Index (HPI).
[3] Usually a country, but also for sub national units and country clusters or groupings.

ognize that many choices do not depend on income. For example, even a rich landlord in a rural area may not have access to reliable electricity or underground sanitation; a female may be considered old enough to marry at 15 years of age in certain communities depriving her of education and other freedoms. Moreover, income is subject to diminishing marginal utility and an exclusive focus on per capita income does not take into account how income is distributed or utilised.

## III. Strengths and Limitations of the HDI

The strength of composite indices, like the HDI is that being a single number it is simple to present. It can be used as a powerful advocacy tool to catch the attention of policy makers, media and NGOs which can expand the debate to focus on human outcomes. Another strength is that a composite index can offer a multi dimensional view of social and economic phenomena by capturing a broader information set. For example, the HDI attempts to capture the health, education and income related achievements in one single figure. Indices also help monitor progress, facilitate comparisons across time and geographical areas and help in setting measurable targets.

Composite indices however do have their limitations. Any index is only a summary - much more limited than the broader concept it sets out to measure. The HDI for example, is far more limited than the concept of human development, just as the GNP is far more limited than the concept of economic prosperity of a nation. The HDI cannot provide a complete picture of human development as many critical aspects of the human condition cannot be quantified. Even for aspects which can be quantified, it is sometimes difficult to obtain consistent and reliable data across time and space.

Nevertheless, the HDI has proved to be a useful shorthand way to map the human condition, not unlike the GDP which represents the economic condition.

## IV. Principles in Indexing

Indexing is neither difficult nor a mystery – anybody with high school mathematics can do it once he knows the logic behind it. This exercise is meant to take the reader through the logic and sequential steps involved in the calculations. Once the logic is clear, it can even trigger off ideas to modify and customize the index for other applications.

Typically, indexing is a simple process of aggregating individual variables or indicators to obtain one summary measure. Since individual indicators are expressed in different units of measurement, they cannot be combined together unless they are made scale free. This is the first step. In some cases all selected indicators do not move in the same direction (e.g. mortality rates cannot be combined with literacy rates because higher mortality is considered bad whereas higher literacy is desirable). All indicators have to be made unidirectional

– say by taking reciprocal values for some. Following this, the scale free values are given desired weights (a subjective decision) before completing the aggregation. While these are general principles, in specific cases different formulas are used to combine different indicators.

This exercise will take you through the steps of calculating the HDI based on the formula used in the global HDRs. Information is presented on three imaginary countries. The reader will be expected to select appropriate indicators relevant for the HDI, calculate the HDI using the formula, compare the HDIs for the three countries and draw suitable conclusions.

## V. Calculating the HDI

Calculating the HDI includes the following steps.

### Step 1. Obtain actual data for the relevant indicators

This may be the most time consuming part. As seen above, the HDI captures three dimensions – a long and healthy life, knowledge and a decent standard of living. Indicators for each of the dimensions can be seen in Table 1.

### Step 2. Convert dimension indicator(s) into unit free values to facilitate aggregation through construction of dimension indices

The indicators used are measured in different units. For example, life expectancy at birth is in number of years, the literacy rate and enrolment are in percentages, and GDP per capita is in US Dollars. They cannot be added as they are. For aggregation they have to first be made comparable. In order to do this we first calculate separate, scale free sub indices for each dimension. This can be done in different ways. The HDI uses the method called 'division by own range', the range being the difference between the maximum and minimum values of the respective indicators[4]. The maximum and minimum values are called the goalposts of the indicators.

**Identify goalposts for each indicator.** This means the maximum and minimum value for each indicator. Theoretically life expectancy, literacy and enrolment as well as incomes can be zero at a minimum. But to be more meaningful, minimums are taken to be lowest values observed historically by going back 30 years. Regarding the maximum values, theoretically income could be infinite – leading to a division by infinity. For life expectancy it is not immediately clear what the maximum should be. Of course for literacy and enrolment 100 percent makes sense as the maxima. For the HDI maximum values are those that can be envisioned in the next thirty years. For example, when looking at GDP, economic growth rates can indicate that maximum income that richest countries are likely to achieve by 2020 is $ 40,000 (in 1990 $ PPP).

