

## **GNH WF METHOD AND OPTIMIZATION OF GNH RESOURCES**

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### **Abstract/Synopsis**

GNH Weightage Factor (WF) Method is a mathematical procedure useful in the following cases:

- (1) To identify relative importance (weightage) the surveyed population is knowingly/unknowingly attaching to each surveyed Domain while answering the Cantril Ladder Questionnaire (Subjective Happiness Survey).
- (2) To compute for every Domain optimum distribution of the current GNH budget and also of the added budget under various optimum allocation schemes.
- (3) To compute the extra GNH budget required to enhance the current GNH to the desired value and to calculate optimum distribution of the extra budget amongst different Domains.
- (4) To compute under various optimization schemes the new GNH number when the budget of some Domain(s) is changed by certain percentage.
- (5) To identify Paradigm Shift (PS) and Prime Movers of Happiness (PMH) situations in the available survey data.
- (6) To compute the change in GNH value when the surveyor uses his/her own WF numbers for the Domains.
- (7) To eliminate the effect of arbitrary nature of GNH Index procedure deciding “who is happy and who is not”.
- (8) To identify Cantril Ladder GNH part not explained by GNH Index procedure.

The following two available survey data are used to illustrate WF Method procedures:

- (1) Bhutan GNH survey data (Reference 1)
- (2) Thailand GNH survey data (Reference 2).

**The WF Method tables are easy to computerize for their routine use. Total 13 (thirteen) tables are attached here to illustrate unique computation procedures of the above 8 (eight) cases.**

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### **Section 1.0: Introduction to Weightage Factor (WF) Method**

The following two methods to report GNH values are currently in vogue. These methods are used in both the references 1 and 2.

- (1) Cantril Ladder Method: This method is based on the survey of happiness resulting from the Cantril Ladder questionnaire such as: On the scale of 0 to 10 (0 indicating ‘not at all happy’ and 10 indicating ‘very happy’), taking all things together, how

happy would you say you are? The average number is reported as GNH of the area in the survey.

- (2) GNH Index Method: This method results in generating a GNH Index number of the area. The GNH questioner assumes the sources of happiness in the form of Domains and comes-up with the rationale to decide who is happy and who is not and at what level. The resulting unique average number is reported as GNH Index of the area.

These two methods have their advantages and short-comings such as: The Cantril Method does not shade any light on the sources of happiness and therefore gives no clue or information regarding the GNH improvement procedure. The GNH Index Method assumes in priori the sources of happiness and arbitrarily decides who is happy and who is not. Because of these different methodologies, it is rarely expected that the surveys based on them will yield identical results. The net result is a conflict in reporting happiness level of a nation or the area under study.

When we are comparing the happiness of nations, it is essential that the computation method should be acceptable to all the nations involved. Also, one has to realize that different areas have different sources of happiness (Domains) as indicated, for example, by the PASIE classification of Reference 3. This warrants appropriate Domain selection which may be peculiar to that nation. The Cantril Ladder Method bypasses this situation since its questionnaire directly uses the wording "Taking all things together". This leads us to conclude that Cantril Ladder Method be used as a true GNH number of the area or the nation. GNH Index Method results should be mathematically adjusted to coincide GNH Index number to Cantril Ladder GNH. This mathematical process is called "Optimization". The process can yield variable optimization schemes and it is at the discretion of the surveyor which one to be used based on his/her knowledge of the area. This will correctly identify the true Weightage Factor (WF) the surveyed population is knowingly or unknowingly employing while answering the Cantril Ladder questionnaire. This will eliminate the arbitrary nature of GNH Index Method in deciding who is happy and who is not. It will also indicate the relevance of the Domain definition as a true source of happiness of the population.

The WF Method optimizes the Domain survey data by using the formulae and procedures described in the subsequent sections.

