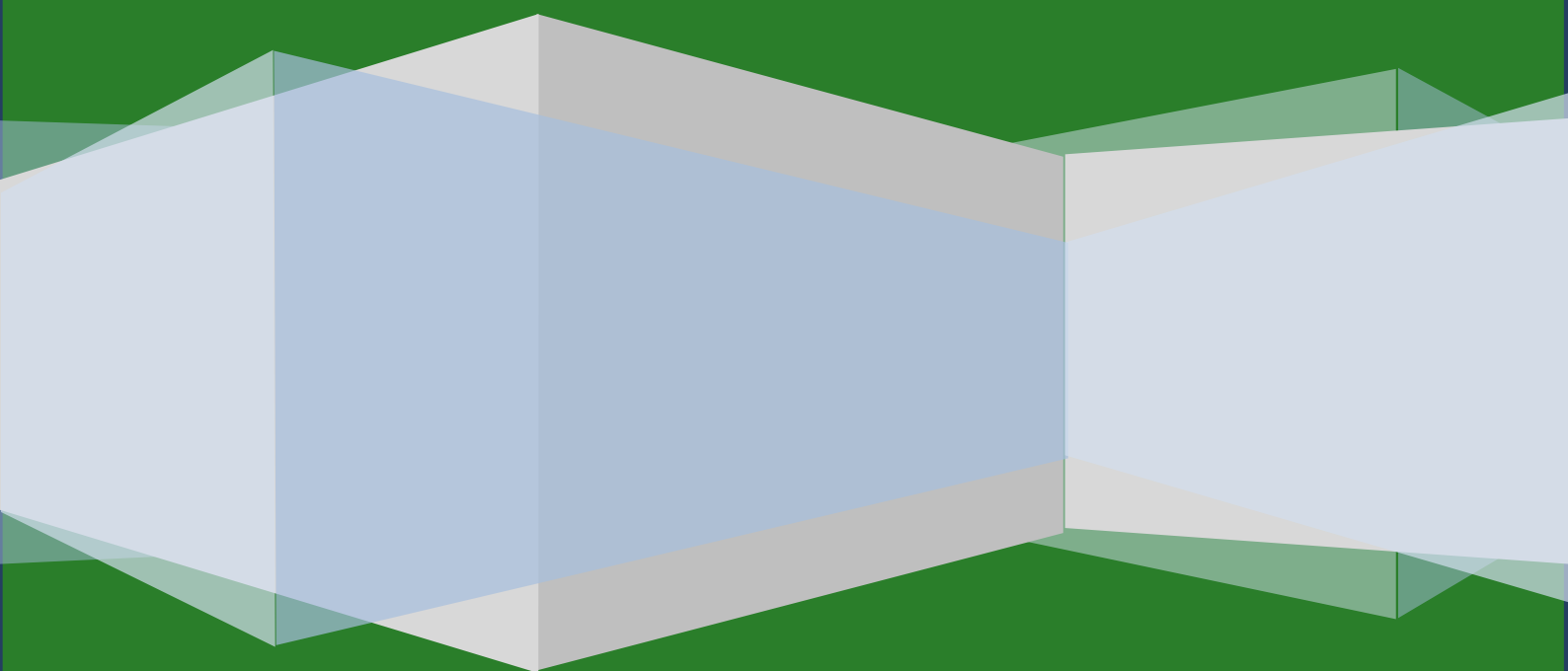


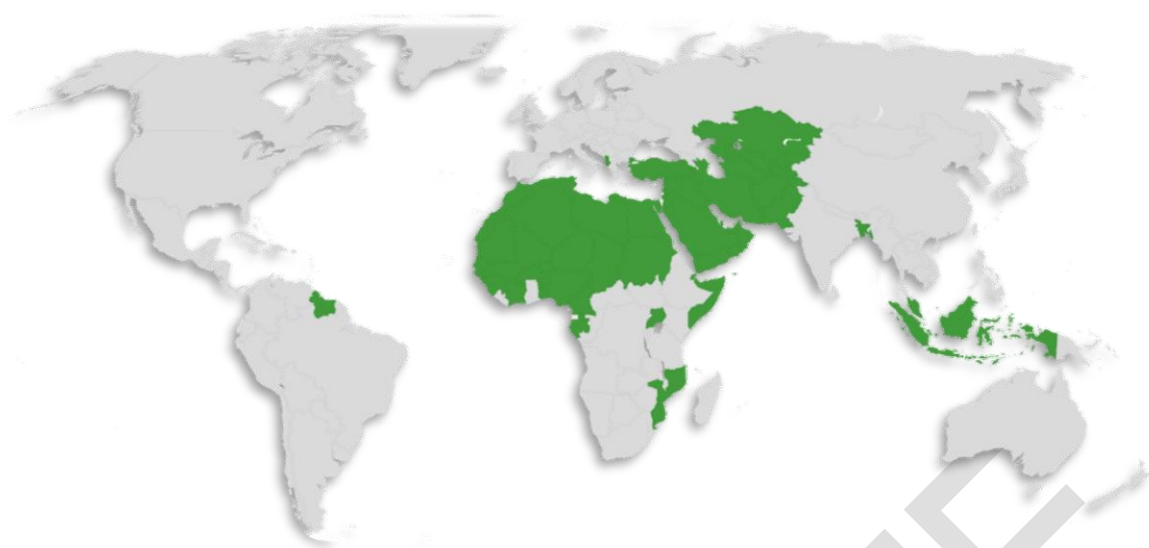
OIC ACCREDITATION CERTIFICATION PROGRAMME FOR OFFICIAL STATISTICS

# **SUSTAINABLE DEVELOPMENT STATISTICS TEXTBOOK**



ORGANISATION OF ISLAMIC COOPERATION  
STATISTICAL ECONOMIC AND SOCIAL RESEARCH  
AND TRAINING CENTRE FOR ISLAMIC COUNTRIES