[4] One could also divide by the mean values of the dimension indicators.

| Table 1: **Three dimensions of the HDI, indicators and corresponding goalposts** | | | |
|---|---|---|---|
| **Dimension** | **Indicator** | **Maximum value** | **Minimum value** |
| A long and healthy life | Life expectancy at birth | 85 | 25 |
| Knowledge | Adult literacy rate (%)<br>Combined gross enrolment ratio (%) | 100<br>100 | 0<br>0 |
| A decent standard of living | GDP per capita (PPP $US) | 40,000 | 100 |

**Calculate dimension indices.** These are calculated using the formula:

$$\text{Dimension Index} = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}$$

Each difference in indicator value from its minimum is divided by its range (Max - Min), using fixed values or goal posts in order to get unit free numbers. They also have the nice property of varying between 0 and 1.

**Dimension 1: Long and healthy life**

The indicator used to measure this dimension is the *life expectancy at birth*. This is defined as the number of years a newborn would live if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the individual's life.

**Dimension 2: Knowledge**

Knowledge is measured by two component indicators – *adult literacy rate* and *combined gross enrolment ratio*. Adult literacy rate is defined as the percentage of people ages 15 and above who can, with understanding, both read and write a short, simple statement related to their everyday life. Combined gross enrolment ratio is the number of students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels.

Calculating the Knowledge dimension index involves two steps. First, to determine each component index by simply calculating the index for the each of the two component indicators. The second step involves calculating aggregating the individual component indices into the Education Index by giving appropriate weights. In this case adult literacy is considered more important and given a higher weight of two-thirds and enrolment a weight of one-third.[5] Thus, combining the adult literacy index (with two-thirds weight) and combined gross enrolment index (with one third

[5] One can, of course, choose other weights. Ultimately the decision on relative weights is a subjective one.

weight) gives us the Education Index for this dimension.

***Education Index = 2/3 (Adult literacy index)+1/3 (gross enrolment index)***

**Dimension 3: Standard of living**

The standard of living is measured by using *GDP per capita (PPP $)*. Per capita income is the total value of the final goods and services produced by a country in a given period of time and divided by the population at mid-year. In order to maintain global comparisons the measurement is made in US$ with purchasing power parity (PPP) – i.e., a measure that equalises the purchasing power of different currencies by converting all to a common currency.

The GDP per capita index is calculated using the same dimension index formula. However there is one difference here. The logarithm of income is used in the formula instead of the actual income figure. The reason for this is that income needs to be discounted since unlimited income is not required to achieve a respectable level of human development. Moreover, income is subject to diminishing marginal utility. Until 1999, income above a cut-off point (world average per capita income) used to be drastically discounted. From 1999, however, a more gradual discounting is done throughout by using the logarithm of income.

### Step 3. Final aggregation of the scale free dimension indices to obtain the HDI

Finally the HDI is calculated by calculating the simple average of the three dimension indices i.e. adding the three indices and diving by three.

## VI. In Sum

The methodology explained in this exercise is the standard one used in the global HDRs. However, each country may come up with their customized indices using the simple principles of indexing explained here - i.e. identification of appropriate indicators, identification of corresponding goalposts or average values, calculation of dimension indices to make the indicators unit free and finally combining them, either by assigning equal or different weights. The global HDI assigns equal weights to each dimension and hence it is a simple average of the three dimension indices.

# Human Development Indexing Exercise

Name: _____ **Country:** _____

## I. Instructions

The exercise consists of (i) calculating the HDI for three imaginary countries (**Masalabad, Guinea Town and Messifeng**); (ii) ranking the countries according to the HDI value obtained; and (iii) based on the HDI index, indicating whether these countries would be among the high, medium, low human development countries.

