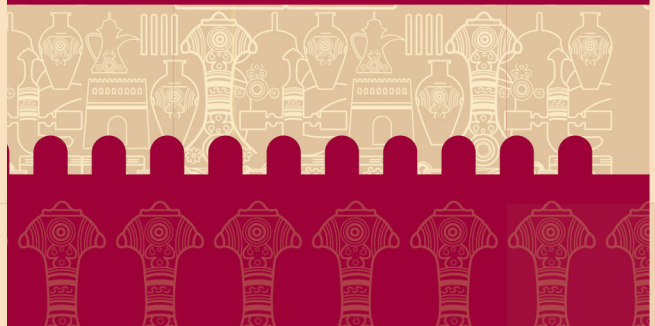


Annex



Terms and Definitions

Adolescent fertility rate: number of births of women aged between 15 and 19 years per 1,000 women of the same age.

Average net enrolment at schools: enrolment rate in a certain stage of education from the age group for this stage of the total population in the same age group.

Average years of schooling: average number of education years obtained by the people of 25 years and above, depending on the level of educational achievement of the population, calculated by the years of study that a student is supposed to spend in each stage of education. This can be calculated directly from household surveys or using educational status of individuals and calculation of the number of years the student is supposed to spend in each stage of education.

Births supervised by specialist medical staff: percentage of births attended by a specialist trained medical staff (physicians, nurses and midwives) able to provide the necessary care for women during pregnancy, childbirth and postpartum. This percentage excludes the number of births under traditional care whether trained or not.

Customer Price Index (CPI): the average price of the basket of goods and services purchased by households. This basket varies from country to country and may be fixed or it may change at over certain periods of time. CPI changes mean a change in the real value of cash (Purchasing Power).

Density of physicians: number of physicians, including public health and specialist physicians per 10,000 people.

Dependency ratio: rate of dependents of the population aged between zero and 14 year old and seniors from the age of 65 and above working age (15-64 years) for every 100 people between 15 and 64.

Expected average years of schooling: the number of schooling years the child at the age of entry to school is expected to receive given that the enrolment pattern by age groups remain the same throughout the child's life.

Gender Inequality Index (GII): a composite index that measures the difference in the achievements in the three dimensions of human development: reproductive health, empowerment and economic activity, resulting from gender inequality. Technical note (3) in the Supplement of Technical Notes includes details on GII calculation.

Gini coefficient of income: measuring the difference in income (or consumption) distribution between individuals and households in a particular country in relation to the complete equal distribution. Lorenz curve indicates the cumulative percentage of total income against the cumulative number of beneficiaries from it starting with the poorest individual or household. Gini coefficient measures the area between the Lorenz curve and the supposed line of absolute equality. This difference is calculated as a percentage of the area below the line. The zero point refers to absolute equality and 100 to inequality.

Grade (1-6): primary.

Grade (7-9): preparatory.

Grade (10-12): secondary.

Gross Domestic Production (GDP): total added value by all producers in the economy plus the taxes on products (minus subsidies) not included in the calculation of production value. No deduction is made for the consumption of manufactured capital assets or depletion of natural resources. The added value is the net output of each sector after adding the outputs and subtracting production inputs. When this value is calculated by the purchasing power parity (PPP) in US\$, it is converted by using official exchange rates of the IMF. An alternative conversion rate is used if the exchange rate is considered too far from the approved price in current transactions in foreign currencies and traded products. When this value is calculated by the purchasing power parity (PPP) in US\$, it is converted to the internationally adopted value of international dollar (ID) on the basis of the same PPP on the GDP of the dollar in the United States of America.

HDI value not related to income: HDI value calculated on the basis of evidence only average life expectancy at birth and education.

Human Development Index (HDI): a composite index that measures average achievements in three basic dimensions of human development, namely long and healthy life, knowledge and a decent standard of living. Technical note (1) in the Supplement of Technical Notes includes details on HDI calculation.

Hybrid HDI: it is an index that has the same function of HDI, but it uses literacy and gross enrolment to construct education index and per capita GDP to construct income index. This Hybrid HDI is used to analyze human development trends. In other words, it is calculated by the same components abovementioned, but by using the new formula (geometric mean).

Inequality-adjusted HDI: the value of the HDI adjusted by a factor of inequality in the three dimensions of human development. Technical note (2) in the Supplement of Technical Notes includes details on Inequality-adjusted HDI calculation.