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# SUSTAINABLE DEVELOPMENT STATISTICS TEXTBOOK

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{{Mrs. Ousmane, Maimouna Ali Boulhassane}}



ORGANISATION OF ISMALIC COOPERATION

STATISTICAL ECONOMIC AND SOCIAL RESEARCH  
AND TRAINING CENTRE FOR ISLAMIC COUNTRIES

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# ACRONYMS

<b>CFC</b>	Consumption of chlorofluorocarbons
<b>GDI</b>	Gender Development Index
<b>HDI</b>	Human Development Index
<b>GII</b>	Gender Inequality Index
<b>GDI</b>	Gender Development Index
<b>HPI</b>	Human Poverty Index
<b>MPI</b>	Multidimensional Poverty Index
<b>WPI</b>	Women Participation Index
<b>GRHDI</b>	Gender-related Human Development Index
<b>UNDP</b>	United Nations Development Programme
<b>WHDR</b>	World Human Development Report
<b>GNI</b>	Gross National Income

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First and foremost, the author would like to thank the ....

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# UNIT 1: INTRODUCTION

This chapter is built around the concept of sustainable development, social inclusion, protecting the environment, social security and access to social services.

***The main objective:*** Basic concepts on sustainable development and other related issues.

## 1.1. The Concept of Sustainable Development

The concept of sustainable development raises the issue of reconciling economic growth, social cohesion and preserving natural resources. In 1987, the Brundtland report defines sustainable development as "a type of development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

In 1992, the Rio summit, held under the auspices of the United Nations, formalizes the concept of sustainable development as: "An economically efficient, socially equitable and ecologically sustainable development ". Also, it affirms the need for quantitative information to measure and assess progress made by countries towards the path of sustainability.

According to UNDP, the chances of sustainable development success necessarily involve corrective actions directly related to man and his environment. Thus five pillars have been identified for sustainable human development. These are: the eradication of poverty, sustainable job creation, promotion of women, environmental protection and good governance.

Given the importance of sustainable development many countries are committed to preparing reports on national indicators of sustainable development. These reports focus mainly on the quality of life, the state of the environment, economy, health, social cohesion with a view to sustainable development and would enable countries to compare themselves to each other. Indeed, they will help measure the efforts made by countries. In most countries, the challenges of sustainable development were also formulated under national strategies, which monitoring and evaluation are based on a set of indicators.



## **1.2. Social Inclusion**

The term social inclusion was coined by the German sociologist Niklas Luhmann (1927-1998) to characterize the relationships between individuals and social systems. Social inclusion means access of an individual or a population to infrastructure, social, cultural and economic services, as well as to decision making, that is to say to power. A population is considered as included, if it is able to participate in the development and implementation of a social project or program.

The courses of action to promote social inclusion vary from one country to another. For example, we can mention:

- Access to infrastructures and social services,
- Equality between women and men,
- Possibilities of human development,
- Material welfare
- An equal redistribution of income with a view to poverty reduction
- Taking into consideration unpaid work,
- Reducing unemployment,
- Equally enhancing all populations and communities,
- Alphabetisation, and education, etc.

Thus, the inclusive approach is to reduce or remove the barriers that exclude or impede an individual or a population to fully participate in the workforce. Social inclusion is a solution to combat inequality.

## **1.3. Environmental Protection**

Climate change and pollution make that respect for the environment has become a major concern. Human activities cause environmental degradation (deforestation, eradication of animal and plant species, pollution of water, soil, air etc.). Renewable resources are consumed without any concern for their reproduction. Indeed, guiding the consumer behaviour to better preserve natural resources and limit the impact of man on the sustainability of the planet is a key objective of environmental policies.

The environmental challenge of sustainable development is to implement actions to reduce the waste of natural resources especially non-renewable ones and reduce pollution in order to preserve the environment for current populations and future generations. Thus, environmental

protection requires political will and the involvement of the whole society (households, companies, states etc.).

#### **1.4. Social protection, access to social services and security**

Social protection can be defined as the set of measures developed to give assurance and assist individuals in case of major risks (unemployment, sickness, old age, family etc.). Social protection has thus both physical targets and social objectives (reducing inequality and ensuring individuals a minimum income allowing them to be integrated into society). Thus, it can be seen as an indispensable means to reduce extreme poverty in developing countries. It helps a population to better manage risks and to provide support to people in extreme poverty.

Thus, social protection is at the heart of the sustainable development process as it aims to strengthen it by stimulating demand for social services. Experience worldwide has shown that no country has reached an acceptable level of human development without doubling efforts to improve the quality of life of its population by promoting access to educational services and quality health, as well as appropriate interventions for social protection.