To facilitate your calculations, indicators for demography, income, education, health and environment are provided for each country at the end of this exercise. Moreover, the maximum and minimum value for certain common indicators are given in Table 1 below.

To make the exercise even simpler, here 's the log of some numbers. You will need to refer to this table for the calculation of the HDI

Table 1. **Goalposts for Common Indicators**

| Indicator | Maximum value | Minimum value |
|---|---|---|
| Life expectancy at birth (years) | 85 | 25 |
| Female life expectancy at birth (years) | 87.5 | 27.5 |
| Male life expectancy at birth (years) | 82.5 | 22.5 |
| Total fertility rate | 10 | 0 |
| Adult literacy rate (%) | 100 | 0 |
| Combined gross enrolment ratio (%) | 100 | 0 |
| Estimated earned income (PPP US$) | 8,750 | 100 |
| GDP per capita (PPP US$) | 40,000 | 100 |

*Source*: UNDP (2003) *Human Development Report 2003*, Oxford University Press, New York

| Table 2. **Log of Numbers** | | | |
|---|---|---|---|
| **Number** | **Log** | **Number** | **Log** |
| 100 | 2 | 1,890 | 3.276468 |
| 250 | 2.397940 | 1,970 | 3.294466 |
| 790 | 2.897627 | 2,070 | 3.315970 |
| 1,310 | 3.117271 | 8,750 | 3.942008 |
| 1,680 | 3.225309 | 40,000 | 4.602059 |

To assist you even further, here's the formula for dimension index (the indicator for which you are interested to calculate an index)

Dimension

$$\text{Index} = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}$$

Note that the minimum and maximum values (the goalposts) for the purposes of this exercise are given in Table 1 above.

**Final Tips**: we have inserted some images to help you in following the steps required.

**Lets start now .....** and .....

## II. Exercise Sheet for Masalabad


**HDI for Masalabad** =
weight (Dimension index 1) + weight (Dimension index 2) + weight ( Dimension index 3)
*In the HDI equal weights are assigned hence each weight = 1/3*. In other words, just calculate the simple arithmetic mean of the three dimension indices.

## III. Exercise Sheet for Guinea Town


**HDI for Guinea Town** =
weight (Dimension index 1) + weight (Dimension index 2) + weight ( Dimension index 3)
In the HDI equal weights are assigned hence each weight = 1/3. In other words, just calculate the simple arithmetic mean of the three dimension indices.

## IV. Exercise Sheet for Messifeng


**HDI for Kingdom of Messifeng** =
weight (Dimension index 1) + weight (Dimension index 2) + weight ( Dimension index 3)
In the HDI equal weights are assigned hence each weight = 1/3. In other words, just calculate the simple arithmetic mean of the three dimension indices.

## V. Ranking the Countries

The **ranking** of the countries is the following**:**

| Country | Value | Rank | High/Medium/Low HD |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

***Right or wrong …. congratulations for completing the exercise!!!***

## VI. HD Indicators for Masalabad

| S. No. | DEMOGRAPHY | Value |
|---|---|---|
| 1 | Total Population (millions), 2001 | 79.2 |
| 2 | Urban Population (as % of the total), 2001 | 24.5 |
| 3 | Population under age 15 (as % of the total), 2001 | 32.6 |
| 4 | Total Fertility Rate, 1970–75 | 6.7 |
| 5 | Total Fertility Rate, 2000–05 | 2.3 |
| **S. No.** | **INCOME** | **Value** |
| 6 | GDP Per Capita (PPP US$), 2001 | 2,070 |
| 7 | Female Estimated Earned Income (PPP US$), 2001 | 1,696 |
| 8 | Male Estimated Earned Income (PPP US$), 2001 | 2,447 |
| 9 | Youth unemployment (% of labour force aged 15–24), 2001 | NA |
| 10 | Percentage of Population Below Poverty Line (US$ 1 a day) – 1990–2001 | 17.7 |
| 11 | Percentage of Population Below Poverty Line (National Poverty Line) – 1987–2000 | NA |
| **S. No.** | **EDUCATION** | **Value** |
| 12 | Adult Literacy Rate (% age 15 and above), 2001 | 92.7 |
| 13 | Female Literacy Rate, 2001 (%) | 90.9 |
| 14 | Male Literacy Rate, 2001 (%) | 94.5 |
| 15 | Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 61 |
| 16 | Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 67 |
| 17 | Combined Primary, Secondary, Tertiary Gross Enrolment Ratio (%), 2000–01 | 64 |
| 18 | Public Expenditure on Education (as % of GDP), 1998–2000 | NA |
| 19 | Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1998–2000 | NA |
| 20 | Public Exp. on Secondary Education (as % of all levels), 1998–2000 | NA |
| 21 | Public Exp. on Tertiary Education (as % of all levels), 1998–2000 | NA |