Infant mortality rate: the risk of death in the first year of birth per 1000 births.

Inherent savings (adjusted net savings): savings rate in an economy as a percentage of gross national income, after taking into account investments in human capital, depletion of natural resources, and pollution damage. The adjusted net negative savings mean that the total wealth is in decline and the economy moves on an unsustainable path.

Intensity of deprivation under multidimensional poverty: average percentage of deprivation experienced by people living under multidimensional poverty

Life expectancy at birth: the number of years that a new born is expected to live if the pattern of death rates recorded by age group at his/her birth remains the same for the duration of his/her life.

Literacy rate among adults: percentage of the population aged 15 years and above who have the ability to write a short and easy paragraph about their daily lives and read and understand the same.

Mortality rate of under-five children: the risk of death in the five years following birth per 1,000 live births based on current mortality rates for this category.

Maternal mortality rate: number of maternal deaths per 100 thousand live births. This includes death during pregnancy or after 42 days after the end of pregnancy, regardless of the duration of pregnancy and its location, and for any reason related to pregnancy, any trace of its effects or any lack in care required. This definition excludes the deaths resulting from an accident not related to pregnancy.

Multidimensional Poverty Index: the percentage of the population living in multidimensional poverty adjusted by the strength of deprivation.

Net flows of foreign direct investment: net flows to have a percentage of shares that equals or exceeds 10 per cent of total shares with voting rights in a particular company based outside the investor's country or its economy. It is the sum of equity capital, reinvested earnings, and long-term and short-term capital, calculated as a percentage of GDP.

Participation rate in the labour force: percentage of the population (aged 15-64 years) involved in the labour market either as workers or job seekers.

Per capita GDP: GDP in US\$ divided by the total population in the middle of the year. When it is expressed as an average annual growth rate, the smaller fraction of the annual growth rate is used with the fixed data of per capita GDP in local currency units.

Per capita gross national income: total added value by all producers in the economy plus the taxes on products (minus subsidies) not included in the calculation of production value plus the primary income received from abroad (compensation of employees and property revenues) divided by the total population in the middle of the year. The added value is the net output of each sector after adding the outputs and subtracting intermediate inputs. When this value is calculated by the purchasing power parity (PPP) in US\$, it is converted to the internationally adopted value of international dollar (ID) on the basis of the same PPP on the GDP of the dollar in the United States of America.

Percentage of population who suffer from multidimensional poverty: percentage of population suffering from deprivation in 3 out of 10 likely indicators used to construct the multidimensional poverty index.

Percentage of the population living below the income poverty line: percentage of the population living below the poverty line (US\$ 1.25 of the PPP per day or the national poverty line). National poverty line is the line deemed by the authorities of a given country suitable for measuring poverty therein based on national estimates on population groups derived from household surveys.

Prevalence of contraceptives of different kinds: percentage of women of reproductive age (15-49 years) who use contraceptives, whether modern or traditional.

Regions: one of the administrative forms in the Sultanate which has replaced by governorates by issuing the royal decree 14/2011 in 26-10-2011.

Repetition rate in primary education: number of learners at the elementary level enrolled in the same previous school year as a percentage of the gross enrolment rate at the school in the previous year.

Severity of food deprivation: average decrease in calories suffered by the malnutrition-afflicted population, calculated as a percentage of the daily dietary energy requirements. The higher this average is, the severer the food deprivation.

Sleep and relaxation in time survey: includes sleeping and relaxing or trying to sleep, whether during the day or the night.

Spread of malnutrition: percentage of people whose consumption of dietary energy is consistently lower than the minimum required to lead a healthy life and do light physical activity at an acceptable weight relative to height.

Total enrolment rate: total students enrolled in a certain stage of education regardless of age. It is calculated as a percentage of the number of people who are at the age of study at this stage.

Unemployment rate (job seekers): percentage of the labour force in the age groups 15 years and above that do not exercise paid work or business, but ready for work and have taken specific steps in search for paid work or self-employment.