#### **Exercises**

- 1) Give a definition of sustainability?
- 2) Is social inclusion similar to sustainable development? Please justify your answer
- 3) How to underpin sustainable development?
- 4) Can social protection reduce population vulnerability? Please justify your answer

# UNIT 2: SUSTAINABLE DEVELOPMENT INDICATORS

This chapter is devoted to the definition of some sustainable development indicators and their analysis.

Main Objective: To define sustainable development indicators

## 2.1. Sustainable Development Index (HDI)

Sustainable Development Index (IDH) is calculated since 1990 by the **"United Nations Development Programme"** (UNDP) in order to classify countries according to progress. It takes into account several criteria to determine the standard of living in a given country, as well GNI per capita (economic dimension) and Education and Life Expectancy (social dimension). This ranking, based on the concept of human development, has been established to correct deficiencies in comparing countries based on only indicators related to Gross Domestic Product (GDP). Indeed, GNI (or GDP) is controversial because although it is a useful indicator to determine the growth of a country or region of a statistical point of view, it does not include all components contributing to the quality of life of residents. As a result of this incompleteness, high economic growth rate does not necessarily indicate an increase in living standards.

Therefore, the income cannot sum up human life, and its low level cannot sum up all the deprivation afflicting humans. This is why the UNDP developed the concept of "human development" and developed composite indicators to capture different qualitative and quantitative dimensions of development. Thus the level of development is measured through the Human Development Index (HDI). In 1995, the gender-related development index (HDI) and the Gender Empowerment Measure (GEM) have been initiated.

Thus, the HDI essentially aims to raise awareness and stimulate debate at national and international levels on human development issues. To this end, it provides a ranking of countries in terms of human development based on indicators introduced gradually by UNDP.

The HDI aims at measuring development gains in longevity, knowledge and standard of living; while GDI assesses progress in human development by redressing the inequalities between men and women and the GEM measures inequalities in terms of economic and political opportunities. Since 1997, UNDP launched the concept of "human poverty" measured by the human poverty index (HPI). Finally, from 2010, the HPI is replaced by the Multidimensional

Poverty Index (MPI) to allow a broad measuring of non-income poverty on the basis of access to basic social services.

## **2.2. Indicators of Poverty and Inequality**

The most conventional approach considers poverty as "the absence of an adequate income to meet the minimum basic needs in terms of nutrition, food security, health, education, and access to basic infrastructure." This monetary approach to welfare allows to measure poverty by comparing the income or consumption of individuals with a certain predefined level below which they are considered poor. The measure of income poverty is done either from an absolute poverty or relative poverty viewpoints. Relative poverty is based on the selection of a line from the consumer distribution while the absolute line is associated with certain minimum standards set outside the scope of distribution. Generally, developing countries use absolute poverty approach that involves setting an absolute threshold since there are large proportions of people who survive on the barest minimum. Thus, measuring poverty includes the following three steps: (I) the selection of a measurement indicator of welfare and its evaluation; (II) estimating a poverty line; and (iii) calculating an index (summary statistics) that characterizes the poor and non-poor households based on the poverty line.

Inequality is based on the idea that the perception of individuals or households of their relative position in society is an important aspect of well-being. Unlike measures of poverty which depend essentially on the average level and distribution of income or consumption, measures of inequality include the entire distribution

## **2.3. Health Indicators**

Health is a fundamental component in human capital because it affects the income. Healthy people are more productive because they are more suitable to work and withstand greater efforts. The indicators reflect the progress accomplished by countries in terms of medical advances, risk prevention, and in terms of improving the quality of life of people. It is in that sense that it falls in the scope of sustainable development, containing its three aspects economic, social and environmental.

In recent years, the idea of establishing social protection mechanisms in health is therefore widely adopted in many developing countries. Indeed, many of them have chosen to implement free care policies for the most vulnerable (Niger, Haiti, Burkina Faso and Mali, for example). Since 2005, Niger has introduced measures for exempting pregnant women and children from 0 to 5 years. This policy had a significant impact on the level of utilization of health services. To

this end, in 2012, 83% of pregnant women received a pregnancy monitoring against 40% in 2005. Promoting free access to health care for children under 5 years also helped increase very clearly the early treatment of the main diseases causing infant mortality.

## **2.4. Environmental Indicators**

In terms of integrating sustainable development principles into development policies, the main constraints that contribute to the loss of natural resources remain the same for decades. These include the poor control of illegal human activities, ranging from high population growth to problems of managing agricultural and forest land-use that are the main source of CO<sub>2</sub> emissions and the use of ozone depleting substances etc.

The environmental indicators help assessing the extent to which countries which have ratified the Montreal Protocol meet their commitment to reduce emissions of carbon dioxide and progress towards the gradual decrease of CFC consumption. Carbon dioxide emissions account for most of the greenhouse gas emissions associated with global warming. The Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol (1987) have succeeded in preventing global environmental disaster.

## **2.5. Gender-related Indicators**

Gender differences are not merely biological. They are also visible in the way society defines roles which, in turn, originate practices that keep women in situations of dependence, poverty or discrimination.

Gender equality improves the capacity of the population to participate in development. Women empowerment is reflected in their participation in political life and decision-making.

Gender inequality is a major obstacle to human development. Since 1990, girls and women have made significant progress, but without actually achieving gender equality. Disadvantages facing women are a major source of inequality. Too often, women and girls are discriminated in the fields of health and education, political representation, labour market, etc. leading to negative repercussions on the development of their capabilities and their freedom of choice.