## **Section 2.0: Optimization Formula**

This section describes the formula used to optimize the Domain data to match its GNH Index result with the Cantril Ladder GNH (Subjective Happiness GNH of Bhutan). Resulting WFs are subsequently employed in the unique procedures required to compute the practical information such as optimum distribution of budget, optimized procedure to enhance GNH Index of the nation/area, distribution of added budget in GNH allocations for

the maximum benefit of the population, etc., as listed in the Abstract/Synopsis. The rationale behind this optimization scheme is based on the fact that when GNH Index value is more than the Cantril Ladder GNH the top contributing Domains' efficacy, assumed by the surveyor to create happiness in the population, is over-rated compared to the one actually experienced by the population. As a result, the weightages of the top contributors should be reduced. At the same time, the weightages of the bottom contributors must be increased to keep the measurement scale of Cantril Ladder to be constant before and after the optimization. Similar rationale is applied when GNH Index value is less than the Cantril Ladder GFNH.

The optimization formula can be summarized as follows:

$$y = \{C - [BD/(D-n)]\} / \{T - [Bn/(D-n)]\}$$

Where:

C = Overall Contribution to GNH by Cantril Ladder Survey,

D = Number of Domains,

T = Sum of Contributions by Top "n" Domains,

B = Sum of Contributions by Bottom (D-n) Domains,

y = WF of Each Top "n" Domains,

WFB = WF of Each Bottom (D-n) Domains = (D-ny)/(D-n).

Notes:

- (1) y and (D-ny) > or = 0. Negative value not allowed since it implies reduction in the happiness derived from that source. One can reduce the source (Domain) budget but cannot make it negative.
- (2) When Cantril Ladder GNH is less than GNH Index: y < or = 1.0.
- (3) When Cantril Ladder GNH is more than GNH Index: y > or = 1.0.
- (4) In all the optimization schemes the sum of WFs should remain constant, same as the original survey implies. The latter gives equal weightage of 1 (one) to all the Domains, making original sum equal to the number of Domains(D). Violation of this will change the Cantril Ladder scale, instead of 0 to 10 to something else, which is not allowed.

### **Section 3.0: Explanation of Attached Tables**

The format of each table is unique in its own way depending on the purpose for which it is created. These tables can be computerized for their repeated routine use.

Table 1: It is for Bhutan GNH Survey data of Reference 1. The ratios of urban and rural communities are derived from the pages 89 and 90 of this reference.

Table 2: This table gives in a tabular form the Weightage Factors of different Domains for the possible optimum distribution conditions. The surveyor has a choice of "n" value based

on his/her understanding of the area under survey. The table also identifies the Paradigm Shift (PS) situation occurring at  $n=4$  where WF value ( $y$ ) is negligible.

Table 3: This table shows how to distribute, for example, 100 million dollars under various optimization schemes for the maximum benefits to the urban population of Bhutan.

Table 4: The calculations of this table show that when the current Cantril Ladder GNH of Bhutan is to be raised from 0.708 to say 0.80 value, about 13% increase in the current budget is required. The table also computes the Domain distribution of the budget under various optimization conditions.

Table 5: The Paradigm Shift condition, described in Reference 3 (page 79) is noticed at  $n=4$  optimization scheme of Table 2. Its computation procedure is tabulated here.

Table 6: Bhutan Survey Data of rural population (Reference 1) is analyzed here to compute WFs of the Domains. Only two optimization schemes ( $n=7$  and 8) seem to be valid. Also, PS condition is observed at  $n=7$ .

Table 7: This table shows, for each valid optimization scheme, how to distribute, for example, 100 million dollars to create maximum happiness/wellness in the Bhutan rural population.

Table 8: Computation of Paradigm Shift situation ( $n=7$ ) is tabulated here. From the Tables 7 and 8 one may conclude that special emphasis should be given to the education of the Bhutan rural population. The education areas selected should be in ARF (Allowable Research Fields) prescribed in Reference 3. The ARF listed fields are: agriculture, horticulture, Global Warming, Green Earth, infrastructure, medicine, pharmacy, etc. Also, from the Tables 7 and 8 it is noted that happiness/wellness derived from "Good Governance" Domain weighs heavily in the rural mind of Bhutan.