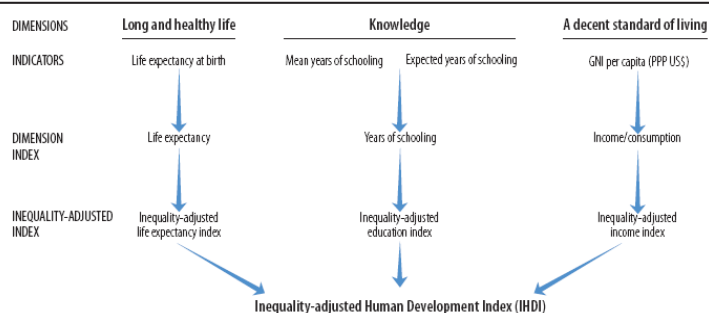
Technical Notes

Calculating the human development indices—graphical presentation

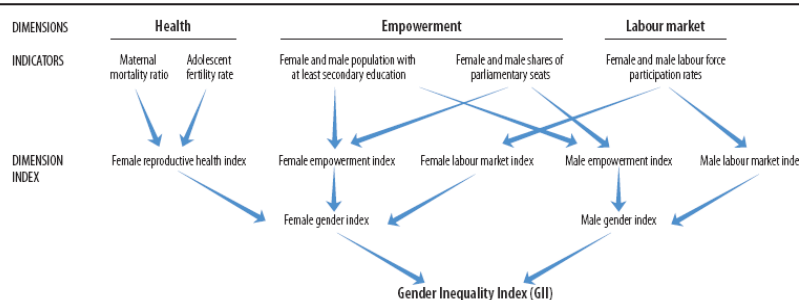
Human Development Index (HDI)



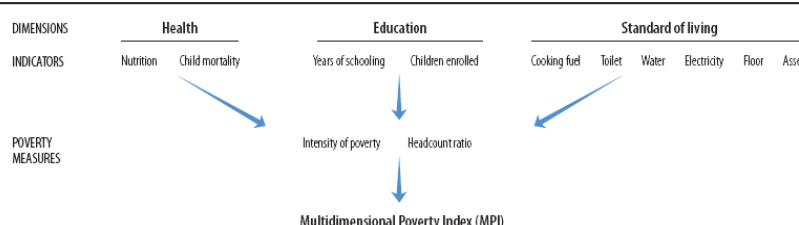
Inequality-adjusted Human Development Index (IHDI)



Gender Inequality Index (GII)



Multidimensional Poverty Index (MPI)



Source: Report of HDI Worldwide 2010

1- HDI Calculation

The concept of human development is much deeper and richer than to be reflected in one composite index, or even in a detailed set of statistical indicators. However, HDI is a useful tool to simplify a complex reality - and this is the target of HDI. It is a measurement that reduces the accomplishments of a particular country at the level of human development to three major dimensions: long and healthy life, knowledge acquisition, and decent standard of living. HDI is a geometric mean of the range of indexes that measure the achievements in each of the three dimensions.

- Achievements related to the dimension of long and healthy life measured by life expectancy at birth.
- Achievements related to the dimension of knowledge acquisition measured by two indexes: average years of schooling and average years of expected schooling.
- Achievements related to the dimension of decent standard of living measured by per capita gross national income (GNI).

HDI shows the distance the country should take to reach the maximum possible value of 1. It also allows for comparisons among countries. The difference between HDI maximum possible value and the value achieved by the country shows the deficit of the country in terms of HDI. The challenge for each country is to find ways to reduce this deficit. This is to say that HDI measures the overall progress of any country in the field of human development. In other words, HDI value for each country indicates the way to go to reach specific goals, namely: average age of 83.2 years, access to education for all, and decent standard of living. HDI reduces these three key indicators to a general measure through measuring the achievement in each indicator as the relative distance from the target. The maximum and minimum values for each variable are converted to a scale from zero to 1, so that each country is at one point on this scale.

Data Sources

- ❑ Life expectancy at birth: life tables for Omanis and the entire population, (Directorate General of Social Statistics, Ministry of National Economy).
- ❑ Average years of schooling: 2009/2010 HEIS which provides detailed data on the age and gender of each household member, their nationality, enrolment in education, number of schooling years completed successfully, (Directorate General of Social Statistics, Ministry of National Economy).
- ❑ Average expected schooling years: HEIS which provides detailed data on the age and gender of each household member, their nationality, and educational attainment by sex and age group. These data are in six categories: no education, primary education, preparatory education, secondary education and higher education. Information about the duration of the study in each stage is used to calculate the estimates, (Directorate General of Social Statistics, Ministry of National Economy).
- ❑ Per capita gross national income (GNI): Annual Statistical books, in addition to the use of PPP coefficient based on Omani Rial = 0.304 US\$. To calculate the per capita GNI for Omanis, the number listed in the Annual Statistical Book for the population as a whole was divided between Omanis and expatriates, according to per capita household income based on the 2009 HEIS.