Gender inequalities are also viewed through the gender-based violence, especially against women. To assess the involvement of women especially in decision-making and economic activity, UNDP has included the Gender Inequality Index (GII) in its 2010 Human Development

Report. This index is based on the idea that the disadvantages faced by women and girls are a major source of inequality with negative results on their fundamental freedoms. The gender inequality index reflects the disadvantages women face in reproductive health, empowerment and the labour market.

Reproductive health is measured by maternal mortality and adolescent fertility rates.

Empowerment is measured by the share of parliamentary seats held by women and the share of adult women and men aged 25 and over having had access to at least a secondary education.

Economic status is expressed in participation in the labour market rate as measured by labour force participation rate among women and men aged 15 and over.

### Exercises

- 1) Give a definition of the terms: Human Development Index (HDI), Gender Inequality Index (GII).
- 2) Give the difference between the incidence, depth and severity of poverty.
- 3) Define inequality in its economic sense

# UNIT 3: METHOD OF CALCULATING SUSTAINABLE DEVELOPMENT INDICATORS

This chapter focuses on the methodology of calculating some sustainable development indicators such as human development, poverty, health, environment and gender indicators.

**Main objective:** Methodology of Measuring Sustainable Development Index

## 3.1. Sustainable Development Index (HDI)

Since 1990, the United Nations Development Programme publishes a synthetic index of human development in its global report.

This index focuses on longevity, knowledge and standard of living.

It is calculated on the basis of 3 main variables:

- Life expectancy
- Knowledge level (combined primary, secondary and tertiary enrolment rates)
- Real GDP per capita power parity-adjusted

### **Box 1: Changes in HDI calculation**

*Since 2010, the indicators used to measure progress in terms of education; incomes as well as the way in which the indicators are aggregated were changed. Thus, in terms of knowledge, the average length of schooling replaces the literacy rate and gross enrolment rate is reformulated expected duration of schooling- namely, the expected number of years of schooling for a child, according to the current gross enrolment rates. The average duration of schooling is subject to more frequent estimates to a greater number of countries and allows distinguishing between the countries, while the expected years of schooling (life expectancy at school) is part of the reframing of this dimension in terms of years.*

*To measure the standard of living, gross national income (GNI) per capita replaces Gross Domestic Product (GDP) per capita. Indeed, in a world marked by globalization, there is a big difference between the income of the population of a country and its national production. A part*

*of the income of residents is sent abroad, some residents receive transfers from abroad and some countries receive quite substantial aid funds. For example, the Philippines' GNI greatly exceeds its GDP, and thanks to international aid, the GNI of Timor-Leste is many times higher than its domestic production (HDR 2010).*

*Finally, the method used to aggregate the three dimensions has also been reconsidered. An essential change was made in the sense that the formula is increased to a geometric average (which measures the typical value of a set of numbers). Thus, by 2010, the HDI constitutes the geometric average of the three dimension indexes. The poor performance in any dimension is now directly reflected in the HDI. The practice of using the natural logarithm of income is maintained. Income contributes to human development, but the marginal contribution of income to human development decreases as income increases.*

**Source: HDR 2010 and 2011**

HDR is therefore a composite indicator. Its value ranges between 0 and 1. The situation is much more rewarding when the HDR is close to 1. In other words, the more a country's indicator is high the better are life conditions of the populations.

It is calculated as follows:

### ***Creating Dimensional Indicators***

The first step consists of creating sub-indexes for each dimension. This is to define minimum and maximum values that allow converting the indicators into indices between 0 and 1. The geometric average is used to aggregate the results; the maximum value does not affect the relative comparison (in percentage) between two given countries or two time intervals. Therefore the maximum values that were retained are the maximum values of indicators actually recorded in observed countries. However, the minimum values have an important bearing on any comparison, and therefore it uses values that can be considered as subsistence values or "natural" zeros. Any change is thus measured according to minimum levels which each society needs to survive over time.

### **Justification for the minimum and maximum values**

- **Life expectancy at birth** : minimal historical value and maximum stated value
- **Education**: A society is able to survive without a formal education (minimal value is zero).  
Thus, a society can actually exist without formal education, which justifies the establishment



of minimum education levels mentioned .The maximum value of the average duration of schooling is the maximum projected value in 2025. The maximum value of the expected duration of schooling is the number of schooling years required to reach master's level in several countries.

- **GNP per capita:** Survival is dependent on a basic level of income.

