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Estimation of Under-achievements in Livelihood Space: Search for Sustainability Index and Influencing Factors Through Quantum Computing and Artificial Intelligence

Soumya Sengupta

Sugata Sen

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Ensuring a decent livelihood is one of the greatest challenges being faced by the human society. Even after multifaceted efforts, the outcome to sustain livelihood throughout the world is not uniform. This work wants to find the actual scenario of sustainable livelihood in our global village. To that respect an index of under-achievement is constructed here. The concepts of mathematical topology, artificial intelligence and quantum computing have been used for that construction. The created index is tested to find the significant influencing factors.

On the basis of the existing literature it appears that the outcomes on delivering sustainable livelihood are distinctly different in different economies. Incidentally the research on sustainable livelihood has failed to deliver desired answers to this diverse result due to the absence of proper research methods. This problem in the academic discourses can well be solved through the ideas of artificial intelligence. Artificial intelligence techniques can properly optimize the decisions about sustainable livelihood in a multi dimensional framework. This decision optimization operation in a multi dimensional framework can best be achieved through the platform of quantum computing. Thus the specific objectives of this study are.

- Firstly, to construct an under-achievement index in the sustainable livelihood space with the help of mathematical topology.
- Secondly, to cluster the economies on the basis of their under-achievements to find the under-lying histro-geographical patterns of economy wise under-achievements.
- Thirdly, to locate the direct as well as indirect effects of influencing factors on the composite under achievement with the help of artificial intelligence in the platform of quantum computing.

This work is based on secondary data published by World Bank. Sustainable livelihood is determined through the concepts published by Department of Foreign and International Development, UK. The ideas of mathematical topology and artificial intelligence have been used to come to the conclusion. The whole work is executed in the platform of quantum computing. Eventually the economies within the livelihood topological space are clustered on the basis of their under-achievements. These clusters are used to determine the spatial and histological influences on the intensities of under-achievements through multiple regression. Finally the significance of the model is tested.

It is assumed that there are m key elements to achieve sustainable livelihood and n perspectives or economies to achieve the optimum. Thus the local achievement of the i^{th} perspective is

$o_i = \{ d^*_{i1}, d^*_{i2}, d^*_{i3}, \ldots\ldots d^*_{im} \}$

where i=1,2,3,.....n, j=1,2,3,.....m and $i \neq j$

d^*_{ij} are the achievements of the i^{th} perspective in j^{th} key element.

Now, $O=\{ o_i \}$ where i=1,2,3,...n.

Connecting the n perspective through each of the key elements we can get m topological spaces.

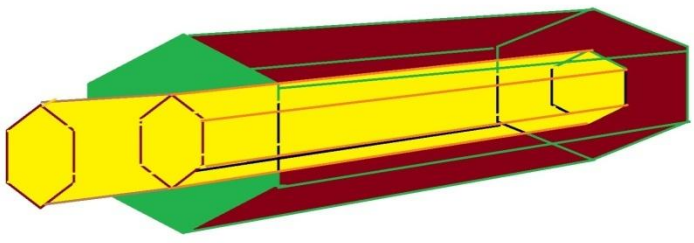
Now let $Z=\{ \tau_j \}$, where j=1,2,3,....m, where τ_j is the topological spaces.

Now let, Z^* is the desired set of topological apace and $\hat{Z}$ is the achieved topological space. Then the difference between Z^* and $\hat{Z}$ is the global under achievement with respect to sustainability of livelihood. Again the under-achievement of each perspective as presented by the perspective wise difference between Z* and $\hat{Z}$ is the under-achievement Index for that particular perspective. In other words if UAI_i is the under-achievement index of the i^{th} economy then it can be written that