| S. No. | HEALTH | Value |
|---|---|---|
| 39 | Life Expectancy at Birth (yrs.), 2001 | 68.6 |
| 40 | Life Expectancy at Birth (Female), 2001 (yrs) | 71.0 |
| 41 | Life Expectancy at Birth (Male), 2001 (yrs) | 66.3 |
| 42 | Infant Mortality Rate (per 1,000 live births), 2001 | 30 |
| 43 | Under 5 Mortality Rate (per 1,000 live births), 2001 | 38 |
| 44 | Maternal Mortality Ratio Reported (per 100,000 live births), 1985–2001 | 95 |
| 45 | Percentage of children underweight for age (% under age 5), 1995–2001 | 33 |
| 46 | Population with access to improved sanitation (%), 2000 | 47 |
| 47 | Population with access to improved sanitation (%), Urban, 2000 | 82 |
| 48 | Population with access to improved water source (%), 2000 | 77 |
| 49 | Population with access to improved water source (%), Urban, 2000 | 95 |
| 50 | Population with access to improved water source (%), Rural, 2000 | 72 |
| **S. No.** | **ENVIRONMENT** | **Value** |
| 51 | Percentage of land area covered by forests, 2000 | 30.2 |
| 52 | Ratio of protected area to surface area, 2003 | 0.03 |
| 53 | Per capita carbon dioxide emissions (metric tons), 1999 | 0.6 |

## VII. HD Indicators for Guinea Town

| S. No. | DEMOGRAPHY | Value |
|---|---|---|
| 1 | Total Population (millions), 2001 | 23.5 |
| 2 | Urban Population (as % of the total), 2001 | 58.1 |
| 3 | Population under age 15 (as % of the total), 2001 | 33.4 |
| 4 | Total Fertility Rate, 1970–75 | 5.2 |
| 5 | Total Fertility Rate, 2000–05 | 2.9 |
| **S. No.** | **INCOME** | **Value** |
| 6 | GDP Per Capita (PPP US$), 2001 | 8,750 |
| 7 | Female Estimated Earned Income (PPP US$), 2001 | 5,557 |
| 8 | Male Estimated Earned Income (PPP US$), 2001 | 11,845 |
| 9 | Youth unemployment (% of labour force aged 15–24), 2001 | NA |