The following minimum values have been identified:

**Table 1: Maximum and minimum values for HDI in HDR 2014**

Indicator	Observed maximum values	Minimum values
Life expectancy at birth	85	20
Average length of schooling	15	0
Expected length of schooling	18	0
GNP per capita ( PPP US\$)	75000	100

**Source : HDR 2014**

When the minimum and maximum values defined, sub-indices are calculated as follows:

$$Indice dimensionnel = \frac{Valeur\ de\ l'indicateur\ du\ pays - Valeur\ minimale}{Valeur\ maximale - Valeur\ minimale}$$

**N.B: For the income index, we use logarithms of values**

- Represented by two indicators, the index of this dimension is calculated as follows:

$$I_{Education} = I_{Dattendue}^{1/2} * I_{Dmoyenne}^{1/2}$$

- Aggregating sub-indices to obtain the human development index

By 2010, the overall HDI is calculated as the geometric average of the indices of three selected dimensions (health, education, income):

$$IDH = I_{Vie}^{1/3} * I_{Education}^{1/3} * I_{Revenu}^{1/3}$$

Countries are ranked according to the value of the HDI based on fixed thresholds

**Table 2: Membership threshold HDI**

HDI's Threshold	Category
<0,550	Low HDI
[0,550;0,699]	Average HDI
[0,700;0,799]	High HDI
$\geq 0,800$	Very high HDI

### 3.2. Poverty and Inequality Indicators

In the case of Niger, the relevant and most commonly used poverty measures are Foster Greer and Thorbecke indexes commonly referred to as FGT, which measure namely the incidence of poverty (P0), the depth of poverty (P1) and severity of poverty (P2). Multidimensional Poverty Index

- **Incidence of poverty:** measures the proportion of population which level of consumption is below the poverty line. Assuming a population size (n) in which people (q) are poor, the index is as follows:

$$H = \frac{q}{n}$$

- **The depth of poverty or poverty gap** indicates how far the poor are from the poverty line, i.e. it gives the average deficit of consumption according to the poverty line of the entire population and allows estimating the resources required to bring the entire population above the poverty line. The index is obtained through the following formula

$$: PG = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - y_i}{z} \right]$$

Z is the adopted poverty line while yi represents consumer spending.

- **The severity of poverty:** takes into account not only the poverty line, but also the inequalities among the poor by attributing a greater weight to the poorest. The index is obtained through the following formula:

$$PS = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - y_i}{z} \right]^2$$

- **Multidimensional poverty index (MPI)** is among the indexes used for measuring

Poverty. IPM identifies multiple deprivations at the individual level in health, education and standard of living. It is based on micro-data from household surveys. All indicators needed to construct the measure must come from the same survey. In households give, we determine whether each individual is poor or not depending on the number of deprivations his household suffers. These data aggregate all households to be included in the national measure of poverty.

Just like the HDI, the MPI has three main dimensions: health, education and standards of living, expressed by 10 indicators, all having the same weighting in their measure (Figure 1). A household is considered as living in multidimensional poverty when it is subject to deprivations in two to six indicators (the limit varies according to the weight of the indicator in the measure). The thresholds are very low, showing great deprivations, and most of them meet the Millennium Development Goals.

It is clear that the MPI is of a particular relevance to less developed countries. It expresses the widespread deprivation in South Asia, sub-Saharan Africa and the poorest countries in Latin America. It reflects the extent of poverty beyond monetary measures, which represents a big step forward.

MPI calculations involve assigning each person a score based on the number of deprivations per household for each of the 10 indicators and their components. The maximum score is 10, while each dimension has an equal weighting. Each of education and health dimensions present two indicators, and each component has a value of  $5/3(1.67)$ . For its part, the standard of living dimension has six indicators; therefore, each component is equal to  $5/9$  or  $0.56$ .

The education thresholds are divided as follows: no member of the household has achieved their schooling at to 5years, at least one school age child. The health thresholds cover the following aspects: at least one member of the household is suffering from malnutrition, and one or many children are dead<sup>1</sup>. And the standards of life thresholds are associated to the following factors: the absence of electricity, not having access to clean drinking water, no access to sanitation, the use of unclean cooking fuels (animal dung, wood, charcoal), dirty floors houses, the household does not own a van nor a similar motorized vehicle, and owns no more than one of the following: a bicycle, a motorcycle, a radio, a fridge, a telephone or a TV.

---

<sup>1</sup> In the present report, these two indicators have been replaced respectively by 'the proportion of individuals living in households and have found themselves in a situation where they do not have enough food for the household during the last 12 last months prior to the survey' and 'the proportion of children who have caught fever, malaria or diarrhea during the 4 last weeks prior to the survey'.

In order to identify multidimensionally poor people, the total privations of each household are summed up to obtain the level of privations per household, i.e. (c). The threshold value of 3 corresponding to one third of the indicators distinguishes between the poor and the non-poor. We consider that a household (and each member of it) is multidimensionally poor if (c) is equal or higher than 3. A household which the number of deprivations is between 2 and 3 is vulnerable or at risk of multidimensional poverty. MPI value corresponds to the result of two measures: multidimensional poverty rate and the severity (depth) of poverty. H, The poverty rate, represents the proportion of the population which is multidimensionally poor, i.e.