$$UAI_i = Z^*_i - \hat{Z}_i$$

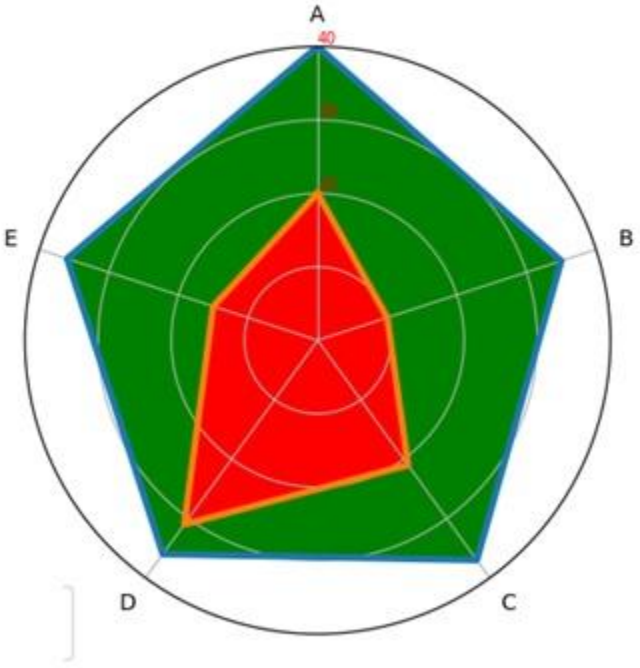
Now the O, Z*, $\hat{Z}$ and the global under-achievement space are presented through the following diagrams.

Chart- I



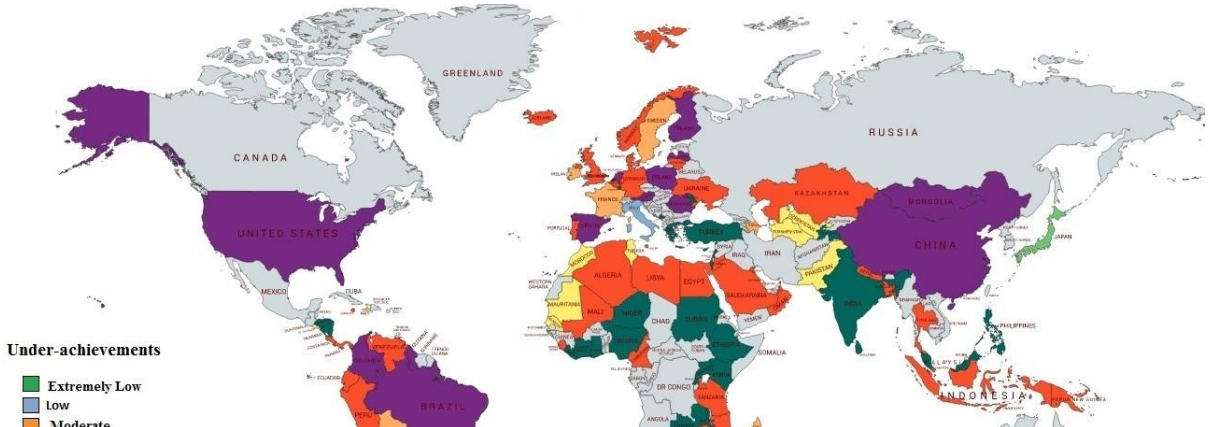
In the above diagram the internal narrow topological space is the actually achieved livelihood space ($\hat{Z}$) where as the external broader topological space is the optimum topological space (Z*). The difference between these two topological spaces is the global under achievement in sustainable livelihood.

Chart - II



Any cross section of the topological space (Chart – I) as created in the previous paragraph and as shown through Chart - II is the presentation of optimum plane and achievement plane of an economy or perspective. Difference between the target plane and the achievement plane, as shown by the green area in Chart –II, is the perspective wise under-achievement area or the perspective wise under-achievement index. Clustering of the economies on the basis of their under-achievements can be presented through the following diagram (Chart – III). Interestingly, no distinct geographical or historical pattern on the under-achievement has been observed.

Chart – III



It is found that the under achievement in sustainable livelihood is significantly influenced by the status of human development, year of schooling, history as a colony, balance of payment, human rights of the citizens and level of globalizations. But sustainable livelihood is not affected by sex ratio, per capita income, life expectancy at birth, natural calamities, political instability and corruption within the society. Interestingly, it is observed that under achievement diminishes with the improvement of the human development, with the favorable balance of payment and improvement in human right. At the same time under achievement in sustainable livelihood increased with the improvement of mean year of schooling and level of globalization. The colonial history of a society also put imprint on the achievement level on sustainable livelihood. It is observed that the societies with a colonial past have performed badly in achieving sustainable livelihood. At the same time to achieve sustainable livelihood societies should take steps to improve human development, balance of payment and human rights.