| | | |
|---|---|---|
| 10 | Percentage of Population Below Poverty Line (US$ 1 a day) – 1990–2001 | <2 |
| 11 | Percentage of Population Below Poverty Line (National Poverty Line) – 1987–2000 | NA |
| **S. No.** | **EDUCATION** | **Value** |
| 12 | Adult Literacy Rate (% age 15 and above), 2001 | 87.9 |
| 13 | Female Literacy Rate, 2001 (%) | 84.0 |
| 14 | Male Literacy Rate, 2001 (%) | 91.7 |
| 15 | Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 74 |
| 16 | Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 71 |
| 17 | Combined Primary, Secondary, Tertiary Gross Enrolment Ratio (%), 2000–01 | 72 |
| 18 | Public Expenditure on Education (as % of GDP), 1998–2000 | 6.2 |
| 19 | Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1998–2000 | 31.8 |
| 20 | Public Exp. on Secondary Education (as % of all levels), 1998–2000 | 32.9 |
| 21 | Public Exp. on Tertiary Education (as % of all levels), 1998–2000 | 31.9 |
| **S. No.** | **HEALTH** | **Value** |
| 22 | Life Expectancy at Birth (yrs), 2001 | 72.8 |
| 23 | Life Expectancy at Birth (Female), 2001 (yrs) | 75.3 |
| 24 | Life Expectancy at Birth (Male), 2001 (yrs) | 70.4 |
| 25 | Infant Mortality Rate (per 1,000 live births), 2001 | 8 |
| 26 | Under 5 Mortality Rate (per 1,000 live births), 2001 | 8 |
| 27 | Maternal Mortality Ratio Reported (per 100,000 live births), 1985–2001 | 41 |
| 28 | Percentage of children underweight for age (% under age 5), 1995–2001 | 18 |
| 29 | Population with access to improved sanitation (%), 2000 | NA |
| 30 | Population with access to improved sanitation (%), Urban, 2000 | NA |
| 31 | Population with access to improved water source (%), 2000 | NA |
| 32 | Population with access to improved water source (%), Urban, 2000 | NA |
| 33 | Population with access to improved water source (%), Rural, 2000 | 94 |

| S. No. | ENVIRONMENT | Value |
|---|---|---|
| 34 | Percentage of land area covered by forests, 2000 | 58.7 |
| 35 | Ratio of protected area to surface area, 2003 | 0.05 |
| 36 | Per capita carbon dioxide emissions (metric tons), 1999 | 5.4 |

## VIII. HD Indicators for Messifeng

| S. No. | DEMOGRAPHY | Value |
|---|---|---|
| 1 | Total Population (millions), 2001 | 146.3 |
| 2 | Urban Population (as % of the total), 2001 | 33.4 |
| 3 | Population under age 15 (as % of the total), 2001 | 41.8 |
| 4 | Total Fertility Rate, 1970–75 | 6.3 |
| 5 | Total Fertility Rate, 2000–05 | 5.1 |
| **S. No.** | **INCOME** | **Value** |
| 6 | GDP Per Capita (PPP US$), 2001 | 1,890 |
| 7 | Female Estimated Earned Income (PPP US$), 2001 | 909 |
| 8 | Male Estimated Earned Income (PPP US$), 2001 | 2,824 |
| 9 | Youth unemployment (% of labour force aged 15–24), 2001 | 13[a] |
| 10 | Percentage of Population Below Poverty Line (US$ 1 a day) – 1990–2001 | 13.4 |
| 11 | Percentage of Population Below Poverty Line (National Poverty Line) – 1987–2000 | 32.6 |
| **S. No.** | **EDUCATION** | **Value** |
| 12 | Adult Literacy Rate (% age 15 and above), 2001 | 44.0 |
| 13 | Female Literacy Rate, 2001 (%) | 28.8 |
| 14 | Male Literacy Rate, 2001 (%) | 58.2 |
| 15 | Female Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 27 |
| 16 | Male Gross Enrolment Ratio Combined Primary, Secondary, Tertiary, 2000–01 | 45 |
| 17 | Combined Primary, Secondary, Tertiary Gross Enrolment Ratio (%), 2000–01 | 36 |
| 18 | Public Expenditure on Education (as % of GDP), 1998–2000 | 1.8 |

