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Bhutan's Gross National Happiness Index 2008

The Centre for Bhutan Studies released the new Gross National Happiness (GNH) Index at the Gross National Happiness Conference held 24-26 November 2008 in Thimphu, just after the Coronation of the 5th King, His Majesty Jigme Khesar Namgyel Wangchuck. Although Bhutan has held the ideal of replacing GNP with GNH since the 4th King took office in 1972, this is the first ever quantitative index that has been computed. The first page of this note gives an overview; subsequent pages provide details on the construction of the GNH Index.

The index is constructed of 72 indicators representing 9 dimensions. To realize GNH, each person should have achieved sufficiency in each of the 9 dimensions.[1] The dimensions are:

Psychological Well-being	**Living Standards**
Health	**Education**
Culture	**Time Use**
Ecology	**Good Governance**
Community Vitality	See **www.grossnationalhappiness.com**

The GNH Index is based on survey data from 560 respondents in 12 Dzonkhags.[2] In future years, the survey may be more extensive and the indicators may shift slightly to improve the accuracy of the GNH Index, but the nine dimensions will be the same.

What is the GNH for Bhutan? Below is a description for the popular press. This description uses the metaphor of 'offering bowls' which are common in Bhutan.

- GNH_0 = 0.64 means: most Bhutanese have six of the nine bowls full.
- GNH_1 = 0.76 means: of the bowls that are not full, they are two-thirds full
- GNH_2 = 0.80 means: of the bowls that are not full, inequality is low.
- *Headcount = 100%* - No Bhutanese had sufficiency in all indicators.

What else did the GNH Index reveal? Here are some highlights:
- Women are usually less happy than men.
- The Dzonkhags that were most happy of the 12 were Wangdue Phodrang and Thimphu. Those that were least happy were Gasa and Tashigang.
- Of the nine bowls, the most people had full bowls in 'time use' and 'good governance'.

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[1] That is, the present GNH uses a union approach to identification, hence the headcount of 0% full happiness. Alkire, Santos and Ura 2008 explore other identification methods using poverty as well as sufficiency thresholds.

[2] Wangdue Phodrang, Thimphu, Haa, Tsirang, Zhemgang, Samdrup Jongkhat, Tashi Yangste, Samtse, Pemagatshel, Dagana, Gasa and Tashigang.

THE GNH MEASURE: AN OVERVIEW

Indicators and weights

The GNH is constructed of 72 indicators in 9 dimensions. The dimensions are equally weighted. Within each dimension, the indicators are equally weighted but as there are different numbers of indicators per dimension, the indicators take different weights in calculating the overall measure.

Construction of the GNH

The GNH construction is based upon a robust multidimensional measurement of insufficiency, that is represented as M_0, M_1, and M_2.[3] The GNH is one minus the insufficiency, because it represents the population who enjoy sufficiency. There are three GNH measures:

GNH_0: $1-M_0$: the headcount (H) times the *average proportion of dimensions* in which a household has achieved sufficiency ($1-A$). This expresses the **breadth** of sufficiency. In simple terms, it is the number of offering bowls that are full.

GNH_1: $1-M_1$: M_1 is equal to the above M_0 measure (HA) times the average *achievement* in the dimensions in which a person has less than sufficiency (G). This expresses the **depth** of sufficiency. In simple terms, it is *how full* the bowls are that are not completely full. ($M_1=HAG$)

GNH_2: $1-M_2$: This is the M_0 measure times the square of each average achievement (S). This adds a consideration for the **inequality** in happiness among different Bhutanese as it emphasizes the deprivations of the most deprived. ($M_2=HAS$)

Interpretation of the GNH

GNH_0 is **0.64.** This means that Bhutanese have achieved sufficiency in 64% of the dimensions. 9 dimensions times 0.64=5.74. Thus Bhutanese on average have achieved sufficiency in 6 dimensions.

GNH_1 is **0.76.** To calculate depth we divide (1-.76) by (1-0.64). This is 0.24/0.36 or 2/3. This means that Bhutanese have on average achieved 2/3 of sufficiency in the dimensions that are lacking.

GNH_2 is **0.80.** This measure combines **breadth, depth, and equality.** Thus it is the summary of all the aspects of GNH. It parallels one minus the Foster Greer Thorbecke index when alpha equals 2, and represents inequality among people. If inequality were very high, the M_2 measure would be very different from M_1 because squaring the values serves to exaggerate the lowness of the poorest people. The GNH Index shows that inequality is rather low, because 0.80 is not very different from 0.76.

The 'headcount' (H) is 100%. This means that no Bhutanese have achieved sufficiency in all 72 indicators.

