

**A Comparative Assessment of Development of Indian States**

**A CONCEPT NOTE BY CDS RESEARCH TEAM**

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**I. Introduction**

The present study attempts to compare the status of development of Indian States, by constructing a comprehensive and holistic index of development using objective and quantifiable criteria.

Needless to mention, there are many indices that have been constructed to evaluate the state of development or some particular aspect of it, especially in the context of India. However, more often than not, construction of these indices is driven by specific objectives and motivations, such as generating a criterion for public resource allocation among Indian States or providing an indicator of the more lucrative destinations for investors etc. Unfortunately, even after a thorough scan of the existing literature on the subject, it is difficult to find any index of development designed for Indian States that attempts to operationalise a holistic concept of “development” as enunciated in the report by Stiglitz, Sen and Fitoussi (2009). Our study attempts to do so by generating an index of development that captures the holistic framework of Stiglitz, Sen and Fitoussi (2009). We define welfare in terms of a number of domains and use a number of indicators to assess progress in each domain that gives an objective space neutral assessment. Furthermore, we use different methods to aggregate the

different indicators, first at the level of domains and then at an overall level. We thus end up with both domain indices as well as an overall index.

This note explains the concept of development and its various domains that we incorporate in this study. It also describes the variables/indicators for capturing each domain of development. Finally, we spell out the methodology that we intend to adopt to aggregate these different indicators to arrive at domain specific indices and then an overall index of development combining all domains. The indices are so constructed that they are readily amenable for making comparisons across states.

## **2. Conceptual framework**

Development of a society essentially implies achieving a quality of life for its members. Therefore, any assessment of development across societies requires a clear conceptualisation of the quality of life (QoL). QoL is a broad concept that includes a full range of factors that people value and thus clearly goes beyond material prosperity (Sen, 1988). GDP per capita, reflecting people's command over resources, as a measure of development suffers from three major limitations (Stiglitz, Sen and Fitoussi, 2009). First, resources are the means that are transformed into well-being in ways that differ across people. Individuals with greater capacities for enjoyment or greater abilities for achievement in valuable domains of life may be better off even if they command fewer resources. Second, many resources are not marketed, and even when they are, prices will differ across individuals, making it problematic to compare real incomes across individuals. Third, many determinants of human well-being are aspects of people's life-circumstances, which cannot be described as resources with imputable prices, even if people make trade-offs among them. This brings to the fore the multi-dimensionality of the concept of development reflecting human welfare.

Given the multidimensional nature of development and the absence of a straightforward link with opulence, there are three distinct approaches that have been devised to assess the quality of life – the subjective approach, the capability approach, and the approach based on welfare economics (Stiglitz, Sen

and Fitoussi, 2009). The subjective approach is based on the philosophical tradition that individuals are the best judge of their own situation. It uses the self reporting of people about their own state. One of the important contributions of research based on subjective approach is that it elicited a better understanding of the determinants of QoL, such as income, health status, and education. In the capability approach, a person's life is evaluated in terms of the functioning he/she is free to choose, where functioning is a broad term used to refer to the activities and situations that people consider to be important to achieve, such as health, education, and political voice. In this perspective, well-being of a person is a summary index of the person's functionings. While the above two approaches are closely connected respectively to the disciplines of psychology and moral philosophy, the third one is connected to economics. Welfare economics and the theory of fair allocation suggest a method to include non-market aspects of QoL into a broader measure of well-being on the basis of individual preferences.

Research on QoL based on the above mentioned approaches emphasises a range of features in people's life that are important either intrinsically as objective expressions of a good life or instrumentally to achieve valuable subjective state or objective goal. However, it is important to note that what are the objective features or dimensions of good quality life inevitably depends on value judgements. It is true that valuation of various aspects of life differ from person to person (value-heterogeneity) and the process of change involved in development also changes the valuation of people (value-endogeneity). Though value-heterogeneity and value-endogeneity are serious issues, it has been argued that the actual extent of agreement on aspects determining life's quality is indeed quite large (Sen, 1988 and Stiglitz, Sen, and Fitoussi, 2009). It appears that there is a broad consensus on some of the key dimensions of life quality. For instance, Stiglitz, Sen, and Fitoussi (2009) list the following dimensions that may be considered essential for having a quality life in modern societies.