Creation of Indexes in the Three Dimensions

HDI is created by creating sub-indexes for each dimension first. A maximum and a minimum value (i.e. measurable benchmarks) are determined for each key indicator to turn the indicators to an index of between zero and one. Since the geometric mean is used to calculate the total, the maximum value does not impact the relative comparison (in percentage) between two countries or time periods. The maximum value is set on the basis of the maximum value, and the minimum value based on the values recorded by the indicators during 2010-1980. However, the minimum value impacts comparability, and therefore the value considered the minimum necessary for the continuation of life or value equal to zero is used. The progress is calculated based on the minimum limit that the community needs to continue. As identified in the 2010 World Human Development Report, we used the minimum value as follows: 20 years for average life expectancy at birth, zero for both education variables, and US\$ 163 for per capita GNI. The minimum average life expectancy is based on recorded indexes over a long time period. As for education, any society can continue without it. Therefore, the minimum value of both variables was set at zero. As for income, it is necessary to secure it at the minimum value to ensure survival, and US\$ 163 is the minimum value recorded in the past (Zimbabwe in 2008), (see the following table).

Dimension	Recorded Maximum		Minimum	
	Value	Country	Value	Country
Life expectancy at work	83.2	Japan	20	
Average schooling years	13.2	United States of America	0	
Expected average schooling years	20.6	Australia	0	
Composite education index	0.95	New Zealand	0	
Per capita GNI	108211	United Arab Emirates	163	Zimbabwe

After determining the maximum and minimum values, sub-indexes are calculated as follows:

Dimension Value = (actual value - minimum value) \ (maximum value - minimum value).(1)

In the education dimension, equation (1) is used for both indexes and then the geometric mean is calculated for them before the equation (1) is used again. As for the income index, the natural logarithm of the actual maximum and minimum values is used for income.

Collection of Sub-Indexes to Create HDI

HDI is the geometric mean of the indexes of the three dimensions:

(Life Dimension^{1/3}. Education Dimension^{1/3}. Income Dimension^{1/3}) (2)

Equation (2) involves on the possibility of incomplete replacement among the various HDI dimensions. It therefore addresses one criticism levelled at the linear collection equation in terms of full complete replacement among dimensions.

Calculation of the HDI of the Sultanate of Oman – Total Population

Index	
Average life expectancy at birth (in years)	73.59
Average schooling years	8.07
Expected average schooling years	12.95
Per capita GNI (as per PPP of US\$)	25653

$$\text{Index of life expectancy} = \frac{20-73.59}{20-83.2} = 0.848$$

$$\text{Index of average schooling years} = \frac{0-8.07}{0-13.2} = 0.611$$

$$\text{Index of average expected schooling years} = \frac{0-12.95}{0-20.6} = 0.629$$

$$\text{Index of education} = \sqrt{\frac{0-0.611 \times 0.629}{0-0.951}} = 0.652$$

$$\text{Index of income} = \frac{\ln(163)-\ln(25653)}{\ln(163)-\ln(108211)} = 0.778$$

$$\text{HDI} = \sqrt[3]{0.848 \times 0.652 \times 0.778} = 0.755$$

2- Inequality-Adjusted HDI Measurement

Inequality-adjusted HDI addresses the inequality in distribution among the population in every dimension of human development. This index is based on a set of composite indexes that show distribution in each dimension, proposed by Foster and López - Calva and Hikala (2005), based on Atkinson's set of measurements of inequality (1970). (For more details see Alikre and Foster 2010)

Inequality-adjusted HDI shows the differences in human development dimensions by reducing the average value of each dimension according to the level of inequality therein. The value of the inequality-adjusted HDI is equal to the value of the original HDI Human when there is full equality among people while less than the value of the original HDI in the case of inequality. In this sense, the inequality-adjusted HDI is as an expression of the actual level of human development while HDI can be considered as an indicator of the "potential" human development (i.e. HDI maximum level)

which can be achieved in the absence of inequality. The “difference” in human development ascribe to inequality is that between the HDI and the inequality-adjusted HDI as a percentage.