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[3] Alkire and Foster 2007. 'Counting and Multidimensional Poverty' *Working Paper 7* on www.ophi.org.uk

Gross National Happiness Measure Construction.

Bhutan's GNH measure has been designed to fulfill various criteria which are needed for an annual national measure of happiness that is also relevant to national and district policy.

A measure of Gross National Happiness might be presumed to comprise a single psychological question on happiness such as "Taking all things together, would you say you are: Very happy, Rather happy, Not very happy, or Not at all happy." However, this is not the case. The objectives of the kingdom of Bhutan, and the Buddhist understandings of happiness, are much broader than those that are referred to as 'happiness' in the Western literature. Under the title of happiness, we include a range of dimensions of human well-being. Some of these are quite traditional areas of social concern such as living standards, health, and education. Some are less traditional, such as time use, emotional well-being, culture, community vitality, and environmental diversity.

The Gross National Happiness measure is generated to reflect the happiness and general well-being of the Bhutanese population more accurately and profoundly than a monetary measure. The measure will both inform Bhutanese people and the wider world about the current levels of human fulfillment in Bhutan and how these vary across districts and across time, and will also inform government policy.

Dimensions and Indicators. The GNH measure has been designed to include nine core *dimensions* that are regarded as components of happiness in Bhutan, and is constructed of *indicators* which are robust and informative with respect to each of the dimensions. The nine dimensions were selected on *normative* grounds, and are equally *weighted*, because each dimension is considered to be relatively equal in terms of its equal intrinsic importance as a component of gross national happiness. Within each dimension, several *indicators* were selected that seemed likely to remain informative across time, had high response rates, and were relatively uncorrelated. The nine dimensions are:

1. *Community Vitality*
2. *Culture*
3. *Education*
4. *Environmental Diversity*
5. *Governance*
6. *Health*
7. *Living Standard*
8. *Psychological Well-being*
9. *Time Use*

In this perspective, 'happiness' comprises having sufficient achievements in each of the nine dimensions.

The Gross National Happiness Index (GNH) is constructed in 2 steps, one of which pertains to identification and one to aggregation.[4] We describe each of these steps, and then the mechanism for breaking the index down to report dimensional achievements for each district or group.

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[4] For a detailed justification of this methodology please see Alkire, Sabina and James Foster. 2007. Counting and Multidimensional Poverty. *OPHI Working Paper 7.* www.ophi.org.uk

Identification
The *first* step is to define whether each household has attained sufficiency in each of the nine dimensions. This is done by applying a sufficiency cutoff to each dimension. As this is an innovative methodology, and is not familiar to most readers, we pause to explain.

In poverty measurement, it is quite common to apply a poverty line, which distinguishes people who do not have enough money from those who are non-poor. Of course income poverty lines are very imperfect, but the concept of being able to distinguish people who are poor is well-understood. Bhutan holds that it is possible to distinguish, additionally, between those people who have attained 'sufficient' level of achievement and those whose attainments fall short of sufficiency.

Sufficiency Cut-off
The Gross National Happiness Index applies a 'sufficiency' cutoff to each indicator. The sufficiency line is set, naturally, at a higher level than a poverty line. In some indicators it is set at the top level of achievement for that indicator. In other indicators it is set at a level that is deemed 'sufficient' for most people. A person is identified as having a *sufficient* quality of life if his or her achievements in that indicator meet or exceed the cutoff. If the achievements do meet or exceed the cutoff, the person's actual achievements are replaced by the 'sufficiency' level. For example, if a person's actual income were 1,000 and the sufficiency cut-off were 150, then the person would be treated as if they earned 150. Thus achievements *above* the sufficiency cutoff do not further *increase* someone's quality of life score. The level at which the sufficiency cutoff is set is a value judgment, which can be a topic for public discussion, but the fact that it may be difficult to set an exact cutoff should not obscure the reasonableness of setting *some* sufficiency cutoff.

The Gross National Happiness Index takes the position that beyond a certain point, we don't need to keep adding in higher achievements to the quality of life mechanically; we confine our attention somewhat to a middle band of achievements that contribute significantly to human well-being for most people.

The sufficiency cutoffs are applied as follows: The value of each indicator in which a household attains sufficiency is given a 1. Subsequently all achievements that are less than sufficient are replaced by the 'normalized gap'. The normalized gap is the sufficiency cutoff minus the actual achievement of the household, and that difference is divided by the sufficiency cutoff. For example, if the poverty line is 8 and the achievement is 6, the gap is (8-6)/8, or 0.25. The 'squared' gap is simply the value of the gap squared (0.25)(0.25)=0.0625.

Now how do we identify who is happy? The GNH takes what is known as the 'union' approach to identification in the literature on multidimensional measurement. That is, any shortfall from sufficiency that any household experiences in any indicator within any dimension is considered to depress Gross National Happiness. A person who has achieved sufficiency in all 72 indicators in all 9 dimensions is considered happy.