Table 9: When the budget of certain Domain(s) is increased by some percentage(s), it will change the GNH of the area by the value depending on the optimization scheme of distribution. The new GNH values of the Bhutan urban area are calculated here, for example, when Ecology Diversity budget is doubled.

Table 10: When the surveyor uses his/her own WF values, GNH will change. The procedure for this computation is tabulated here using easy to understand fictitious data.

Table 11: Reference 2 outlines the Thailand GNH Survey Data for the Cantril Ladder and GNH Index methods. Similar data is available for 158 nations in Reference 2. Thailand data is used here for illustration purpose. Similar calculations can be performed for other nations to obtain optimum Weightage Factors using the formula on Section 2. The optimization study of Thailand data indicates that GDP and Social Support Domains are the Prime Movers of Happiness (PMH) of the Thailand population.

Table 12: This table shows optimum distribution of, for example, 100 million dollars, under various optimization schemes for the maximum benefits (wellness/happiness) of the Thailand population.

Table 13: If Thailand Cantril Ladder GNH is to be raised from the current value of 6.455 to say 7.5, the GNH budget need be increased by 24% as calculated in this table. The latter

also shows the optimum allocations of the required budget under various optimization schemes.

#### **Section 4.0: Conclusion**

Weightage Factor (WF) Method is a useful mathematical tool for the optimum use of GNH resources of any area or nation. It alienates the redundancy of the Domain distributions caused by the arbitrary nature intrinsic to the GNH Index Survey. Usage of GNH Method results in enhanced happiness/wellness of the population by optimum allocation of GNH resources to various Domains. The Domains which have maximum efficacy to create happiness/wellness for the population are correctly identified and are given optimum allocations accordingly. Thus, WF Method avoids the wastage of GNH resources.

#### **References:**

- (1) Centre of Bhutan Studies, Publication "Provisional Findings of 2015 GNH Survey", November 2015, Karma Ura, Sabina Alkire, Tshoki Zangmo, Karma Wangdi.
- (2) "World Happiness Report 2015", Edited by John F. Helliwell, Richard Layard, and Jeffrey Sachs,  
<http://www.theglobeandmail.com/news/national/article24073928.ece/BINARY/World+Happiness+Report.pdf>
- (3) Dr. M. M. Moharir, Tate Publication "Success, Happiness and Manifesto of Happism", ISBN 978-1-62854-895-2, 15.09.01.

**Table 1: BHUTAN GNH SURVEY DATA**

<b>RURAL &amp; URBAN CONTRIBUTIONS TO OVERALL GNH INDEX</b>				
<b>(A)</b>	<b>(B)</b>	<b>(C) %Contribution to Overall</b>	<b>Rural Contribution</b> <b>(D)=@X0.6835</b>	<b>Urban Contribution</b> <b>(F)=@X0.3165</b>
<b>S. N.</b>	<b>Domain Name</b>	<b>GNH Index (Page 30)/(% X 0.756/100)</b>		
1	Psychological Wellbeing	10.48/.0792	.0792 X .6835 = .0541	.0792X.3165 = .0251
2	Good Governance	10.18/.0770	0.0526	0.0244
3	Education	9.78/.0739	0.0505	0.0234
4	Health	13.1/.0990	0.0677	0.0313
5	Ecological Diversity	12.41/.0938	0.0641	0.0297
6	Community Diversity	11.56/.0874	0.0597	0.0277
7	Cultural Diversity	11.01/.0832	0.0569	0.0263
8	Living Standard	10.91/.0825	0.0564	0.0261
9	Time Use	10.57/.0799	0.0546	0.0253
	SUM	100.00/.756	0.5167	0.2393

CHECK: 0.756 X 0.6835 = 0.5167 OK , 0.756 X 0.3165 = 0.2393 OK

NOTES: (1) This data is from Reference 1. From page 89, 0.6835 and 0.3165 are respectively rural and urban population ratios.

(2) Cantril Ladder GNH (Subjective Happiness Index of Bhutan) are reported on 0 to 10 scale. They are reduced to 0 to 1 scale for consistency.