Data Sources

The inequality-adjusted HDI depends on detailed data sources to obtain the actual distribution in each dimension and measure the distribution in different dimensions: the distribution of income and years of schooling are measured at the individual level while life expectancy depends on age groups.

Inequality in distribution is determined in every HDI dimension in the Sultanate for each of the following elements according to data sources listed for each dimension (all data below are available at the Directorate General of Social Statistics at the Ministry of National Economy):

- ❑ Average life expectancy: based on data of the abridged mortality tables and this distribution is available across age periods (0-1, 1-5, 5-10, and +85) It includes mortality rates and the average age at death for each age group.
- ❑ Years of schooling: HEIS which provides detailed data on the age and gender of each household member, enrolment in education, and number of schooling years completed successfully.
- ❑ Variation in standard of living: using per capita household consumption based on 2009/2010 HEIS.

Calculation of the Inequality-Adjusted HDI

The inequality-adjusted HDI is calculated in three stages:

First stage: measurement of inequality in distribution

The inequality-adjusted HDI depends on Atkinson's set of inequality measurements (1970) and sets the risk factor ϵ at one. In this case, inequality is measured using the following equation:

Where X is the geometric mean and μ is the mathematical mean in distribution. In this way, the equation becomes:

$$A_x = 1 - \frac{\sqrt[n]{X_1 \dots X_n}}{\bar{X}} \quad (1)$$

Where X_1, X_2, \dots, X_n represent individual data. The value of (life expectancy, schooling years, and per capita income / consumption) is calculated on the basis of the data in HEIS and mortality tables.

The geometric mean of the equation (1) cannot be zero. Therefore, in the case of average years of schooling, one year is added to the recorded figures for calculating the inequality. In case of excessive increase or decrease in value of per capita income, a percentage of 0.5 per cent is deducted of the top one fifth in the distribution to reduce the impact of the excessive high value. Moreover, the negative or low income in the bottom one fifth is replaced by the minimum value of 0.5 per cent from the bottom of income distribution.

Second stage: adjustment of dimension indexes as per inequality factor

The average of achievements in a certain dimension \bar{X} is adjusted according to the inequality factor as follows:

$$\bar{X}^* = \bar{X} (1 - A_x) = \sqrt[n]{X_1 \dots X_n}$$

Therefore, \bar{X}^* which is the actual geometric mean of distribution reduces the average value on the basis of inequality in distribution and focuses on the lower part of distribution.

The inequality-adjusted dimensions indexes I_{Ix} shall be calculated by multiplying HDI dimension indexes I_x by $(1 - A_x)$ where A_x is measure of Atkinson's measure which applies to this equation:

$$I_{Ix} = (1 - A_x) \cdot I_x$$

The inequality-adjusted income index depends on the unadjusted GNI index (without using the logarithm).

• I_{Income}^*

Third stage: measuring inequality-adjusted HDI

The inequality-adjusted HDI is the geometric mean of the inequality-adjusted three dimensions.

First: the HDI is calculated as adjusted by inequality factor that includes the unadjusted income index (IHDI*).

$$IHDI^* = \sqrt[3]{I_{Life} \cdot I_{Education} \cdot I_{Income}^*} =$$

$$\sqrt[3]{(1-A_{Life}) \cdot I_{Life} \cdot (1-A_{Education}) \cdot I_{Education} \cdot (1-A_{Income}) \cdot I_{Income}^*}$$

Then, HDI is calculated on the basis of unadjusted income index HDI* so that the value if distributed evenly shall be as follows:

$$HDI^* = \sqrt[3]{I_{Life} \cdot I_{Education} \cdot I_{Income}^*}$$

The percentages are calculated for the difference between the measurement of both HDI and IHDI as follows:

$$Loss = 1 - \frac{IHDI^*}{HDI^*} = 1 - \sqrt[3]{(1-A_{Life}) \cdot (1-A_{Education}) \cdot (1-A_{Income})}$$

Given that the percentage of the difference resulting from inequality in income distribution is the same in average income and logarithm, IHDI is calculated as follows:

$$IHDI = \sqrt[3]{(1-A_{Life}) \cdot (1-A_{Education}) \cdot (1-A_{Income})} \cdot HDI$$

One of the main disadvantages of the IHDI is its inability to demonstrate the interdependence and thus its inability to measure overlapping differences. To avoid this problem, measuring all the data related to each individual should be derived from a single survey. However, this is impossible at the moment.

The following tables review the actual steps to calculate IHDI in Oman for the total population.