1. **Health:** Health is a basic factor deciding both length and quality of life. It has both intrinsic and instrumental worth. Better health not only allows people to enjoy their life, but it also enables them to work and earn.

2. **Education:** Education is essential for having a quality life in modern society. Apart from its contribution towards improving peoples' productivity and earnings, education positively impacts other domains of wellbeing like health, social connections, civic and political life and enjoyment of arts and sciences.
3. **Personal Activities:** The way people spend their time and the nature of their personal activities influence the quality of their life, irrespective of incomes generated, and also their subjective judgment of well-being. Various activities discussed under this domain include paid (decent) work, unpaid domestic work, leisure, commute etc.
4. **Political voice and governance:** Ability to participate in political discourse and to dissent as well as to speak up against the authority on matters that one perceives to be wrong are essential aspects of political freedom. This, along with their ability participate in the governance of the country, improves the self-esteem of the people and enables them to influence choices that impact on people's lives.
5. **Social Connections:** Being a social animal, social connections and interactions improve the quality of life in many ways. Apart from providing many services like insurance and security, social connections and interactions help people to have a broader and realistic attitude to life, helping them to cope with many anxieties and stresses in life, enabling them to have better life-evaluations and health status.
6. **Environmental Conditions:** Apart from providing sustainability, better environmental conditions contribute to life quality in many ways. Clean air, water and surroundings positively contribute to the health of the people. Further, people also value environmental amenities or disamenities and they take this into consideration when they make their choices such as where to live.
7. **Personal insecurity:** Personal insecurity includes external factors that put at risk the physical integrity of each person: crime, accidents, natural disasters, and climate changes are some of the most obvious factors.

8. **Economic insecurity:** Uncertainty about future income and material conditions emerging out of events such as employment loss, wage cut, and illness, can drastically reduce the quality of life.

In our attempt to assess the extent of development across Indian states, we adopt a conceptualisation of development that consists of material living standard plus the above described dimensions of quality of life, except the domain of personal activities. Though personal activities are an important factor deciding the quality of life, we dropped this dimension because of the unavailability of suitable indicator(s) capturing this dimension.

### 3. Domains and Variables

**Table 1. Domains and variables**

<b>Domain</b>	<b>Variables</b>	<b>Description</b>
<b>Wealth and material living standard</b>	Average value of assets per household	Asset ownership
	Average share of non-food expenditure in the total consumption expenditure	Consumption expenditure
<b>Health</b>	Hospital beds per 1000 population	Health infrastructure – input variable
	Health expenditure as a percent of GSDP	health financing – input variable
	Infant mortality rate	health status – outcome variable
<b>Education</b>	Pupil-teacher ratio	Educational infrastructure – input variable
	Number of persons having at least secondary education in per 1000 persons	Educational achievement – Outcome indicator
	Number of persons having at least graduate education in per 1000 persons	Educational achievement – Outcome indicator
<b>Political voice and governance</b>	Voting percentage	Political participation
	Success ratio of women candidates	Political participation

<b>Social connection</b>	Percentage of households with less than four members	Extent of social support
	Suicide rate	Extent of social seclusion
<b>Environmental conditions</b>	Per capita forest and tree cover (in hectare)	Green cover
	Percentage of violation of various water quality parameters	Water pollution
	Number of Integrated Treatment, Storage and Disposal facilities	Waste management
<b>Personal security</b>	Number of police personnel per one lakh population	Personal security (input indicator)
	Percentage contribution to the all India incidence of total cognizable crimes	Personal insecurity – outcome indicator
<b>Economic insecurity</b>	Unemployment rate for persons of age 15-59 years according to current daily status	Income insecurity
	Share of workers in agriculture and allied activities	Livelihood vulnerability
	Proportion of workers (per 1000) in the informal sector	Occupational vulnerability