Table 2: BHUTAN GNH SURVEY DATA

WF METHOD TO EQUAL URBAN GNH INDEX TO CANTRIL SCALE URBAN GNH						
(A)	(B)	(C) %Contribution to Overall	Urban Contribution	(F)=@X0.3165	Contribution Number	
S. N.	Domain Name	GNH Index (Page 30)/(% X 0.756/100)				
1	Psychological Wellbeing	10.48/.0792	.0792X.3165 = .0251		7	Higher to Lower
2	Good Governance	10.18/.0770	0.0244		8	
3	Education	9.78/.0739	0.0234		9	
4	Health	13.1/.0990	0.0313		1	
5	Ecological Diversity	12.41/.0938	0.0297		2	
6	Community Diversity	11.56/.0874	0.0277		3	
7	Cultural Diversity	11.01/.0832	0.0263		4	
8	Living Standard	10.91/.0825	0.0261		5	
9	Time Use	10.57/.0799	0.0253		6	
	SUM	100.00/.756	0.2393			

$$y = \{C - [BD/(D - n)]\} / \{T - [Bn/(D - n)]\}$$

$$WFB = (D - ny)/(D - n)$$

Cantril Scale Urban GNH = 0.708, Required Urban Contribution to Overall Bhutan GNH = 0.708 X 0.3165 = 0.2241 = C

D = Number of Domains = 9

n	T	B	DB/(D-n)	Bn/(D-n)	Numerator	Denominator	Y	WFB	Remark
3	0.0887	0.1506	0.2259	0.0753					y Negative, no good
4	0.115	0.1243	0.22374	0.09944	0.00036	0.01556	0.0231	1.781	OK
5	0.1411	0.0982	0.22095	0.12275	0.00315	0.01835	0.17166	2.03542	OK
6	0.1664	0.0729	0.2187	0.1458	0.0054	0.0206	0.262135	2.47573	OK
7	0.1915	0.0478	0.2151	0.1673	0.009	0.0242	0.3719	3.1983	OK
8	0.2159	0.0234	0.2106	0.1872	0.0135	0.0287	0.47038	5.2369	OK

CHECK for n=4: .1150 X .0231 + .1243 X 1.781 = .22409 = C OK

CHECK for n=8: .2159 X .47038 + .0234 X 5.2369 = .2241 = C OK

NOTES: (1) "y" is negative for n=1,2,3 no good

(2) At n=4, "Y" is small giving possibility of Paradigm Shift at n=4. See Table 5.

**Table 3: BHUTAN GNH SURVEY DATA**  
**WF Method for Optimum Distribution of 100 Million Dollars Available in Addition to Current Urban GNH Budget**

Cantril Ladder GNH 0.708, C=0.2241						
(A)	(B)	Urban Contribution (F)=@X0.3165	(G) Weightage Factor Table 2, n=4	(H) Weightage Factor Table 2, n=8	Dollars (Millions) n=4 (F)X(G)X100/0.2241	Dollars (Millions) n=8 (F)X(H)X100/0.2241
1	Psychological Wellbeing	.0792X.3165 = .0251	1.781	0.47038	19.95	5.268
2	Good Governance	0.0244	1.781	0.47038	19.39	5.121
3	Education	0.0234	1.781	5.2369	18.6	54.68
4	Health	0.0313	0.0231	0.47038	0.323	6.57
5	Ecological Diversity	0.0297	0.0231	0.47038	0.306	6.234
6	Community Diversity	0.0277	0.0231	0.47038	0.285	5.814
7	Cultural Diversity	0.0263	0.0231	0.47038	0.271	5.52
8	Living Standard	0.0261	1.781	0.47038	20.74	5.478
9	Time Use	0.0253	1.781	0.47038	20.11	5.31
	SUM	0.2393	8.9974	9	99.98	100

**NOTE: Similar calculations can be made for n=5,6,and 7. When n=1,2 and3, "y" is negative, no good.**