Aggregation
The *second* step is to aggregate the data of the population a decomposable measure that is sensitive to the 'depth' as well as 'breadth' of achievements (Alkire and Foster 2007). That is, first we identify the shortfalls from gross national happiness, and then we subtract this from 1. The resulting measures are the GNH. There are three measures:

The GNH$_0$ is equal to 1 minus the product of two measures *HA*. **GNH$_0$ = 1-HA**
The GNH$_1$ is equal to 1 minus the product of three measures *HAS*. **GNH$_1$ = 1-HAG**
The GNH$_2$ is equal to 1 minus the product of three measures *HAS*. **GNH$_2$ = 1-HAS**

H is the *headcount* and represents the percentage of people who have not achieved sufficiency.
A is the *average proportion* of dimensions in which people do not achieve sufficiency. **breadth**
G is the average proportionate 'depth' of shortfall from sufficiency people experience. **depth**
S is the average squared proportionate 'depth' of shortfall from sufficiency. **inequality**

Break Down by Dimension
Having calculated the Gross National Happiness indices, it is very easy to break down each index to identify how achievements in each dimension extend or dampen Gross National Happiness. To achieve this, one sums the total number of persons who have not achieved sufficiency in each dimension, and divides this sum by the total number of shortfalls experienced in the population. This produces the *percentage contribution* to shortfalls in Gross National Happiness of that particular dimension.

First level of analysis:
Beyond the GNH measures itself, several kinds of basic analyses are immediately apparent. Not all are able to be completed with the current GNH data, but future surveys that are more extensive would facilitate these analyses.

First, we compare the GNH in different districts, to see which districts have higher GNH scores.

Second, we can compare the GNH across time to see if GNH is decreasing or increasing.

Third, we *decompose* the GNH by dimension (or indicator) and by district. In this way we can see how *shortfalls* in GNH vary across dimensions and across districts. This information reveals immediately in what dimensions of life *shortfalls* from sufficiency are most acute.

Fourth, we track the decomposition of GNH across time, to see in which dimensions sufficiency is increasing, and also to track whether or not it is decreasing in any dimensions.

Fifth, we study the average depth of deprivations, to identify whether the *gap* below the sufficiency cutoff is deepening or narrowing across time.

In addition to the very basic analyses listed below, the GNH will be the topic of econometric analyses to explore interconnections between dimensions, production functions, causal pathways and returns to investments in different dimensions and indicators. These analyses will enable the GNH also to be used to guide additional policies such as budget allocation.

In these ways, the GNH can be a policy instrument, and can capture a great deal of interconnected information that can not otherwise be presented and compared so succinctly.

CONSTRUCTION OF THE GNH - EXAMPLE:
To illustrate, we take an example having nine dimensions and four persons (in actual fact the same steps would be followed using all of the GNH indicators). **Note: The numbers are arbitrary and are used only as an example.**

$$Achievements = \begin{bmatrix} 7 & 8 & 7 & 6 & 8 & 5 & 7 & 8 & 6 \\ 4 & 9 & 4 & 5 & 3 & 7 & 6 & 5 & 4 \\ 9 & 5 & 5 & 8 & 3 & 3 & 8 & 7 & 4 \\ 2 & 9 & 8 & 1 & 4 & 4 & 9 & 3 & 4 \end{bmatrix}$$

Sufficiency Cutoff

$$\begin{bmatrix} 5 & 9 & 7 & 5 & 6 & 4 & 8 & 7 & 6 \end{bmatrix}$$

Step 1. Apply Sufficiency cutoffs to obtain matrices g_1 and g_2. 1 indicates non-deprivation and the value indicates the normalized gap, which is $\dfrac{sufficiency\,cutoff - achievement}{sufficiency\,cutoff}$

$$g_1 = \begin{bmatrix} 1 & .11 & 1 & 1 & 1 & 1 & .12 & 1 & 1 \\ .2 & 1 & .43 & 1 & .5 & 1 & .25 & .28 & .33 \\ 1 & .44 & .28 & 1 & .5 & .25 & 1 & 1 & .33 \\ .6 & 1 & 1 & .8 & .33 & 1 & 1 & .57 & .33 \end{bmatrix}$$

$$g_2 = \begin{bmatrix} 1 & .11^2 & 1 & 1 & 1 & 1 & .12^2 & 1 & 1 \\ .2^2 & 1 & .43^2 & 1 & .5^2 & 1 & .25^2 & .28^2 & .33^2 \\ 1 & .44^2 & .28^2 & 1 & .5^2 & .25^2 & 1 & 1 & .33^2 \\ .6^2 & 1 & 1 & .8^2 & .33^2 & 1 & 1 & .57^2 & .33^2 \end{bmatrix}$$