| | | |
|---|---|---|
| 19 | Public Exp. on Pre-Primary & Primary Ed. (as % of all levels), 1998–2000 | NA |
| 20 | Public Exp. on Secondary Education (as % of all levels), 1998–2000 | NA |
| 21 | Public Exp. on Tertiary Education (as % of all levels), 1998–2000 | NA |
| **S. No.** | **HEALTH** | **Value** |
| 22 | Life Expectancy at Birth (yrs), 2001 | 60.4 |
| 23 | Life Expectancy at Birth (Female), 2001 (yrs) | 60.3 |
| 24 | Life Expectancy at Birth (Male), 2001 (yrs) | 60.6 |
| 25 | Infant Mortality Rate (per 1,000 live births), 2001 | 84 |
| 26 | Under 5 Mortality Rate (per 1,000 live births), 2001 | 109 |
| 27 | Maternal Mortality Ratio Reported (per 100,000 live births), 1985–2001 | NA |
| 28 | Percentage of children underweight for age (% under age 5), 1995–2001 | 38 |
| 29 | Population with access to improved sanitation (%), 2000 | 62 |
| 30 | Population with access to improved sanitation (%), Urban, 2000 | 95 |
| 31 | Population with access to improved water source (%), 2000 | 90 |
| 32 | Population with access to improved water source (%), Urban, 2000 | 95 |
| 33 | Population with access to improved water source (%), Rural, 2000 | 87 |
| **S. No.** | **ENVIRONMENT** | **Value** |
| 34 | Percentage of land area covered by forests, 2000 | 3.1 |
| 35 | Ratio of protected area to surface area, 2003 | 0.05 |
| 36 | Per capita carbon dioxide emissions (metric tons), 1999 | 0.7 |

# Solutions: Right or wrong?

| I. Solutions for Masalabad | |
|---|---|
|  | Life Expectancy Index = (68.6 - 25) / (85 - 25) = 0.726 = 0.73 |
|  | **Adult Literacy Index** = (92.7 - 0) / (100 - 0) = **0.927**<br>**Gross Enrolment Index** = (64 - 0) / (100 - 0) = **0.64**<br><br>**Education Index =** 2/3 (0.927) + 1/3 (0.64) = 0.8313 **= 0.83** |
|  | **GDP Index** = [log (2,070) – log (100) ] / [ log (40,000) - log (100) ] = 0.506 = **0.51** |
| **HDI for Masalabad** = 1/3 (0.73) + 1/3 (0.83) + 1/3 (0.51) = **0.688** | |
| **II. Solutions for Guinea Town** | |
|  | **Life Expectancy Index** = (72.8 - 25) / (85 - 25) = 0.796 **= 0.80** |
|  | **Adult Literacy Index** = (87.9 - 0) / (100 - 0) = **0.879**<br>**Gross Enrolment Index** = (72 - 0) / (100 - 0) = **0.72**<br><br>**Education Index =** 2/3 (0.879) + 1/3 (0.72) = 0.826 **= 0.83** |

*Source*: UNDP (2003) *Human Development Report 2003*, Oxford University Press, New York

| | |
|---|---|
|  | **GDP Index** = [log (8,750) – log (100) ] / [ log (40,000) - log (100) ] = 0.746 = **0.75** |
| **HDI for Guinea Town**= 1/3 (0.80) + 1/3 (0.83) + 1/3 (0.75) = **0.790** | |

## III. Solutions for Messifeng

| | |
|---|---|
|  | **Life Expectancy Index** = (60.4 - 25) / (85 - 25) = **0.59** |
|  | **Adult Literacy Index** = (44.0 - 0) / (100 - 0) = **0.44**<br>**Gross Enrolment Index** = (36 - 0) / (100 - 0) = **0.36**<br>**Education Index =** 2/3 (0.44) + 1/3 (0.36) = 0.413 **= 0.41** |
|  | **GDP Index** = [log (1,890) – log (100) ] / [ log (40,000) - log (100) ] = 0.490 = **0.49** |
| **HDI for Messifeng** = 1/3 (0.59) + 1/3 (0.41) + 1/3 (0.49) = **0.499** | |

## IV. Ranking of the Countries

The **ranking** of the countries is the following**:**

| Country | Value | Rank | High/Medium/Low HD |
|---|---|---|---|
| Masalabad | 0.688 | 2 | Medium HD |
| Guinea Town | 0.790 | 1 | Medium HD |
| Messifeng | 0.499 | 3 | Low HD |

***Congratulations for completing the exercise!!!***

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