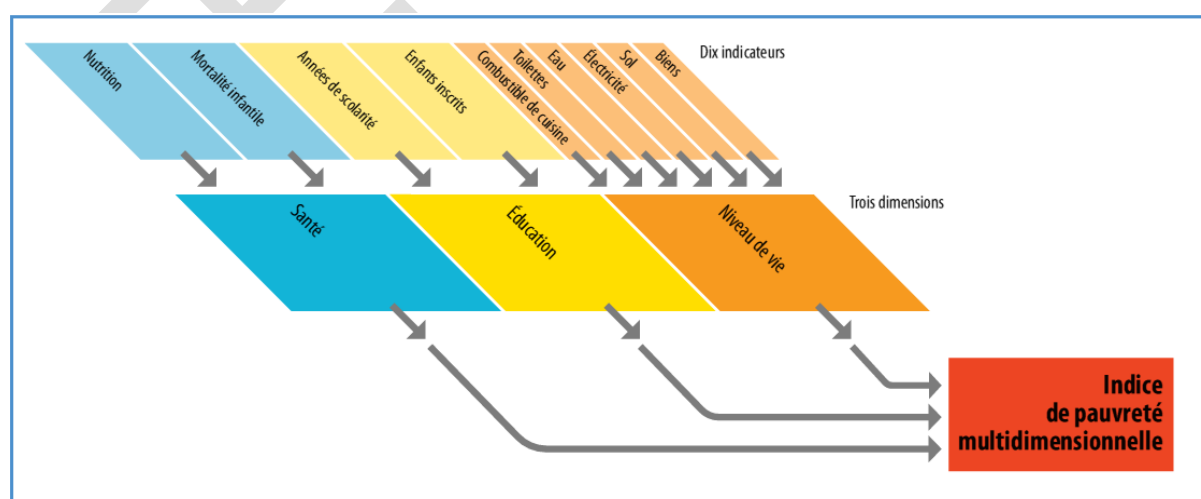
$$H = \frac{q}{n}$$

Where q refers to the number of multidimensionally poor people and n represents the total of the population. A, referring to the depth of poverty, reflects the weighted indicators which make up (d), that is the value for which poor people suffer from deprivation. In the case of only poor households, summing the number of deprivations divided by the total number of indicators and the total number of poor people:

$$A = \frac{\sum_1^q c}{qd}$$

Where c is the total number of weighted deprivations facing the poor, while d is the total number of indicators considered ( 10 in this case) which constitute this index.

**Graphic 1: Multidimensional Poverty Index (MPI): three dimensions, 10 indicators**



Source: HDR 2010

These poverty measures focus on the situation of individuals living below the poverty line. To complete the poverty analysis, it is useful to focus on inequality resumes defined on the total distribution and which they allow to better prepare policies.

The inequality measures were made through using commonly used indicators in this field, namely: Lorenz curve, Gini index, Atkinson index and Theil index.

**Lorenz curve** is commonly used to compare inequalities in living standards. it is a cumulative frequency curve comparing the distribution of a specific variable( consumption expenses for example) to the even distribution which represents equality. The more the Lorenz L(P) curve is close to the square metre, the more the consumption expenses distribution is egalitarian. The distribution is perfectly egalitarian when the Lorenz curve is diagonally represented. However, the more the curve is away from the diagonal line, the more the distribution of the total consumption expenses is non-egalitarian.

- **The Gini Index** is the most commonly used to measure well-being inequalities. It is based on Lorenz curve which compares the demographic weight of a population with its economic weight. It varies between 0 and 1. The measure of Gini is not unstable among groups, but rather between incomes and types of expanses. The more the value of Gini index is high, (close to 1), the bigger is the inequality gap among the study population, and verse versa.

Expressly,  $X_{i_i}$  a point on the X-axis and  $y_i$  a point on the Y-axis. Therefore,

$$Gini = 1 - \frac{1}{N} \sum_i^N (x_i - x_{i-1}) (y_i + y_{i-1})$$

$X_{i_i}$  a point on the X-axis and  $y_i$  a point on the Y-axis. When there is N (equal intervals on the X-axis, this formula is reduced to:

$$Gini = 1 - \frac{1}{N} \sum_i^N (y_i + y_{i-1})$$

Contrarily to the Gini Index, Atkinson Index is decomposable within socio-economic groups. It is rarely used and given by the following formula:

$$A_{\epsilon} = \begin{cases} 1 - \left[ \frac{1}{N} \sum_i^N \left( \frac{y_i}{\bar{y}} \right)^{1-\epsilon} \right]^{1/(1-\epsilon)}, & \epsilon \neq 1 \\ 1 - \frac{\prod_{i=1}^N \left( y_i^{\frac{1}{N}} \right)}{\bar{y}}, & \epsilon = 1 \end{cases}$$

- **Theil index** is very much used in inequality analysis, and is a part of the generalised entropy (GE) given by the formula.

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)} \left[ \frac{1}{N} \sum_{i=1}^N \left( \frac{y_i}{\bar{y}} \right)^{\alpha} - 1 \right]$$

The GE value is ranging between 0 and infinity, with 0 referring to an egalitarian distribution and a high value meaning a strong inequality. The Parameter  $\alpha$  is weight given to the gap between incomes and distribution. The most commonly used values of this parameter is 0, 1 and 2. For this parameter which is equal to 1, we have the T index of Theil.

$$GE(1) = \frac{1}{N} \sum_{i=1}^N \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right)$$

When it is equal to 0, we have the L index of Theil, still known as *the mean log deviation measure*.

$$GE(0) = \frac{1}{N} \sum_{i=1}^N \ln \left( \frac{\bar{y}}{y_i} \right)$$

### 3.3. Health Indicators

- **Child mortality rate**

Child mortality rate is the number of children who die before the age of 1.

1000 live births in a given year.

The child mortality rate measures the chance of survival of the children under the age of 1. It also reflects the economic, social, cultural and environmental situation in which the populations live, especially when it comes to health. The mortality rate usually helps identifying the poor and vulnerable populations.