Step 2. Compute the GNH_1. The *Gross National Happiness* measure is equivalent to the headcount H (in this case 100%) of persons who have not achieved full sufficiency times A, the average proportion of dimensions in which poor persons are deprived (in this case $23/36 = .64$) times S, the average *severity* of the gap.

$$GNH_0 = 1 - HAG = 1 - \left\{ 1.0 \left[\frac{1}{4} \left(\frac{2}{9} + \frac{6}{9} + \frac{5}{9} + \frac{9}{9} \right) \right] \right\} = 0.64$$

$$GNH_1 = 1 - HAG = 1 - \left\{ 1.0 \left[\frac{1}{4} \left(\frac{2}{9} + \frac{6}{9} + \frac{5}{9} + \frac{9}{9} \right) \left(\frac{(.11+.12+.2+.43+.5+.25+.28+.33+.44+.28+.5+.25+.33+.6+.8+.33+.57+.33)}{18} \right) \right] \right\}$$

$= .76$

$$GNH_2 = 1 - HAS = 1 - \left\{ 1.0 \left[\frac{1}{4} \left(\frac{2}{9} + \frac{6}{9} + \frac{5}{9} + \frac{9}{9} \right) \left(\frac{(.11^2+.12^2+.2^2+.43^2+.5^2+.25^2+.28^2+.33^2+.44^2+.28^2+.5^2+.25^2+.33^2+.6^2+.8^2+.33^2+.57^2+.33^2)}{18} \right) \right] \right\}$$

$= .89$

Break Down by Dimension

To break down we calculate A_d which is the contribution to A of each dimension. For example, summing down each dimension we construct the vector v which is the *number of people* who are deprived in each dimension.

$$g_0 = \begin{bmatrix} 1 & .11 & 1 & 1 & 1 & 1 & .12 & 1 & 1 \\ .2 & 1 & .43 & 1 & .5 & 1 & .25 & .28 & .33 \\ 1 & .44 & .28 & 1 & .5 & .25 & 1 & 1 & .33 \\ .6 & 1 & 1 & .8 & .33 & 1 & 1 & .57 & .33 \end{bmatrix}$$

$$v = [2 \quad 2 \quad 2 \quad 1 \quad 3 \quad 1 \quad 2 \quad 2 \quad 3]$$

From this, we find the contribution of each deprivation A_d to overall A, which is merely the proportion of total deprivation counts that each dimension contributes. In this example, there are 18 total deprivations, thus dimension 1 contributes 2/18= of the deprivations, dimension 2 and 3 are the same; dimension 4 contributes only 5.5% to overall deprivation, dimension 5, 16.5%, and so on. The upper row is simply the total *HAG* times the percentage contribution – e.g. (0.23) x (0.11) = (0.025). This breakdown is a tremendously relevant part of any policy analysis, as it can track the evolution of relative progress in different dimensions across time.

Example	1. Living Standard	2. Time Use	3. Health	4. Education	5. Culture	6. Ecology	7. Emotion	8. Governnace	9. Community	Total
	0.025	0.025	0.025	0.012	0.37	0.012	0.025	0.025	0.037	0.23
Shortfalls	*11%*	*11%*	*11%*	*5.5%*	*16.5%*	*5.5%*	*11%*	*11%*	*16.5%*	*100%*

This note introduced the methodology for Gross National Happiness measurement consisting of *(i)* a cutoff identification method that identifies sufficiency both in terms of achievements in each dimension, and achievements across a range of dimensions and *(ii)* an aggregation methodology that satisfies a range of desirable properties including decomposability. The 'sufficiency' cutoffs are set so that any person who had achieved full sufficiency in every dimension would be regarded as fully 'happy'. The measure seems to be *understandable and easy to describe,* because it relies on a cutoff approach which is widely used in policy already. It can reflect *"common sense" notions of happiness* in that the dimensions and indicators directly were chosen because of their relevance in the Bhutanese context. Furthermore this measure is specifically geared not just to notice incremental changes over time, but also to *target, track changes, and guide policy.* This is because the measure is actually developed by considering the sector of the population which does *not* enjoy a sufficient quality of life at present, and scrutinizing the dimensions in which they fall short. The measure *can be decomposed* by variables such as district or language group, and the quality of life can then be broken down by dimension to *identify which dimensions show the highest shortfalls* in different regions or groups. This last characteristic makes it a good tool for tracking changes across time, or for guiding policies to address specific needs of different groups efficiently. It is *technically solid*, enjoying properties of dimensional monotonicity and decomposability.

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