	Indicator	Dimension Index	Measurement of Inequality	IHDI
Life expectancy at birth	73.59	0.848	0.053	(1-0.053)* 0.848= 0.803
Average schooling years	8.07	0.611		
Expected average schooling years	12.95	0.629		
Education index		0.652	0.343	(1-0.343)* 0.652= 0.428
Logarithm of Per capita GNI	10.152	0.778		
Per capita GNI	25653	0.236	0.256	(1-0.256)* 0.236= 0.176

	HDI	IHDI	Difference
HDI on the basis of unadjusted income	$0.507 = \sqrt[3]{0.848 \cdot 0.652 \cdot 0.236}$	$0.392 = \sqrt[3]{0.803 \cdot 0.428 \cdot 0.176}$	$1 - \frac{0.584}{0.755} = 0.227$
HDI	$.755 = \sqrt[3]{0.848 \cdot 0.652 \cdot 0.778}$	$0.755 * \frac{0.392}{0.507} = 0.584$	

3- Gender Disparity Index

Gender Disparity Index (GDI) measures the barriers faced by women in three dimensions, namely

reproductive health, empowerment and labor market. It shows the disparity in human development resulting from inequality in achievements of women and men in the three dimensions. The value of GDI varies between zero where there is parity between women and men in the three dimensions and (1) where there is inequality between men and women in all dimensions subject of measurement. The calculation of the GDI is based on a measurement proposed by Seth (2009) of inequality that takes into account the correlation between dimensions. GDI is based on the overall average of general averages calculated as follows: first the indicators of all dimensions are compiled by calculating the geometric mean of the various dimensions for women and men separately then they are merged by calculating the common average for women and men.

Indicators used and their sources:

- 1- Area of reproductive health: maternal mortality rate (MMR) and adolescent fertility rate (AFR). These indicators relate to only females and are supposed to be equal to one for males. The related data were obtained from Annual Health Book 2009.
- 2- Area of empowerment: proportion of women to men in the parliament (PR) obtained from the report of the Millennium Development Goals, and the proportion of the population with secondary and higher (SE) education obtained from the 2009 HEIS.
- 3- Area of labor market: Labour Force¹ Participation Rate (LFPR) obtained from the 2009 HEIS.

GDI Calculation

GDI is calculated in four main phases:

First stage: collecting data in various dimensions for women and men separately by using geometric means

The collection equation in the case of women and girls is as follows:

$$G_F = \sqrt[3]{\left(\frac{1}{MMR} \cdot \frac{1}{AFR}\right)^{1/2} \cdot (PR_F \cdot SE_F)^{1/2} \cdot LFPR_F}$$

In the case of men and boys, the collection equation is as follows:

$$G_M = \sqrt[3]{1 \cdot (PR_M \cdot SE_M)^{1/2} \cdot LFPR_M}$$

Second stage: calculation of the common average for men and women

Indexes of both genders are collected by using the common average for men and women to create distribution index equally between genders:

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

The use of the geometric means for men and women by the common average reflects inequality between men and women and also take into account the interdependence between different dimensions.

Third stage: calculation of the geometric mean of the arithmetic averages for each indicator

The benchmark of disparity is calculated in two steps: 1- collection of indexes of men and women using the simple arithmetic mean through equal transactions (i.e. equally between both sexes) and 2 - collection of the arithmetic mean of the indexes in the various dimensions by using the geometric mean.

¹ Woman work could not necessary reflect better status of human development. Family poverty could be one of the motives behind woman work (Fatima Al Hamidi, 2002), while empowerment of woman require a minimum level of decent standard of living. So, the high level of women participation in labour market in countries like Bangladesh and Cambodia, for example, compared to Oman may be caused by high poverty level in these countries compared to Oman.

$$G_{F,M} = \sqrt[3]{\overline{Health} \cdot \overline{Empowerment} \cdot \overline{LFPR}}$$

$$\overline{Health} = \left(\sqrt{\frac{1}{MMR} \cdot \frac{1}{AFR}} + 1 \right) / 2,$$

$$\overline{Empowerment} = \left(\sqrt{PR_F \cdot SE_F} + \sqrt{PR_M \cdot SE_M} \right) / 2,$$

$$\overline{LFPR} = \frac{LFPR_F + LFPR_M}{2}$$

Stage four: GDI calculation

GDI is calculated by comparing the index distributed evenly between the sexes with the benchmark:

$$1 - \frac{Harm(G_F, G_M)}{G_{F,M}}$$

It ranges from zero (total equality between dimensions) and 1 (complete inequality between dimensions).