**The indicator can be calculated as follows: The number of children under the age of 1 year deaths during one year divided by the number of births in the same year. The obtained result is then multiplied by 1000.**

As regards data taken from civil registers, we evaluate the number of live births and the number of children under the age of 1 deaths occurring in the same year. The number of deaths is divided by the number of births and the result is multiplied by 1000.

In what concerns household surveys, child mortality estimations are obtained directly from questionnaires on births, from demographic or health surveys, or indirectly using the Brass method which is similar to multiple indicator cluster surveys.

The best data source for evaluating child mortality rate is a whole system of vital statistics registration covering at least 90% of the population's civil status events.

- **Maternal Mortality Rate**

Maternal mortality rate is an essential indicator to the analysis of women health. Maternal mortality is defined by the WHO as: “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.” The second revision of the international statistical classification of diseases and related health problems ensures that late death occurring between six weeks and one year following childbirth will be taken into account. Maternal mortality rate allows monitoring childbirth related deaths.

**Maternal mortality rate can be calculated by dividing the recorded or estimated number of deaths (related to maternal mortality) by the number of total live births recorded or estimated during the same period. The result is multiplied by 100 000.** Maternal mortality rate can be also calculated directly on the basis of civil registers and household survey data.

Developing countries have generally access to weak vital statistics registration systems. The data collected generally come from health services; however, few women in rural area have access to

these services. Consequently, the most commonly used data sources are survey data: (demographic and health surveys, surveys on the living conditions of households, etc.).

### 3.4. Gender-related Indicators

- **Gender Development Index**

The Gender Development Index measures gender gaps in terms of human developmental while taking three HDI dimensions into consideration:

- Health measured by life expectancy at birth for both women and men.
- Education measured by the expected duration of girls and boys schooling and the average duration of schooling of adults (women and men) aged 25 and over.
- Economic situation measured by men and women revenue-related estimations.

GDI calculation involves separately calculating women and men HDI by using the same HDI calculation method. The same variation ranges of HDI are retained in order to take the indicators from a 0 to 1 scale. The only difference is in terms of life expectancy at birth for which the variation ranges are adjusted based on an average biological advantage ( i.e. On average, women are expected to live longer than men) of 5 years for women compared to men.

There are four steps to calculate GII:

- Estimation of earned income for men and women
- Standardization of indicators
- Women and men HDI calculation (Gender-related HDI)
- GDI calculation

#### **Step 1: Estimation of earned income for men and women**

This step is composed of two sub-components:

- The evaluation of women share in the total payroll as follows:

$$S_F = \frac{\frac{W_F * A_F}{W_H}}{\frac{W_F * A_F + A_H}{W_H}} \quad \text{With,}$$

**and women and men salaries respectively**

**$F = (1 - )$  economically active women's share in the population**



- Estimation of women's revenue per capita through the Gross National Income (**GNI**) per Capita() and the female share of the total population (**P<sub>F</sub>**)

$$P_F = \frac{N_F}{N}$$

$$GNI_{pc}^F = GNI_{pc} * \frac{S_F}{P_F}$$

- Estimation of men's revenue per capita

$$GNI_{pc}^H = GNI_{pc} * \frac{S_H}{P_H}$$

## Step 2: Standardization of the indicators

To calculate women and men HDI, indicators which significantly have different units should be converted into an index. They are converted into an index ranging between 0 and 1 according to the following equation.

$$\text{Dimension indices} = \frac{\text{used value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}$$

## Step 3: Men's and women's HDI

Women's HDI is obtained through:  $IDH_F = (I_{Health\ F} * I_{Education\ F} * I_{income\ F})^{1/3}$

men's HDI is obtained through:  $IDH_H = (I_{Health\ H} * I_{Education\ H} * I_{income\ H})^{1/3}$

## Step 4: GDI Calculation

GDI is calculated through the following equation:  $IDG = \frac{IDH_F}{IDH_H}$

In a egalitarian society, the GDI should converge towards unity, i.e. being close to 1.

- **Gender Inequality Index (GII)**

GII indicates the loss of human developmental due to inequalities in women's and men's achievements in these dimensions.

The calculation this index which is prepared in an economic framework, does not include gender-based violence.

The GII ranges between 0 (ideal situation) and 1 (total marginalisation of one sex for the benefit of the other). The higher is the GII value, the more important are the disparity between men and women. GII provides new insights on women's situation in more than 150 countries. It provides a general description of gender gaps in major areas of human development. The component's indicators bring to light the areas requiring political intervention and stimulate proactive reflection and public policies to overcome women's disadvantages.

GI is calculated through following five steps:

- Processing minimum and maximum values
- 
- Sex-related aggregation (harmonic mean)
- Calculation of the geometric average of arithmetic averages for each indicator
- GI calculation

#### Step 1: Processing of zero and extreme values

- A minimum value of 0.1 is affected to all indicators because the geometric average cannot include 0
- Maternal mortality truncations ( per 1000 births):
- Minimum value 10
- Maximum value: 1000 (
- Parliamentary representativeness: minimum value of 0.1

#### Step 2: Aggregation in each gendered group

Aggregation of total dimensions for women and men

**For women:**

$$G_F = \sqrt[3]{\left(\frac{10}{TMM} * \frac{1}{AFR}\right)^{1/2} * (PR_F * SHE_F)^{1/2} * ARLM_F}$$

**For men:**

$$G_H = \sqrt[3]{1 * (PR_H * SHE_H)^{1/2} * ARLM_H}$$

**ARLM:** Activity Rate in labour Market

**MMT:** Maternal mortality rate

**AFR:** Adolescent fertility rate

**PR<sub>H</sub>** : Proportion of parliamentary seats held by men

**PR<sub>F</sub>** : Proportion of parliamentary seats held by women

**SHE:** Educational attainment at secondary and higher education

### Step 3: Aggregation between sexes through harmonic mean

Is defined as follows

$$HARM(G_F, G_H) = \left[ \frac{G_F^{-1} + G_H^{-1}}{2} \right]^{-1}$$

The use of harmonic means in geometric means reflects the inequalities among women and men and takes into consideration associations between dimensions.