#### **4. Methodology**

##### ***Normalisation***

As a first step, the set of indicators collected across a range of domains need to be normalized and made comparable, given that they are in different measurement units with varying scales of computation. Normalization can be done in a variety of ways. Ranking is the basic normalization technique which overlooks cardinality and mutual distances. Another commonly used normalization technique is to convert the variable into a standard normal distribution  $N(0,1)$ . The problem with this technique is that mutual distances are largely conditioned by the mean which may be affected by extreme values. Yet another method of normalisation is the so-called Max-Min  $[(\text{Max-Obs})/(\text{Max-Min})]$  technique of

unitary conversion that limits the range to (0,1). Apart from being affected by extreme values, in this conversion we implicitly assume that development occurs in a linear scale, in the sense that a movement from 0.2 to 0.25 in the development index is treated equally as a movement from 0.9 to 0.95. This could be contested.

We, therefore, decide to adopt a normalisation method that allows for concavity in the mutual distances between the index values. This formulation is:

$$\text{Normalised } X_i = (\text{Ideal best } X_i - \text{Observed } X_i) / (\text{Ideal best } X_i + \text{Observed } X_i)$$

As evident, from the ideal best value we situate the states in a unitary range (0,1) with mutual distance following a concave path way by assuming the Canberra Distance Function.<sup>1</sup>

### ***Weighting and Aggregation***

#### ***Equal Weights***

The simplest way to aggregate a set of indicators is to assign equal weights to each, as done in the UN Human Development Index (HDI). However, this assumes that each domain of development as described above are equally important in evaluating the status of development of a region.

#### ***Principal Component Analysis (PCA)***

One way of arriving at a weighted average of different domain indices with unequal weights is through PCA. This is used primarily when the variables in question are expected to be correlated. The statistical method involves calculation of n principal components (PC) as linear combinations of the n variables, constructed in such a way that they are all orthogonal to each other. By construction, the first two or three PCs tend to capture over 95% of the combined variation of all variables. As proposed by Nagar and Basu (2002) a weighted average of all n principal components weighted by their respective eigenvalues (representing the fraction of total variation explained by each PC)

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<sup>1</sup> A typical feature of Canberra Distance Function is to represent deprivation in a unitary scale (0 and 1) with concavity in the pathway.

would serve as a perfect indicator of development capturing all domains defined above with weights assigned according to the variations reflected by actual data.

### Analytic Heirarchy Process (AHP)

Analytic Hierarchy Process (AHP) is a widely used technique for multi-attribute decision-making developed by Thomas Saaty. It essentially resolves the problem of reading multi-attribute outcomes in a hierarchical structure. Such a hierarchical structure is dictated by pair wise comparison of attributes in terms of the extent to which one can substitute the other. Weights represent the trade-off across indicators. They measure willingness to forego a given variable in exchange for another. Hence, they are not importance coefficients. It may cause misunderstandings if AHP weights were to be interpreted as importance coefficients. The core of AHP is an ordinal pair wise comparison of attributes. For a given objective, the comparisons are made between pairs of individual indicators, asking which of the two is the more important, and by how much. The preference is expressed on a semantic scale of 1 to 9. Such a scaling is made in terms of the levels of partial correlation coefficients irrespective of sign. Lesser is the partial correlation values with alternative indicators greater is the weight attached to that indicator.

### Aggregation: Additive versus Multiplicative

The aggregation can be done in two ways that is additive or multiplicative. While the most commonly used is the additive aggregation method (arithmetic mean), it suffers from one limitation, namely, domains are assumed to be perfectly compensatory – lower values of one domain can be exactly compensated by higher values of another domain with a constant rate of compensation. This assumption implies perfect substitutability between domains, which is questionable. The multiplicative method (geometric mean) overcomes this limitation of this constant rate of compensation of the additive method. Moreover, the geometric mean is also more sensitive to inequalities in the distribution of domain indices. We use both methods of aggregation in our study.

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