	Reproductive Health		Empowerment		Labor Market
	MMR	AFR	PR	SE	LFPR
Females	0.075	0.120	0.091	0.358	0.218
Males			0.909	0.462	0.69
(females + males)/2	$\frac{\sqrt{\left(\frac{1}{0.075}\right) \cdot \left(\frac{1}{0.120}\right)} + 1}{2} = 0.547$		$\frac{\sqrt{0.358 \cdot 0.091}}{2} + \frac{\sqrt{0.462 \cdot 0.909}}{2} = 0.414$		$\frac{0.218 + 0.69}{2} = 0.453$

Accordingly, the geometric mean for females and males can be calculated as follows:

$$GF = 0.155 = \sqrt[3]{\left(\frac{1}{0.075}\right) \cdot \left(\frac{1}{0.120}\right)} = \sqrt[3]{0.358 \cdot 0.091 \cdot 0.218}$$

$$G_M = 0.765 = \sqrt[3]{1 \cdot \sqrt{0.462 \cdot 0.909} \cdot 0.69}$$

$$HARM(G_F, G_M) = \left[\frac{1}{2} \left(\frac{1}{0.155} + \frac{1}{0.765} \right) \right]^{-1} = 0.257,$$

$$G_{MF} = \sqrt[3]{0.547 \cdot 0.414 \cdot 0.453} = 0.468,$$

$$GII = 1 - \frac{0.257}{0.468} = 0.451.$$

4- Multidimensional Poverty Index (MPI)

MPI determines various facets of deprivation at the individual level in the areas of health, education and standard of living. It is based on the accurate data from household surveys. To calculate it, all the indicators used are taken from the same survey as opposed to the IHDI calculation where indicators are taken from different sources.

Each individual in the household is classified in terms of poverty or lack thereof on the basis of the number of deprivation aspects in his household. Then, data are collected in a measure of poverty at the national level.

Methodology used in the 2010 Human Development Report 2010

For each individual a certain number of points are set according to the deprivation status of his family from among the ten indicators (d), and the maximum number of points recorded is 10. Each of the three dimensions has the same weight (one third) and health and education dimensions have two indicators each. Therefore, the weight of each indicator is 5/3 (or 1.67). The dimension of standard of living has six indicators and thus the weight of each indicator is 5/9 (0.56). The two indicators of education are not completing five years of study by any household member, and the presence of at least one child at school age but not enrolled in school (until eighth grade). The two health indicators are the presence of at least one household member suffering from malnutrition and death of one or more children. The indicators of the standard of living are lack of electricity, lack of access to clean drinking water, lack of access to improved facilities, use of “dirty” fuel for cooking (dung, firewood, or coal), residing at a house whose floor is sand, not owning a car, truck or any similar vehicle, and acquisition of one of these means at most: a bicycle, motorcycle, radio, refrigerator, telephone, and television set.

To determine MPI, recorded points in every aspect of deprivation are added to measure household deprivation (c). The boundary between the poor and non-poor is 3 or more points, i.e. one third of indicators. If the total of (c) is 3 or more, the household (and all members) is in multidimensional poverty while households whose total is between 2-3 are exposed to multidimensional poverty.

The MPI value is the outcome of multiplying two measures: the proportion of people who suffer from multidimensional poverty and the severity of poverty defined by the average number of deprivation cases suffered by the poor.

The proportion of population who suffer from multidimensional poverty (H) is equal to:

$$H = q/n$$

Where **q** is the number of population who suffer from multidimensional poverty and **n** is the total number of population.

The severity of poverty (A) reflects the proportion of indicators measured (d) which indicates the deprivation of the poor population. The points of deprivation recorded are added only for poor households, and divided by the total number of indicators and the total number of the population who suffer from poverty.

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

Where **c** is the total number of deprivation aspects suffered by the poor and **d** is the total number of measured indicators (in this case 10).

Methodology used in the Human Development Report of the Sultanate of Oman:

The same methodology was used to measure multidimensional poverty along with modification of the health dimension indicators because of its unavailability in the same survey with other household data as required by the methodology. We used lack of required calories as a substitute for malnutrition indicators. It is worth mentioning that this indicator is one of the indicators used to monitor the Millennium Development Goals. Moreover, weights have been modified for health and education indicators to take the weight of 1.667 and standard of living indicators 0.833. In this way, the total weights are 10 as in the original index.