### Step 4: Calculating the geometric average of arithmetic means

The referenced standard for calculating inequalities can be obtained through an aggregation of women and men indices using equal weightings. Indices are aggregated on the total of dimensions as follows:

$$G_{\bar{F},\bar{H}} = \sqrt[3]{\overline{Santé} * \overline{Autonomisation} * \overline{TAME}} \quad \text{With,}$$
$$\overline{Health} = \left( \sqrt{\frac{10}{TMM} * \frac{1}{AFR} + 1} \right) / 2$$
$$\overline{Autonomization} = \left( (PR_F * SHE_F)^{1/2} + (PR_H * SHE_H)^{1/2} \right) / 2$$
$$\overline{ARLM} = \frac{ARLM_F + ARLM_H}{2}$$

é should not be considered as a corresponding indices average, but rather as a value ranging between established norms for reproductive health indicators (i.e. Less maternity related deaths and less pregnancy among adolescents).

### Step 5: Gender Inequality Index Calculations

The GII is calculated according to the following equation:

$$IIG = 1 - \frac{ARLM(G_F, G_H)}{G_{\bar{F},\bar{H}}}$$

### 3.5. Environmental Indicators

- **Carbon dioxide emissions (per capita) and consumption of chlorofluorocarbons which deplete the ozone layer:**

Carbon dioxide emissions Per capita are the total amount of carbon dioxide emitted by a country through activities carried out (production and consumption) by the population divided by the total population. According to the United States Oak Ridge Information Analysis Centre which analyses carbon dioxide related data, carbon dioxide emissions calculated or estimated by country include emissions from consumption of solid, liquid, gaseous, production of cement and gas flare combustion **Carbon dioxide emissions per capita are simply calculated by dividing the emissions of carbon dioxide by the number of inhabitants in a country.**

- **Consumption of substances that deplete the ozone layer:**

Chlorofluorocarbon consumption (CFCs) in tons of potential for ozone depletion is equal to the total consumption in weighted tons of different substances belonging to this group less metric tons of each substance (as defined in the Montreal Protocol on Substances that Deplete the ozone layer) multiplied by its potential to deplete the ozone layer. A substance that depletes the ozone layer is any substance containing chlorine or bromine that destroys the stratospheric ozone layer. **Thus, CFCs consumption is equal to domestic production, plus imports, minus exports, minus destroyed quantities, minus use as starting material of various CFCs.**

The annual national consumption of CFC is equal to the sum of the weighted consumption in tons (metric tons in consumption multiplied by the potential for ozone depletion) of the individual CFCs.

These indicators monitor and evaluate countries that have ratified the Montreal Protocol that have pledged to reduce emissions of carbon dioxide and the phasing out of CFC consumption.

- **Proportion of population with sustainable access to improved water source:**

The proportion of population with sustainable access to an improved water source is the percentage of population using running water, public fountains, wells, pumps, protected wells, protected springs or rainwater as a drinking water.

**The indicator is calculated as the ratio between the number of people using an improved water source** (grid connections, standpipes, boreholes with hand pumps, protected wells, protected springs or rainwater harvesting) **and the total population.** The same method is used for urban and rural areas and regions.

The indicator provides information on access to improved water sources in a country on the premise that the need for water is one of the basic physiological needs for every human being. But when it is not healthy, it can lead to a deterioration of the population health status.

### Exercises

1) A given country X has the following data:

Indicators	
Life expectancy at birth	70 years old
Average length of schooling	9 years old
Expected length of schooling	13 years old
GNP per capita ( PPP US\$)	1500

- Calculate the HDI of the country with reference to the maximum and minimum values mentioned in the text
- Sort this country based on the belonging threshold of its HDI

Consider a country Y, where men's HDI is equal to 0.66 and women's HDI is equal to 0.54:

- Calculate the Gender Development Index (GDI) in this country
- Interpret the result

A researcher decides to analyse the inequality in a country Z through the Theil Index (GE). After calculation, he finds  $GE = 2$

Interpret this result

- Suppose a fictional country where the population  $n = 1$  million people. Suppose  $q$  ( $q = 400\,000$ ) number of poor people in this population.
  - Calculate the poverty incidence
  - Interpret the result

TEMPLATE

## GLOSSARY

**Average length of schooling:** The average number of exposure to the school system per a person aged 25 and over.

**Expected duration:** It refers to the expected schooling duration for a school-aged child

**Gross national income per capita:** is the total income of an economy generated of its production and its production factors, subtraction of income paid for the use of production factors owned by the rest of the world, converted to international dollars using PPP rates and divided by the population in thousands of years.

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