To illustrate the methodology used, we use this example based on the use of virtual data:

Household Number	1	2	3	4	Weights
Household size	4	5	7	4	
Dimensions and Indicators					
Education					
Not completing five years of study by any household member	0	1	0	0	3/5
At least one child at school age not enrolled in school	0	0	1	0	3/5
Health					
Non sufficiency of calories required	1	1	0	1	3/5
Living conditions					
No electricity	0	1	1	1	6/5
No access to clean drinking water	0	0	1	0	6/5
No access to proper sanitation	0	1	1	0	6/5
Residing in a house with sand flooring	0	0	0	0	6/5
Use of "dirty" fuel for cooking (dung, firewood, or coal),	1	1	1	1	6/5
Households not having a vehicle and has one of the following at most: a bicycle, motorcycle, radio, refrigerator, telephone, and television set	0	1	0	1	6/5
Number of weighted deprivation (total deprivations multiplied by their weights)	$2.5 = 3/5 + 6/5$	$6.67 = 2*3/5 + 4*6/5$	$5 = 3/5 + 4*6/5$	$4.167 = 3/5 + 3*6/5$	
Is the household poor?	No	Yes	Yes	Yes	
Percentage of population suffering from poverty	$0.8 = (5+7+4)/(4+5+7+4)$				
Severity of poverty	$(5+7+4)*10 / (5*6.6667 + 7*5 + 4*4.16667) = 0.531$				
MPI	$0.8 * 0.531 = 0.42504$				

5- Human Development Index of Regions and Governorates

The same methodology and indexes were used for calculating HDI by region and governorates. The data required for calculating health and education indexes at the level of regions and governorates are available but data are not available for per capita GNI by region and governorates. Therefore, if it is necessary to estimate this indicator for the regions and governorates of the Sultanate, actual data for similar indicators are used and certain assumptions are adopted.

Due to the lack of estimates of per capita GNI at the level of governorates and regions of the Sultanate, we assumed that the per capita GNI is distributed to governorates and regions as per capita household income is distributed based on the results of the 2009/2010 HEIS. The estimate of per capita GNI by the governorates and regions of the Sultanate is:

Per capita GNI by governorates and regions of the Sultanate = per capita household income by governorates and regions * (per capita GNI of the Sultanate as a whole / per capita household income for the Sultanate as a whole).

6- Youth Human Development Index

This index consists of the three indexes: health, education and income. The same indicators used in the original index were used to calculate the Youth HDI. However, since we are concerned here with a certain age category (15-29 years), a special treatment to the method of calculating some indicators was required as summarized as follows:

- 1- Life expectancy at birth: we used the same life tables for Omanis and the entire population, but since these young people had already reached 15 years life expectancy at birth were estimated for the category of 15 years.
- 2- Average years of schooling: we used the 2009 HEIS which provides detailed data on the age and gender of each household member, their nationality, enrolment in education, and number

of schooling years completed successfully. Average years of schooling were calculated for individuals in the 15-29 year age group.

- 3- Average of expected years of schooling: based on the HEIS which provides detailed data on the age and gender of each household member, their nationality, enrolment in education, and educational achievement as per sex and age category. The distribution of youth by educational achievement was obtained as contained in the following categories: no education, primary education, education preparatory, secondary education and higher education. Information on the duration of study at each stage was used to calculate estimates of average expected years of schooling for youth.
- 4- Per capita GNI: the 2009 Annual Statistical Book provides data on per capita GNI in Omani Rial. The PPP on the basis that Omani Rial = 0.304 US\$ was used to estimate the share of youth of GNI adjusted by the purchasing power of the dollar. To calculate the per capita GNI of youth, it was supposed that the ratio between the share of youth in GNI young and per capita GNI of the Sultanate as a whole and for all ages are equal to the ratio between the youth share of household income and per capita household income for the Sultanate as a whole and for all ages, that is:

$$= \text{Share of young of household income} * (\text{per capita GNI of the Sultanate as a whole and for all ages} / \text{per capita household income for the Sultanate as a whole and for all ages}).$$

The regular calculation method (see item 1 in this supplement) was used on these indicators to derive Youth HDI.